

C2
1

**RECOMMENDATION FOR CODE AND CRITERIA CHANGES REGARDING
ACCESS TO SHORELINE (TRAMS) AND SHORELINE MODIFICATIONS
Planning Commission September 28, 2010**

Description:

Amend the City Code, Chapter 25-2, Subchapter C, Article 13 relating to docks, bulkheads and shoreline access, Chapter 25-5-2 relating to site plan exemptions and Chapter 25-8-92 relating to Critical Water Quality Zone boundaries. This Code amendment proposes to clarify regulations for shoreline access (i.e. trams or incline elevators) and modify shoreline protection requirements to include the prevention of vertical bulkheads, promotion of stable and environmentally-functional shorelines that provide wave abatement, and provide additional guidance to protect the integrity, water quality and safety of Lake Austin, Lady Bird Lake, and Lake Walter E. Long as requested by the Parks Board, Environmental Board and Planning Commission in 2009. Amendments to 25-5-2 (Site Plan Exemption) will clarify related site plan exemptions for maintenance. Amendments to 25-8-92 will provide clarification that the inundated areas of the lakes are part of the Critical Water Quality Zone. A new section of the ECM will be proposed to support the amended code.

Background:

There has been an increase in permitting requests for incline elevators (trams) as a means of providing access to the lake shore over cliffs or slopes. While traditional methods of access such as footpaths, stairs or sidewalks are addressed in the code, additional requirements are needed to regulate incline elevators and protect Critical Environmental Features.

Vertical bulkheads currently compose approximately one-half of the shoreline of Lake Austin and typically do not support the environmental, water quality and wave abating benefits that naturally sloped and vegetated shorelines provide. The First National Lakes Assessment by the EPA "shows that poor habitat condition along the shoreline is the most significant stressor in lakes" and that "local, state and national initiatives should center on protecting shoreline habitats." Current code language prohibiting "smooth, vertical bulkheads" has led to problematic interpretations. Attempts in 2005 to provide clarification has not resulted in a substantive change in the typical development practices. WPD Environmental Resource Management Division has provided a webpage summarizing the disadvantages of vertical bulkheads, benefits of sloped and vegetated shorelines, alternatives to vertical bulkheads, guidance resources and proposed draft code/criteria amendments. http://www.ci.austin.tx.us/watershed/bulkhead_shoreline.htm.

Summary of Proposed Changes to the LDC:

LDC 25-2 Article 13 (Boat Docks)

- Change Article 13 title to "Docks, Bulkheads and Shoreline Access"
- Replace "Town Lake" with "Lady Bird Lake" to reflect current name.
- Prohibit new boat ramps
- Prohibit storage of toxic or hazardous materials over water (fuel, herbicides, insecticides, etc)
- Include definitions for bulkhead and shoreline access (trams)
- Require site plan and building permit for shoreline access (trams)
- Require a licensed third-party inspection for trams (to meet State regulations)
- Construction of shoreline access must minimize disturbance to vegetation, preserve canopy, replace herbaceous ground cover and be screened from view with vegetation
- Shoreline stabilization to minimize wave action and wave return, demonstrate design guidelines and materials as specified in ECM (forthcoming), no bulkhead or revetment slopes greater than 45 degrees (unless in narrow man-made channels)
- Prohibit capturing or recapturing of land

C2
2

LDC 25-8-92 (CWQZ)

- Clearly establish that inundated areas are part of the CWQZ

LDC 25-2-1066 (Screening Requirements)

- Trams must be screened from the view of property that is in an urban residence (SF-5) or more restrictive zoning district by providing vegetation and tree canopy as prescribed by rule.

LDC 25-5-2 (Site Plan Exemptions) and 25-5-3 (Small Projects)

- Site plan is not required for maintenance if structure was legally constructed, no variance is required, no board or commission approval required, no change to footprint, and no addition or replacement of piles unless the structure is compliant with current code
- Shoreline access exceeding 50ft and 35% gradient is not considered a small project

Historical Initiatives/Stakeholder Input

- February 1, 2005: Development community meets with the LCRA Lake Austin Advisory Panel (LAAP) to express concerns about the delay in bulkhead approvals by the City
- March 8, 2005: PARD presents City process and goals for shoreline development to LAAP
- August 22 and September 8, 2005: LAAP observes wave action on various shorelines
- October 16 & 20, 2005: LAAP and stakeholders provide bulkhead design recommendations to PARD
- December 2, 2005: City Public Works Department presents PARD with proposed draft criteria and standard details requiring rip-rap, rock gabions or other revetment design to be installed for wave attenuation.

Recent Initiatives/Boards and Commissions:

- Winter 2009: During routine hydrilla management field efforts, ERM Staff observes degraded biological community and lakebed scouring common at shorelines with vertical bulkheads
- Feb 19, 2009: Parks Board resolution to recommend amending the LDC to require review and permitting of trams (incline elevators/shoreline access)
- March 2009: ERM Staff estimates vertical bulkheads compose 42% of Lake Austin shoreline, observes a lack of compliance with recommended methods provided in 2005 by Public Works, and initiates literature review regarding shoreline development methods
- May 20, 2009: ERM presents findings to the Environmental Board
- July 15, 2009: Environmental Board recommends to the Planning Commission to initiate staff development of code and criteria changes as necessary to clarify shoreline protection requirements in conjunction with amendments related to trams
- Aug 25, 2009: Parks Board moved to support the Environmental Board resolution
- Oct 27, 2009: Planning Commission initiates staff development of code changes
- April/May 2010: ERM provides status presentations to Parks Board and Environmental Board
- June/July 2010: Environmental Board Subcommittee meetings for code amendments (with stakeholders)
- July 21, 2010: Environmental Board Motion to support draft code amendments
- Aug 24, 2010: Parks Board Motion to support draft code amendments
- September 17, 2010: Environmental Criteria Manual draft provided to stakeholders
- September 28, 2010: Planning Commission

Supporting Material Attachments:

- Draft Code Amendments - Legislative Copy
- Draft Code Amendments - Full text of affected sections with proposed changes shown
- Draft Environmental Criteria Manual (new) section 1.13
- 2005 Propose Criteria and Standard Details (Public Works)
- 2005 Stakeholder recommendations: Sam Crowther (LAAP) and John McIntyre
- Response to stakeholder questions from August 17, 2010 Codes and Ordinances in addition to previous board presentation and subcommittee meetings

C²/₃

Backup Material Resource Links:

The following list presents an abbreviated list of resources on shoreline stabilization provided by federal, regional, state and municipal entities. Included resources include a literature review, handbooks for landowners, alternative method recommendations and technical guidance. A more thorough list of resources can be provided upon request. The *Shoreline Stabilization Handbook* provides a thorough comparison of different methods and issues related to the topic.

Shoreline Stabilization Handbook for Lake Champlain & Other Inland Lakes

(Northwest Regional Planning Commission and NOAA)

<http://nsgd.gso.uri.edu/lcsg/lcsg04001.pdf>

First National Lakes Assessment Released

(EPA)

<http://www.epa.gov/owow/info/NewsNotes/pdf/89issue.pdf>

The Construction, Aesthetics, and Effects of Lakeshore Development: A Literature Review

(Wisconsin Department of Natural Resources)

http://dnr.wi.gov/org/cs/science/publications/PUBL_SS_577_99.pdf

Green Shorelines Report

(City of Seattle)

http://www.cityofseattle.net/dpd/static/Green_Shorelines_Final_LatestReleased_DPDS015777.pdf

Shore Erosion Control, the Natural Approach

(NRCS, NOAA, Maryland DNR)

ftp://ftp-fc.sc.egov.usda.gov/MD/web_documents/programs/rcd/shore_esrcd.pdf

Streambank and Shoreline Stabilization Guidance

(Georgia DNR)

http://www.gaepd.org/Files_PDF/techguide/wpb/Streambank_and_Shoreline_Stabilization_Guidance.pdf

Understanding, Living With, and Controlling Shoreline Erosion: A Guidebook for Shoreline Property Owners

(Tip of the Mitt Watershed Council)

<http://www.watershedcouncil.org/resources%20and%20publications/files/Shoreline%20Erosion%203rd%20Edition.pdf>

Erosion Control: Non-Structural Alternatives. A Shorefront Property Owner's Guide

(North Carolina Coastal Federation)

www.nccoast.org/newsroom/images-pdfs/guides/ErosionBro.pdf

Engineering Field Handbook: Chapter 16 – Streambank and Shoreline Protection

(USDA Natural Resource Conservation Service)

<ftp://ftp-nhq.sc.egov.usda.gov/NHO/pub/outgoing/jbernard/CED-Directives/cfh/EFH-Ch16.pdf>

Staff Request:

Staff requests the Planning Commission review and make recommendations for the proposed code amendments with anticipation of an October 28, 2010 City Council date. Staff also requests for support that the new section to the Environmental Criteria Manual be adopted through the Emergency Rules process with the formal stakeholder process to be completed through the 2nd quarter rules process.

City Staff:

Shoreline access (trams): Pat Murphy (974-2821)

Shoreline modifications (bulkheads): Andrew Clamann (974-2694)

C2
4

Draft Code Amendments - Legislative Copy

C2/5

ORDINANCE NO. _____

AN ORDINANCE AMENDING CITY CODE CHAPTER 25-2, SUBCHAPTER C, ARTICLE 13 RELATING TO DOCKS, BULKHEADS, AND SHORELINE ACCESS; AMENDING SECTION 25-2-1006 RELATING TO SCREENING; AMENDING SECTION 25-5-2 RELATING TO SITE PLAN EXEMPTIONS; AMENDED SECTION 25-5-3 RELATING TO SMALL PROJECTS; AND AMENDING SECTION 25-8-92 RELATING TO CRITICAL WATER QUALITY ZONE BOUNDARIES.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF AUSTIN:

PART 1. City Code Chapter 25-2, Subchapter C, Article 13 (*Boat Docks*) is amended to replace all references to Town Lake with Lady Bird Lake.

PART 2. City Code Chapter 25-2, Subchapter C, Article 13 (*Boat Docks*) is amended to change the title as follows:

ARTICLE 13. [BOAT] DOCKS, BULKHEADS, AND SHORELINE ACCESS.

PART 3. Section 25-2-1171 (*Applicability*) of the City Code is amended to read:

§ 25-2-1171 APPLICABILITY.

(A) This article applies to a structure or development:

- (1) in Lake Austin, Lady Bird [~~Town~~] Lake, or Lake Walter E. Long;
- (2) along the shore of Lake Austin in the area below 504.9 feet above mean sea level;
- (3) along the shore of Lady Bird [~~Town~~] Lake below 435 feet above mean sea level; [~~or~~]
- (4) along the shore of Lake Walter E. Long; or[-]
- (5) used for access to areas described in this Subsection.

(B) The building official, director of the Planning and Development Review Department, and [~~the~~] director of the Parks and Recreation Department shall implement and enforce this article.

PART 4. Section 25-2-1172 (*Definitions*) of the City Code is amended to read:

C2
6**§ 25-2-1172 DEFINITIONS.**

In this article:

- (1) BULKHEAD means a revetment or wall constructed for the purpose of stabilizing or modifying the shoreline.
- (2) CONSTRUCT includes placing or replacing a structure and structurally altering an existing structure.
- (3)[(2)] DOCK includes a wharf, pier, float, floating dock, island, boat dock or other similar structure.
- (4)[(3)] NORMAL POOL ELEVATION means:
 - (a) for Lake Austin, 492.8 feet above mean sea level;
 - (b) for Lady Bird [Town] Lake, 429 feet above mean sea level; and
 - (c) for Lake Walter E. Long, 554.5 feet above mean sea level.
- (5)[(4)] RESIDENTIAL DOCK means a dock that provides a stationary landing for:
 - (a) fishing or swimming; or
 - (b) anchoring, mooring, or storing not more than one vessel.
- (6)[(5)] SHORELINE means the line where the edge of the water meets the land at normal pool elevation.
- (7) SHORELINE ACCESS means improvements constructed to provide a means of approaching the shoreline such as stairs, lifts, trams, incline elevators or escalators.

PART 5. Section 25-2-1173 (*Permit Required for Dock Construction*) of the City Code is amended to read:

§ 25-2-1173 PERMIT REQUIRED FOR [DOCK] CONSTRUCTION.

- (A) A person may not modify a shoreline or construct a dock, bulkhead, or shoreline access unless the person first obtains a site plan and building permit, as applicable, and pays the applicable [a] permit fee set by ordinance.

C2
7

- (B) The building official or the director of the Parks and Recreation Department shall require the applicant to ~~[may]~~ place an identification or registration tag on a dock. A person may not remove a tag placed under this subsection.
- (C) A permit obtained under this section shall be prominently displayed at the construction site until the final inspection and approval by the building official.
- (D) The director of the Planning and Development Review Department ~~[building official]~~ may not approve an application for a permit for the construction of more than two residential docks or other similar structures on a single lot zoned MF-1 or more restrictive, unless:
 - (1) the lot was platted and recorded before August 26, 1976, and perpetual rights to use the water frontage of the lot were granted or conveyed to one or more owners of other lots in the subdivision before June 23, 1979; or
 - (2) the Parks and Recreation Board has approved a site plan that clusters the residential ~~[boat]~~ docks on one or more lots in the subdivision.
- (E) If a permit is required under this section and is not obtained before construction begins, the required fee is increased by an amount established by ordinance. Payment of the additional fee does not relieve a person from complying with this Code.
- (F) Where an inspection is required by state law, neither a Certificate of Compliance nor a final inspection may be issued for shoreline access unless the applicant has submitted an inspection report, signed by a QEI-1 inspector registered with the Texas Department of Licensing and Regulation, stating that all applicable state regulations have been met.

PART 6. Section 25-2-1174 (C) (*Structural Requirements*) of the City Code is amended to read:

- (C) A retaining wall, bulkhead, or other erosion protection device must be constructed to minimize wave return and wave action by using design and materials prescribed by rule ~~[of stacked stone, natural rock rip rap, concrete, steel pilings or wallings, or aluminum]~~. A bulkhead with a greater than 45 degree vertical slope for any portion greater than one foot in height ~~[smooth vertical surface]~~ is not permitted on or adjacent to the shoreline ~~[main body]~~ of a lake listed in section 25-2-1171 (*Applicability*) unless the shoreline is located within an existing man-made channel less than 50 feet in width. ~~[The surface of a wall or bulkhead constructed on the main body of a lake~~

~~must be designed to minimize wave return and reduce wave action.]~~

Capturing or recapturing of land is not permitted on a lake listed in section 25-2-1171 (Applicability).

PART 7. Section 25-2-1176 (*Regulations*) of the City Code is amended by amending Subsections (A) and (F) and adding a new Subsection (I) to read:

- (A) A site plan must comply with this section. A city official may not approve for final inspection a structure that does not conform to the requirements of Title 25 of the City Code, including this section.
- (F) The number of [~~boat~~] residential docks may not exceed:
 - (1) twice the number of lots in the subdivision that have lake frontage on Lake Austin or Town Lake; or
 - (2) the number of lots in the subdivision, if:
 - (a) the subdivision has a common area that fronts on Lake Austin or Town Lake; and
 - (b) a perpetual right to use the water frontage of the common area has been conveyed to a lot owner in the subdivision.
- (I) Construction of a boat ramp is prohibited.

PART 8. Section 25-2-1179 (*Environmental Protection*) of the City Code is amended to add new Subsections (C) and (D) to read:

- (C) Containers of hazardous materials, fuel, oil, herbicides, insecticides, fertilizers or other pollutants may not be stored on docks extending into or above Lake Austin, Lady Bird Lake, or Lake Walter E. Long.
- (D) Construction of shoreline access structures must minimize disturbance to woody and herbaceous vegetation, preserve the tree canopy, and replace herbaceous ground cover to the extent practicable.

PART 9. Section 25-2-1066 (*Screening Requirements*) of the City Code is amended to add a new Subsection (B) and redesignate the remaining Subsections accordingly.

- (B) A person constructing shoreline access, as that term is defined in section 25-2-1172 (*Definitions*), shall screen the shoreline access from the view of property that is in an urban residence (SF-5) or more restrictive zoning district. A person may comply with this Subsection by providing vegetation

62/9

and tree canopy as prescribed by rule. The owner must maintain the screening provided under this section.

PART 10. Section 25-5-2 (*Site Plan Exemptions*) of the City Code is amended to add new Subsections (K) and (L) to read:

- (K) The exemptions provided by this section do not apply to the construction of a dock, bulkhead, or shoreline access as described in Chapter 25-2, Article 13.
- (L) A site plan is not required for maintenance of a dock, bulkhead, or shoreline access under the following conditions:
 - (1) the existing dock, bulkhead, or shoreline access was legally constructed; provided that simple re-decking will be allowed for all docks;
 - (2) no variance from City Code is required;
 - (3) no city board or commission approval is required;
 - (4) there will be no change in the existing footprint of the dock, bulkhead, or shoreline access; and
 - (5) there will be no removal, addition, or replacement of existing or new piles, pilings, or sheet pile, unless the dock, bulkhead, or shoreline access complies with the requirements of Title 25 of the City Code.

PART 11. Section 25-5-3 (*Small Projects*) of the City Code is amended to add a new Subsection (C) and redesignate the remaining Subsection accordingly:

- (C) Notwithstanding any other provisions in this Section, construction of Shoreline Access, as defined in Section 25-2-1172, that exceeds 50 feet in length and is constructed on slopes exceeding 35% gradient does not constitute a small project.

PART 12. Section 25-8-92 (*Critical Water Quality Zones Established*) of the City Code is amended to add a new Subsection (B) and to redesignate the remaining Subsections accordingly:

- (B) Critical water quality zones are established to include the inundated areas that constitute Lake Walter E. Long, Lake Austin, Lady Bird Lake, and the Colorado River downstream of Lady Bird Lake.

C2
10

PART 13. This ordinance takes effect on _____, 2010.

PASSED AND APPROVED

_____, 2010

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Lee Leffingwell
Mayor

APPROVED: _____
Karen Kennard
Acting City Attorney

ATTEST: _____
Shirley A. Gentry
City Clerk

Draft Code Amendments - Full text of affected sections with proposed changes shown

C2
11

Proposed draft changes - 7/28/10

This document presents the full text of affected sections of current code with proposed changes indicated to demonstrate how proposed code changes might appear in context

Article 13 (Boat Docks)	Section 25-2-1171 (Applicability).....	1
	Section 25-2-1172 (Definitions).....	1
	Section 25-2-1173 (Permit Required).....	2
	Section 25-2-1174 (Structural)	2
	Section 25-2-1176 (Regulations).....	3
	Section 25-2-1179 (Environmental).....	4
Section 25-2-1066 (Screening Requirements).....		5
Section 25-5-2 (Site Plan Exemptions).....		5
Section 25-5-3 (Small Projects).....		7
Section 25-8-92 (Critical Water Quality Zones Established).....		7

Black Text– Existing code to remain unchanged

Red – Proposed existing code to be deleted

Green – Proposed language to be added

C2
12

ARTICLE 13. BOAT DOCKS, BULKHEADS, AND SHORELINE ACCESS

§ 25-2-1171 APPLICABILITY.

(A) This article applies to a structure or development:

- (1) in Lake Austin, Lady Bird Town Lake, or Lake Walter E. Long;
- (2) along the shore of Lake Austin in the area below 504.9 feet above mean sea level;
- (3) along the shore of Lady Bird Town Lake below 435 feet above mean sea level; ~~or~~
- (4) along the shore of Lake Walter E. Long; or
- (5) used for access to areas described in this Subsection

(B) The building official, director of Planning and Development Review Department and ~~the~~ director of the Parks and Recreation Department shall implement and enforce this article.

Source: Section 13-2-791(a) and (d); Ord. 990225-70; Ord. 031211-11.

§ 25-2-1172 DEFINITIONS.

In this article:

- (1) BULKHEAD means a revetment or wall constructed with the purpose of stabilizing or modifying the shoreline.
- (2) CONSTRUCT includes placing or replacing a structure and structurally altering an existing structure.
- (3) DOCK includes a wharf, pier, float, floating dock, island, boat dock or other similar structure.
- (4) NORMAL POOL ELEVATION means:
 - (a) for Lake Austin, 492.8 feet above mean sea level;
 - (b) for Lady Bird Town Lake, 429 feet above mean sea level; and
 - (c) for Lake Walter E. Long, 554.5 feet above mean sea level.
- (5) RESIDENTIAL DOCK means a dock that provides a stationary landing for:
 - (a) fishing or swimming; or
 - (b) anchoring, mooring, or storing not more than one vessel.
- (6) SHORELINE means the line where the edge of the water meets the land at normal pool elevation.
- (7) SHORELINE ACCESS means improvements constructed to provide a means of approaching the shoreline such as stairs, lifts, trams, incline elevators or escalators.

Source: Section 13-2-790; Ord. 990225-70; Ord. 031211-11.

C2/13

§ 25-2-1173 PERMIT REQUIRED FOR DOCK CONSTRUCTION.

- (A) A person may not modify a shoreline or construct a dock, bulkhead or shoreline access unless the person first obtains a site plan and building permit, as applicable and pays the applicable a permit fee set by ordinance.
- (B) The building official or the director of the Parks and Recreation Department shall require the applicant to ~~may~~ place an identification or registration tag on a dock. A person may not remove a tag placed under this subsection.
- (C) A permit obtained under this section shall be prominently displayed at the construction site until the final inspection and approval by the building official.
- (D) The director of the Planning and Development Review Department ~~building official~~ may not approve an application for a permit for the construction of more than two residential docks or other similar structures on a single lot zoned MF-1 or more restrictive, unless:
- (1) the lot was platted and recorded before August 26, 1976, and perpetual rights to use the water frontage of the lot were granted or conveyed to one or more owners of other lots in the subdivision before June 23, 1979; or
 - (2) the Parks and Recreation Board has approved a site plan that clusters the residential ~~boat~~ docks on one or more lots in the subdivision.
- (E) If a permit is required under this section and is not obtained before construction begins, the required fee is increased by an amount established by ordinance. Payment of the additional fee does not relieve a person from complying with this Code.
- (F) Where an inspection is required by State law, neither a Certificate of Compliance nor a final inspection may be issued for shoreline access unless the applicant has submitted an inspection report, signed by a QEI-I inspector registered with the Texas Department of Licensing and Regulation, stating that all applicable state regulations have been met.

Source: Sections 13-2-791 and 13-2-794; Ord. 990225-70; Ord. 031211-11.

§ 25-2-1174 STRUCTURAL REQUIREMENTS.

- (A) A dock must:
- (1) comply with the requirements of Chapter 25-12, Article 1 (*Uniform Building Code*) and the Building Criteria Manual; and
 - (2) be braced to withstand pressure of wind and water when boats are tied to the dock.
- (B) A floating dock must be supported by solid displacement flotation devices with durable nonferrous protective coverings. The flotation material must be securely attached to the dock and must be capable of withstanding prolonged exposure to wave action and weather.
- (C) A retaining wall, bulkhead, or other erosion protection device must be constructed to minimize wave return and wave action by using design and materials prescribed by rule of stacked stone, natural rock rip rap, concrete, steel pilings or wallings, or aluminum. A bulkhead with a greater than 45 degree vertical slope for any portion greater than one foot in height smooth vertical surface is not permitted on or adjacent to the shoreline main body of a lake listed in section 25-2-1171 (Applicability) unless the shoreline is located within an existing man-made channel less than 50 feet in width. ~~The surface of a wall or bulkhead constructed on the main body of a lake must be designed to minimize wave return and reduce wave action.~~ Capturing or recapturing of land is not permitted on a lake listed in section 25-2-1171 (*Applicability*).

C2
14

(D) On a determination by a city official or employee that a dock has become, or is in imminent danger of becoming, structurally unsound, the building official:

(1) shall take action to declare the dock a hazard;

(2) shall abate the hazard under Chapter 25-12, Article 10 (*Dangerous Buildings Code*), at the owner's expense; and

(3) may impose a lien on the affected property for the collection of the expense.

Source: Section 13-2-792; Ord. 990225-70; Ord. 031211-11.

§ 25-2-1176 REGULATIONS.

(A) A site plan must comply with this section. A city official may not approve for final inspection a structure that does not conform to the requirements of Title 25 of the City Code, including this section.

(B) A dock or other structure must be constructed so that it is not a hazard to navigation or safety.

(1) The director of the Parks and Recreation Department shall determine, after receiving the recommendation of the Parks and Recreation Board, the distance that a proposed dock may extend into a body of water without constituting a hazard.

(2) A dock may not extend more than 30 feet from the shoreline unless the Parks and Recreation Board determines that the dock will not create a hazard and approves the construction of the dock.

(C) A fence may not extend into the water beyond the shoreline unless the fence was part of a commercial livestock operation, other than raising domestic pets, existing on April 17, 1994. A fence permitted under this subsection:

(1) must be constructed of smooth wire or mesh;

(2) may not extend more than 40 feet beyond the shoreline;

(3) must include a navigation buoy indicating "DANGER", in accordance with the Texas Water Safety Act, installed at the end of the fence, unless the fence does not extend further beyond the shoreline than an immediately adjacent dock; and

(4) must be removed if the livestock operation ceases.

(D) Approval of the Parks and Recreation Board is required for a structure, other than a retaining wall:

(1) to be constructed or altered within 10 feet of a side property line; or

(2) except as provided in Subsection (E), that has a width, measured parallel to the shoreline, greater than 20 percent of the shoreline width of the lot or parcel of land on which the structure is to be constructed.

(E) Subsection (D)(2) does not apply if:

(1) the lot was platted and recorded before August 26, 1976, and a perpetual right to use the water frontage of the lot was granted to the owner of another lot in the subdivision before June 23, 1979; or

(2) the Parks and Recreation Board has approved a site plan that clusters the boat docks on one or more lots in the subdivision.

(F) The number of residential ~~boat~~ docks may not exceed:

(1) twice the number of lots in the subdivision that have lake frontage on Lake Austin or Lady Bird Town Lake; or

(2) the number of lots in the subdivision, if:

(a) the subdivision has a common area that fronts on Lake Austin or Lady Bird Town Lake; and

C2/13

(b) a perpetual right to use the water frontage of the common area has been conveyed to a lot owner in the subdivision.

(G) This subsection applies to a marina area or common area.

(1) Except for a boat dock or a combined storage area on the water's edge, a permanent structure, including a parking lot, must be set back at least 100 feet from the shoreline.

(2) Sanitation facilities must be provided for all marina and picnic areas.

(a) Permanent sanitation facilities are required for a marina or common area with 10 or more boat slips.

(b) Septic tanks and sewage holding tanks may not be located within 100 feet of an area below the normal pool elevation.

(3) The facility operator shall provide for the on-site collection of garbage at the marina or common area.

(a) At least one garbage can with a capacity of at least 32 gallons is required for each four picnic units and for each four boat slips.

(b) The facility operator shall remove garbage in a timely manner.

(H) A business or a living quarter may not be constructed on a pier or similar structure extending into or above Lake Austin, or Lady Bird Town Lake, or Lake Walter E. Long, except under a license agreement approved by the council.

(1) The Parks and Recreation Board shall make a recommendation to the council on each license agreement.

(2) A structure built under a license agreement must comply with the lighting requirements of Section 25-2-1175 (*Lighting And Electrical Requirements*).

(I) Construction of a boat ramp is prohibited.

Source: Section 13-2-795; Ord. 990225-70; Ord. 031120-44; Ord. 031211-11.

§ 25-2-1177 DOCKS EXEMPT FROM CITY LICENSING REQUIREMENTS.

(A) A license agreement from the City is not required for a dock located within the boundaries of a public drainage easement along Lake Austin, Lady Bird Town Lake, or Lake Walter E. Long if it is constructed in accordance with this article and Chapter 25-12, Article 1 (*Uniform Building Code*).

(B) This section does not limit the review of a site plan for construction of a dock.

Source: Section 13-2-796; Ord. 990225-70; Ord. 031211-11.

§ 25-2-1179 ENVIRONMENTAL PROTECTION.

(A) A marine fuel facility or service station must comply with the requirements of Chapter 6-2 (*Hazardous Materials*) and shall be designed, maintained, and operated in a manner that prevents the spilling or leaking of fuel or petroleum products into the water.

(B) The maintenance and repair of watercraft shall be performed in a manner that prevents discharge of fuel, oil, or other pollutants into the water.

(C) Containers of hazardous materials, fuel, oil, herbicides, insecticides, fertilizers or other pollutants may not be stored on residential docks extending into or above Lake Austin, Lady Bird Lake, or Lake Walter E. Long.

(D) Construction of shoreline access structures must minimize disturbance to woody and herbaceous vegetation, preserve the tree canopy, and replace herbaceous ground cover to the extent practicable.

Source: Section 13-2-798; Ord. 990225-70; Ord. 031211-11.

C2
16

§ 25-2-1066 SCREENING REQUIREMENTS.

(A) A person constructing a building shall screen each area on a property that is used for a following activity from the view of adjacent property that is in an urban residence (SF-5) or more restrictive zoning district:

- (1) off-street parking;
- (2) the placement of mechanical equipment;
- (3) storage; or
- (4) refuse collection.

(B) A person constructing shoreline access, as that term is defined in section 25-2-1172 (Definitions), shall screen the shoreline access from the view of property that is in an urban residence (SF-5) or more restrictive zoning district. A person may comply with this Subsection by providing vegetation and tree canopy as prescribed by rule. The owner must maintain the screening provided under this section.

(C) A person may comply with Subsection (A) by providing a yard, fence, berm, or vegetation. If a fence is provided, the height of the fence may not exceed six feet, except as otherwise permitted by Section 25-2-899 (*Fences As Accessory Uses*).

(D) The owner must maintain a fence, berm, or vegetation provided under this section.

Source: Section 13-2-736(c); Ord. 990225-70; Ord. 031211-11.

§ 25-5-2 SITE PLAN EXEMPTIONS.

(A) The director shall determine whether a project is exempt under this section from the site plan requirement of Section 25-5-1 (*Site Plan Required*). The director may require that the applicant submit information necessary to make a determination under this subsection. The director may require an applicant to revise a previously approved site plan under Section 25-5-61 (*Revisions To Released Site Plans*).

(B) A site plan is not required for the following development:

(1) construction or alteration of a single-family residential, single-family attached residential, duplex residential, two-family residential, or secondary apartment special use structure, or an accessory structure, if:

(a) not more than one principal residential structure is constructed on a legal lot or tract; and

(b) a proposed improvement is not located in the 100 year flood plain, or the director determines that the proposed improvement will have an insignificant effect on the waterway;

(2) removal of a tree not protected by this title;

(3) interior alteration of an existing building that does not increase the square footage, area, or height of the building;

(4) construction of a fence that does not obstruct the flow of water;

(5) clearing an area up to 15 feet wide for surveying and testing, unless a tree more than eight inches in diameter is to be removed;

(6) restoration of a damaged building that begins within 12 months of the date of the damage;

(7) relocation or demolition of a structure or foundation covering not more than 10,000 square feet of site area under a City demolition permit, if trees larger than eight inches in diameter are not disturbed and the site is not cleared;

(8) development in the extraterritorial jurisdiction that is exempt from all water quality requirements of this title; or

(9) placement of a commercial portable building on existing impervious cover if the building does not impede or divert drainage and the site complies with the landscaping requirements of this title.

(C) Except for a change of use to an adult oriented business, a site plan is not required for a change of use if the new use complies with the off-street parking requirements of this title.

(D) Except for an adult oriented business, a site plan is not required for construction that complies with the requirements of this subsection.

(1) The construction may not exceed 1,000 square feet, and the limits of construction may not exceed 3,000 square feet, except for the following:

- (a) enclosure of an existing staircase or porch;
- (b) a carport for fewer than ten cars placed over existing parking spaces;
- (c) a wooden ground level deck up to 5,000 square feet in size that is for open space use;
- (d) replacement of a roof that does not increase the building height by more than six feet;
- (e) remodeling of an exterior facade if construction is limited to the addition of columns or awnings for windows or entrance ways;
- (f) a canopy over an existing gas pump or paved driveway;
- (g) a sidewalk constructed on existing impervious cover;
- (h) replacement of up to 3,000 square feet of building or parking area lost through condemnation, if the director determines that there is an insignificant effect on drainage or a waterway; or
- (i) modification of up to 3,000 square feet of a building or impervious cover on a developed site if the modification provides accessible facilities for persons with disabilities.

(2) The construction may not increase the extent to which the development is noncomplying.

(3) The construction may not be for a new drive-in service or additional lanes for an existing drive-in service, unless the director determines that it will have an insignificant effect on traffic circulation and surrounding land uses.

(4) A tree larger than eight inches in diameter may not be removed.

(5) The construction may not be located in the 100 year flood plain, unless the director determines that it would have an insignificant effect on the waterway.

(E) A site plan is not required for minor site development, minor construction, or a change of use that the director determines is similar to that described in Subsections (B), (C), and (D) of this section.

(F) A site plan is not required for construction of additional facilities at an existing public primary educational facility or public secondary educational facility in the zoning jurisdiction or in a municipal utility district in which City building permits are required.

(G) A site plan is not required for construction of a new public primary educational facility or public secondary educational facility in the zoning jurisdiction.

(H) A site plan is not required for the construction of subdivision infrastructure in accordance with approved subdivision construction plans.

(I) The exemptions provided by Subsections (C) and (D) do not apply to a bed and breakfast residential use established after October 1, 1994.

(J) The exemptions provided by this section do not apply to a telecommunications tower described in Subsection 25-2-839(F) or (G) (*Telecommunication Towers*).

(K) The exemptions provided by this section do not apply to the construction of a dock, bulkhead, or shoreline access as described in Chapter 25-2, Article 13.

(L) A site plan is not required for maintenance of a dock, bulkhead, or shoreline access under the following conditions:

(1) the existing dock, bulkhead, or shoreline access was legally constructed; provided that simple re-decking will be allowed for all docks;

(2) no variance from City Code is required;

(3) no city board or commission approval is required;

(4) there will be no change in the existing footprint of the dock, bulkhead, or shoreline access; and

(5) there will be no removal, addition, or replacement of existing or new piles, pilings, or sheet pile, unless the dock, bulkhead, or shoreline access complies with the requirements of Title 25 of the City Code.

§ 25-5-3 SMALL PROJECTS

C2
18

- (A) The director shall determine whether a project is a small project described in this section.
- (B) The following are small projects:
- (1) construction of a building or parking area if the proposed construction:
 - (a) does not require a variance from a water quality regulation;
 - (b) does not exceed 5,000 square feet of impervious cover; and
 - (c) the construction site does not exceed 10,000 square feet, including the following areas:
 - (i) construction;
 - (ii) clearing;
 - (iii) grading;
 - (iv) construction equipment access;
 - (v) driveway reconstruction;
 - (vi) temporary installations, including portable buildings, construction trailers, storage areas for building materials, spoil disposal areas, erosion and sedimentation controls, and construction entrances;
 - (vii) landscaping; and
 - (viii) other areas that the director determines are part of the construction site;
 - (2) construction of a storm sewer not more than 30 inches in diameter that is entirely in a public right-of-way or an easement;
 - (3) construction of a utility line not more than eight inches in diameter that is entirely in a public right-of-way;
 - (4) construction of a left turn lane on a divided arterial street;
 - (5) construction of street intersection improvements;
 - (6) widening a public street to provide a deceleration lane if additional right-of-way is not required;
 - (7) depositing less than two feet of earth fill, if the site is not in a 100 year floodplain and the fill is not to be deposited within the dripline of a protected tree;
 - (8) construction of a boat dock as an accessory use to a single-family residential use, duplex residential use, two-family residential use, or secondary apartment special use if shoreline modification or dredging is not required; or
 - (9) construction of a retaining wall, if the wall is less than 100 feet in length and less than eight feet in height, and the back fill does not reclaim a substantial amount of land except land that has eroded because of the failure of an existing retaining wall;
 - (10) minor development that the director determines is similar to that described in Subsections (B)(1) through (9) of this section;
 - (11) the replacement of development that is removed as a result of right-of-way condemnation; and
 - (12) the construction of a telecommunications tower described in Subsection 25-2-839(F) or (G) (*Telecommunication Towers*).
- (C) Notwithstanding any other provisions in this Section, construction of Shoreline Access, as defined in Section 25-2-1172, that exceeds 50 feet in length and is constructed on slopes exceeding 35% gradient does not constitute a small project.
- (D) For a small project, the director may waive a submittal requirement that the director determines is not essential to demonstrate compliance with this title. The director shall maintain a record of submittal requirements that are waived under this subsection.

§ 25-8-92 CRITICAL WATER QUALITY ZONES ESTABLISHED.

(A) A critical water quality zone is established along each waterway classified under Section 25-8-91 (*Waterway Classifications*).

(1) The boundaries of a critical water quality zone coincide with the boundaries of the 100 year flood plain, except:

(a) for a minor waterway, the boundaries of the critical water quality zone are located not less than 50 feet and not more than 100 feet from the centerline of the waterway;

C2/19

- (b) for an intermediate waterway, the boundaries of the critical water quality zone are located not less than 100 feet and not more than 200 feet from the centerline of the waterway;
- (c) for a major waterway, the boundaries of the critical water quality zone are located not less than 200 feet and not more than 400 feet from the centerline of the waterway; and
- (d) for the main channel of Barton Creek, the boundaries of the critical water quality zone are located 400 feet from the centerline of the creek.

(2) Notwithstanding the provisions of Subsections (A)(1)(a), (b), and (c), a critical water quality zone does not extend beyond the crest of a bluff.

(B) Critical water quality zones are established to include the inundated areas that constitute Lake Walter E. Long, Lake Austin, Lady Bird Lake, and the Colorado River downstream of Lady Bird Lake.

(C) Critical water quality zones are established along and parallel to the shorelines of Lake Travis, Lake Austin, and Town Lake.

(1) The shoreline boundary of a critical water quality zone:

- (a) for Lake Travis, coincides with the 681.0 foot contour line;
- (b) for Lake Austin, coincides with the 492.8 foot contour line; and
- (c) for Town Lake, coincides with the 429.0 foot contour line.

(2) The width of a critical water quality zone, measured horizontally inland, is:

- (a) 100 feet; or
- (b) for a detached single-family residential use, 75 feet.

(C) Critical water quality zones are established along and parallel to the shorelines of the Colorado River downstream of Town Lake.

(1) The shoreline boundary of a critical water quality zone coincides with the river's ordinary high water mark, as defined by Code of Federal Regulations Title 33, Section 328.3 (*Definitions*).

(2) The inland boundary of a critical water quality zone coincides with the boundary of the 100-year floodplain as delineated by the Federal Emergency Management Agency, except that the width of the critical water quality zone, measured horizontally inland, is not less than 200 feet and not more than 400 feet.

(D) In an urban watershed, a critical water quality zone is established along each waterway with a drainage area of at least 64 acres. This does not apply in the area bounded by IH-35, Riverside Drive, Barton Springs Road, Lamar Boulevard, and 15th Street.

(1) Except as limited by Paragraph (3), for a waterway whose 100 year flood plain has been delineated by the Federal Emergency Management Agency (FEMA):

(a) the boundaries of the critical water quality zone coincide with the boundaries of the flood plain as delineated by FEMA; or

(b) if the applicant has calculated the 100 year flood plain for the waterway and the City has approved the calculations, the boundaries of the critical water quality zone coincide with the boundaries of the calculated flood plain.

(2) Except as limited by Paragraph (3), for a waterway whose 100 year flood plain has not been delineated by FEMA:

(a) the boundaries of a critical water quality zone are located 100 feet from the centerline of the waterway; or

(b) if the applicant has calculated the 100 year flood plain for the waterway and the City has approved the calculations, the boundaries of the critical water quality zone coincide with the boundaries of the calculated floodplain.

(3) The boundaries of a critical water quality zone are located not less than 50 feet and not more than 400 feet from the centerline of the waterway.

Source: Sections 13-7-23(a), (b), (c), (d), (f), and (g); Ord. 990225-70; Ord. 990819-99; Ord. 031211-11; Ord. 20080228-116.

Draft Environmental Criteria Manual (new) section 1.13

C2
20

Environmental Criteria Manual Section 1.13 Draft 09/17/2010

1.13.0 DESIGN GUIDELINES FOR SHORELINE MODIFICATION, STABILIZATION AND ACCESS

1.13.1 Introduction

This section of Environmental Criteria Manual (ECM) is a resource document for the clarification and guidance of the minimum design criteria required to achieve compliant shoreline modification, stabilization and access as per Chapter 25-2, Subchapter C, Article 13 of the City of Austin's (COA) Land Development Code (LDC). This guidance pertains to the applicable development of the shores, banks and slopes of Lake Austin, Lady Bird Lake and Lake Walter E. Long.

Naturally vegetated and sloping shorelines provide ecosystem benefits including soil stabilization, wave abatement, pollutant removal, and habitat. Native riparian plants have both structural and physiological adaptations (Mitsch 1993) which stabilize the soils with extensive root systems that can increase the shear strength of soil by transferring shear stresses into tensile resistance (Gray and Sotir 1996). The increase in structural habitat complexity (which includes the roots, plant bodies and irregular surfaces of natural shorelines) results in an increase in dissipation of the kinetic energy of waves (Gabel et al. 2008). Wetlands are able to remove excess nutrients from the water, including nitrogen, phosphorus and organic carbon (National Research Council 1995), immobilize and remove toxins, such as heavy metals, including copper, lead and zinc (Hammer 1989) and reduce turbidity (Kahl 1993; Vestergaard and Sand-Jensen 2000). The surfaces of organic inputs from riparian plants in addition to the stems, leaves, and roots of wetland plants are colonized by microscopic life (Dodds 2002) which are the principal food source of many invertebrates (Baker and Orr 1986). This community establishes the foundation of a complex food web that fosters a healthy biological community. Vegetated and structurally complex shallow waters are utilized by juvenile fish as protective nurseries which provide shelter from predators and safe havens for foraging (Wiley et al. 1984; Killgore et al. 1989).

Although some degree of shoreline erosion is a natural process that sustains riparian ecology, accelerated erosion due to man-made influences can result in property loss and degradation of aquatic and terrestrial resources. These influences include, but are not limited to, increased wave action from recreational boating, removal of native shoreline vegetation and physical modification of the shoreline. The traditional approach to stabilize a shoreline has been to armor the bank with a vertical bulkhead. These rigid, vertical structures inhibit the potential benefits of natural shorelines and can create additional problems including the reflection of wave energy and increased wave action (Gabel et al. 2008), increased erosion of the lake bed (Herder 2007), increased turbidity (NOAA

C2
21

2007), degradation of aquatic habitat (Engle and Pederson 1998), and removal of shoreline vegetation which can affect the productivity of aquatic biological communities (Kahler, Grassley and Beauchamp 2000). Although individual small changes to the environment may not significantly impact an ecosystem, the "cumulative effects of even small lakeshore alterations can lead to major ecosystem responses" (Burns 1991). The findings of the first National Lakes Assessment (NLA) conducted by the EPA indicate that "poor habitat condition along the lakeshore is the most significant stressor in lakes." The NLA suggests that local initiatives "should center on protecting shorelines habitats, particularly maintaining vegetative cover" (USEPA 2010).

As a resource document, this section provides several methods that, if used in the appropriate setting, can achieve compliant shoreline stabilization while minimizing wave return, promoting ecological function and maintaining the natural and traditional character of the lakeshore. However, these are in no way a complete exhaustive compendium of suitable methods. The specific methods selected to satisfy the criteria included in this manual are the responsibility of the applicant and should be based on the constraints of the project area. The City of Austin shall not be responsible to anyone for the use or reliance on any portion of this section and shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with, the use, interpretation or reliance on any specification or guideline contained herein.

Any questions concerning the guidance or use of methods not included in this document should be directed to the Environmental Resource Management, Watershed Protection Department.

The Design Guidelines for Shoreline Modification, Stabilization and Access were drafted by the Environmental Resource Management Division of the Watershed Protection Department in concert with Planning Development and Review. Site plan review is conducted by the Land Use Review Division and construction inspection oversight by the Environmental Inspection Section of the Site and Subdivision Inspection Division both of the Planning and Development Review Department. Review of shoreline modification and access structures is also reviewed by the PARD Planning and CIP Division of the Parks and Recreation Department.

C2
22

1.13.2 Policy

A. Purpose and Intent.

Several recent studies have indicated a need to address both the results of wave action and protection of shoreline integrity. In 2005, following observations of wave action on various shorelines of Lake Austin, the Lake Austin Advisory Panel of the Lower Colorado River Authority (LCRA) recommended the disapproval of vertical, flat bulkheads unless several features were incorporated for the minimization of wave return. A report of recreational boating on Lake Austin by the LCRA, City of Austin and Texas A&M AgriLife has documented significant public concern about the negative effects of wave action on Lake Austin (Kyle et al. 2009). The first National Lakes Assessment (NLA) by the U.S.EPA has stressed the contribution to water quality and biological integrity of naturally functioning shorelines (USEPA 2010). In 2009 the City of Austin Parks Board, Environmental Board and Planning Commission supported an initiative to clarify rules preventing the construction of vertical bulkheads and promoting stable shorelines with materials and designs that will support the functions of native riparian vegetation and shoreline geomorphology.

In order to protect public safety, property, water quality and ecosystem integrity, the intent of this section is to provide criteria and guidance for code compliant shoreline development that promote the form, function and benefits of natural riparian ecosystems. The objectives include providing examples of shoreline stabilization methods which minimize wave return by protecting and/or establishing vegetated, sloping shorelines, and identifying methods to protect the integrity of steep slopes with native vegetation.

B. Plans and Computations.

Plans and computations to support all shoreline modification and access designs shall be submitted to the Planning and Development Review Department for review. Plans and computations shall be in such form as to allow for timely and consistent review and to be made a part of the permanent record for future reference. The reviewer may deny an application if the applicant cannot support designs with appropriate calculations. All engineering computations shall be certified by a Professional Engineer licensed in the State of Texas.

C. Ordinance Authority.

The regulatory requirements and procedures for approval are defined in Volume III, Chapter 25 of the Code of the City of Austin. Chapter 25 was adopted by City Council in order to protect the health, safety and welfare of the Austin community. The information in the following sections is intended to define the technical design criteria needed to achieve the policy goals identified in the Land Development Code relating to shoreline modification, stabilization and access. A brief summary of specific code sections relating to the requirements for erosion and sedimentation control is included below:

1. 6-5-51: Discharges into Storm Sewers or Watercourses.

C2
23

2. 25-1-288: Requirements for a pre-construction inspection; owner's demonstration of compliance; modifications to controls and plans.
3. 25-7-61 and 25-7-65: Adequate temporary and permanent erosion and sedimentation control plans required for final plat, subdivision construction plan, or site plan approval; estimated cost of fiscal security; fiscal security insures no cost to the city.
4. 25-8-181 to 25-8-184: Erosion and sedimentation control required for all construction; restoration required for a complete project; modifications to plans allowed.
5. 25-8-121 – An Environmental Assessment is required for all sites in a floodplain, in a critical water quality zone, a water quality transition zone, and with a slope with gradient of more than 15%.
6. 25-8-321 to 25-8-323: Topsoil to be protected against erosion; existing vegetation to be left in place where possible; limitation of time between rough cutting and final surfacing of roadways.
7. 25-8-341 and 25-8-342: Cuts and fills to be restored and stabilized.
8. 25-8-343: Restoration and revegetation of spoil disposal sites required.
9. 25-8-281 and 25-8-282: Special erosion controls required to protect critical environmental features.
10. 25-7-61: The proposed development will not result in additional identifiable adverse flooding on other property and, to the greatest extent feasible, preserves the natural and traditional character of the land and the waterway.
11. 25-2-1171 to 25-2-1179: Provisions regulating structures along shoreline of Lady Bird Lake, Lake Austin, or Lake Walter E. Long or provided as access to the shoreline.
12. 25-2-1066: Provisions regarding Screening Requirements for shoreline access.

D. Site Plan Submittal Information.

Chapter 25-5-1 of the City Code requires that a site plan be submitted, approved and released before an applicant can develop or change the use of their property or a building permit can be issued. A site plan illustrates the proposed development and its intended use within the context of the site. Existing conditions typically included in site plans include, but are not limited to topography, watercourses, floodplains, significant vegetation, other environmental features, and any existing improvements on the site. Within this framework, a site plan illustrates the proposed development and provides details on features such as access, utilities, parking, landscaping, buffers, building footprint and location of new structures.

C2
24

This document establishes submittal requirements for shoreline modification, stabilization, and access. Certain requirements may be waived by the Director of Planning and Development Review Department if they are determined by the Director to not be applicable.

In addition to the site plan requirements described in Chapter 25 of the Land Development Code, site plans for docks, shoreline modification and stabilization must include:

- (1) A certified survey of the existing shoreline that is less than two years old including legal description and property boundaries.
- (2) Demonstration of temporary erosion and siltation controls for the project.
- (3) Restrictive covenants pertaining to relevant development activities.
- (4) Landscape plan with vegetation specifications as required by this section.
- (5) The location and volume of all proposed dredge and fill activities within the lake and identification of spoils placement.
- (6) Topography of the lakebed extending to a depth of six feet below normal pool elevation, but not to exceed a distance of twenty five feet from the shoreline.

1.13.3 Definitions

Bioengineering - A system of living plant materials used as structural components to restore stability and establish a vegetative community (U.S. Department of Agriculture, 1996).

Biotechnical Stabilization - Mechanical elements (or structures) in combination with biological elements (or plants) to arrest and prevent slope failures and erosion (Gray and Sotir, 1996).

Drainage Fill - Aggregate placed behind the bulkhead to reduce or eliminate hydrostatic pressure.

Filter Fabric - A geotextile used to retain (1) retain the soil particles while (2) providing a zone for the free flow of water through the interface between the riprap armor and the underlying soil (Lagasse et al., 2006).

Flanking - Erosion of shoreline on either side of a shoreline protection measure (USDA, 1997).

Granular Filter Material - An aggregate filter layer used to (1) retain the soil particles while (2) providing a zone for the free flow of water through the interface between the riprap armor and the underlying soil (Lagasse et al., 2006).

Lakeshore Vegetation Buffer Zone - The Lakeshore Vegetation Buffer Zone is the area that native and adapted riparian vegetation plantings are to be planted as per the requirements of ECM 1.13.6(C). The landward boundary of this zone is ten feet inland horizontally from the shoreline. The lakeward boundary of this

C2
25

zone extends to the topographic contour of one foot in depth vertically from the normal pool elevation.

Scour Depth – Depth at which hydrodynamic bottom shear stresses are greater than sediment critical shear stress resulting in scour, or removal of granular bed material by hydrodynamic forces.

Toe – The break in slope at the foot, or bottom of a bank, where it meets the lakebed.

Toe Protection- Submerged materials that are sized to resist movement and/or erosion of lakebed by hydrodynamic forces such as wave action.

Wave Action Zone – The zone that extends from the depth at which wave-induced water movement is negligible ($1/2$ wavelength) to the landward extent of the height of wave run-up.

Wavelength - The horizontal distance between similar points on two successive waves measured perpendicularly to the crest (USDA, 1997). Observations of the LCRA Lake Austin Advisory Panel on Lake Austin indicate that reasonable assumptions for wavelengths range from 8 to 12 feet (Crowther, personal communication, September 2, 2005). See Figure 1.13-1.

Wave Run-up –The vertical distance above the normal pool elevation (as defined in LDC 25-2-1172) that a wave will run up the slope of a shore as it dissipates its energy. The USDA Natural Resource Conservation Service (NRCS) provides technical guidance for calculating wave run-up in Slope Protection for Dams and Lakeshores (USDA, 1997). See Figure 1.13-1.

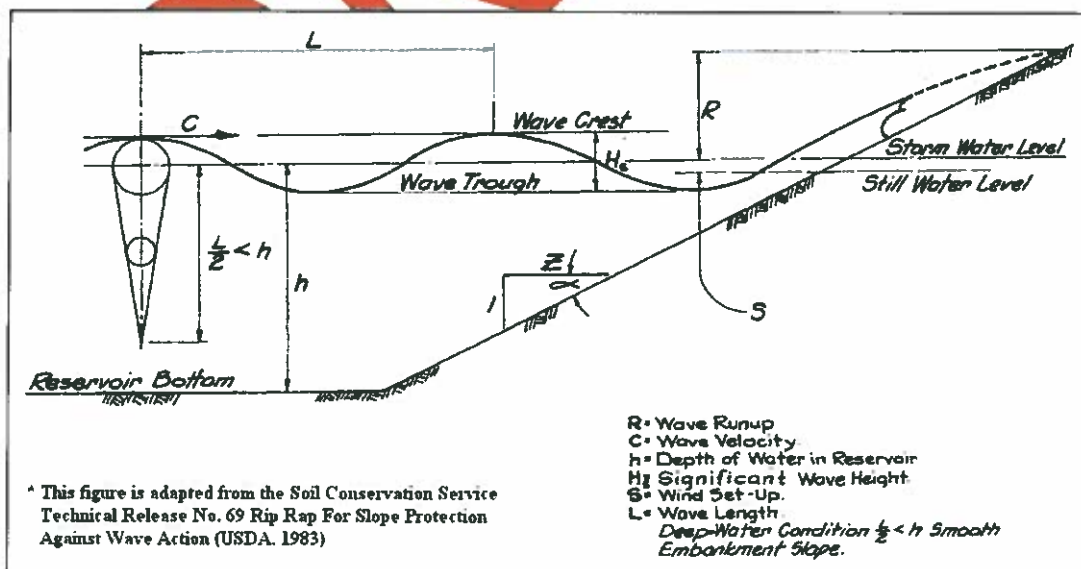


Figure 1.13-1. Wave Runup and Wavelength.

C2
26

1.13.4 Erosion and Sedimentation Controls and Identification Tag

A. Erosion and Sedimentation Control.

Implementation of effective erosion and sedimentation controls should demonstrate the scope and intent of Section 1.4.4(A) of the ECM for shoreline development and shoreline access. Temporary construction disturbance to upland soils should be stabilized with City of Austin approved controls (such as silt fence and mulch logs) and temporary construction disturbance to lake bed substrate should be stabilized with practices appropriate to the constraints of the project area such as silt booms, temporary coffer dams or coconut fiber rolls to be installed as per manufacturer specifications. The applicant must post fiscal surety for erosion and sedimentation controls in accordance with ECM Section 1.4.4 (C).

B. Identification Tag Required for Dock.

Identification or registration tags are required for docks as per LDC 25-2-1173(B). The identification tag shall consist of the street address of the property on which the dock is located and shall be displayed on the lakeward side of the dock facing the centerline of the lake or slough on which it is located. The letters and numbers must be at least two inches in height and be constructed with materials that resist water damage and ultraviolet deterioration.

1.13.5 Recommended Guidance for Appropriate Method for Shoreline Stabilization

A. Guidance for Method Selection.

Depending on the size and scope of the proposed shoreline stabilization or modification, it is recommended to work with a qualified professional or team of professionals. This may require retaining the services of an appropriately qualified biologist, hydrologist, and/or civil engineer, in order to assess and manage the dynamics of the shoreline erosion problem.

An evaluation of existing site characteristics should be performed prior to determining the appropriate method for shoreline stabilization. These characteristics include surface runoff, near-shore bathymetry, site topography, soil composition, vegetation, wave run up, hydrology and slope stability. It is recommended that selection of the appropriate method that meets the intent of this section should be determined by a licensed engineer.

Selection of appropriate methods for shoreline stabilization should consider the following factors:

- Soil characteristics of banks and bed of shoreline.

C2
27

- Proximity to and constraints of Critical Environmental Features (CEF's) such as wetlands, springs, caves, rimrocks and bluffs.
- Existing lakeshore morphology.
- Potential access related to construction or future repair or maintenance of the structure.
- Minimizing impacts to riparian vegetation and/or fish and wildlife habitat.
- Minimizing the spread of invasive plants such as hydrilla.
- Erosion dynamics of the shoreline (i.e., what is causing the problem).
- Appropriate temporary and permanent erosion and sedimentation controls.
- Location along the lake (i.e., is the location in a low or high energy environment).

In the case of shoreline stabilization and modification, work should only be undertaken when the need for such work can be justified by the level of risk to existing buildings, roads, services or property that are being threatened by erosion. Shoreline stabilization methods include non-structural, hybrid and structural. The shoreline stabilization method should be proportionate to the conditions of the site. Table 1.13-1 provides guidance for the selection of shoreline stabilization method.

Table 1.13-1 Shoreline Stabilization Method Selection Guidance

Hydraulic Energy Environment	<i>Low Energy</i>	<i>Medium Energy</i>	<i>High Energy</i>
Shoreline Location	<i>Backwater coves and sloughs</i>	<i>Creek confluences, Cove/slough mouths Shoreline CEFs or Lakeshores facing centerline of lake</i>	<i>Lakeshore facing centerline of lake or narrow (<50ft wide) man-made channels</i>
Exposure and Proximity to Boat Traffic	<i>Low</i>	<i>Moderate</i>	<i>High</i>
Water Depth Within One Foot of Shoreline	<i>< 1 foot</i>	<i>0 to 4 feet</i>	<i>>4 feet</i>
Preferred Shoreline Stabilization Method	<i>Non-Structural Methods</i>	<i>Hybrid Methods (vegetation plantings required)</i>	<i>Structural Methods (vegetation plantings required)</i>

B. Non-Structural, Hybrid and Structural Methods

1. Non-Structural Methods.

Non-structural methods are recommended in areas which are buffered from, or located above, the forces of strong current or wave action. They can also be used in conjunction with hybrid or structural methods described below for portions of projects above the wave runup elevation. Non-structural methods are primarily a combination of native and adapted vegetation with natural, biodegradable materials, generally including coconut fiber rolls, wattles, and /or mattresses, but can also include live fascines, live stakes, branch packing, live cribwalls, joint plantings, and brush mattresses as described in part 650 of the Engineering Field Handbook (USDA, 1996) and Part 654 of the National Engineering Handbook (USDA 2007). Examples of non-structural methods are provided in 1.13.9.

Shoreline stabilization strategies are preferred that utilize native vegetation and biodegradable materials to enhance the integrity of the shoreline and do not concurrently alter the shoreline, remove existing native vegetation, disturb soils, involve the placement of fill in the lake, hard-armor the shoreline, or otherwise constitute development as defined by LDC 25-1-21. Activities that meet these constraints may not require a site plan as per LDC 25-5-1, and are encouraged if sustainable. First consideration should be given to the appropriateness of these non-structural stabilization methods for any shoreline stabilization project.

2. Hybrid Methods.

If site conditions do not permit the exclusive use of non-structural methods, then a hybrid method should be used for shoreline stabilization including bioengineered or biotechnical stabilization methods. Hybrid methods use soft armor materials such as vegetated, fabric encapsulated soil (FES) lifts above the wave runup height and hard armored materials such as appropriately-sized rock riprap in the wave action zone. Hybrid methods also include vegetated, graded slope with rock riprap toe protection and FES lifts with a stacked limestone boulder toe protection. Figures illustrating the various methodologies are shown in Section 1.13.9.

Structural components such as pilings, concrete and metal sheet piles may constitute portions of the internal components of the hybrid structure but not external portions as per the example in 1.13.9. Native and adapted vegetation plantings in the Lakeshore Vegetation Buffer Zone are required for all hybrid methods as per the requirements of ECM Section 1.13.6(C).

3. Structural Methods.

C2/29

If site conditions present extreme characteristics, such as steep bathymetry or narrow man-made channels less than 50 foot in width, purely structural methods may be approved if they meet the general requirements of this section. Structural Methods include metal sheet piles and rock walls. The exclusive use of structural methods is discouraged and is not typically approved unless dictated by extreme site constraints. Structural methods must still demonstrate compliance with the design and materials described in this section. Structural methods will require native and adapted vegetation plantings in the Lakeshore Vegetation Buffer Zone as per the requirements of ECM Section 1.13.6(C).

C. Selection Limitations.

The methods appropriate for high energy environments such as structural hard armoring may not be approved for use in low energy environments or within the boundaries of CEF's, unless the applicant can demonstrate and submit calculations supporting a reasonable and appropriate need for such methods. First consideration must be given to non-structural methods. If non-structural and hybrid methods are not proposed, the applicant must demonstrate that site conditions present extreme circumstances commensurate with structural methods. Extreme circumstances include steeply descending slopes below the normal high water mark which result in depths that would otherwise result in the potential discharge of greater than an average of one cubic yard per running foot along the bank below the plane of the ordinary high water mark.

1.13.6 Design and Material Requirements for Hybrid and Structural Lakeshore Stabilization.

Site plans that will not exclusively utilize a non-structural method as described in 1.13.5(A)(1), must demonstrate that the following criteria have been met:

A. Non-Vertical Slope: As per LDC 25-2-1174(C), the shoreline stabilization method shall not exhibit vertical slopes steeper than 1H:1V (45 degrees) in the wave action zone for any portion greater than one foot in height unless the shoreline stabilization structure is located within a narrow, man-made channel that is less than fifty feet in width.

B. Protection from overtopping, toe scour and flanking: The shoreline stabilization method shall not inherently cause erosion of the upper bank, lakebed or adjacent shoreline. A more thorough explanation of overtopping, toe scour and flanking with design considerations and figures is provided in the Slope Protection for Dams and Lakeshores (USDA 1997).

1. Overtopping - The shoreline stabilization method provides overtop protection to the maximum extent of wave runup on the upper bank. Wave runup can be reduced by using a cap that extends from the top of the bulkhead or by providing a layer of stable horizontal or sloped materials on which wave run-up can be dissipated.

2. Toe Scour Protection - The shoreline stabilization method must provide toe protection of the slope which is embedded to a depth that is greater than the maximum scour depth of the lake bed calculated based on site specific characteristics.

3. Flanking - The shoreline stabilization method must provide protection of the adjacent shoreline from flanking by demonstrating that the ends of the structure resist erosion with tiebacks or return walls.

C. Native and Adapted Vegetation Plantings - The shoreline stabilization method must provide and integrate native and adapted vegetation in the Lakeshore Vegetation Buffer Zone as an erosion and sedimentation control as per the species, quantity and density described in ECM Section 1.13.7(A) Shoreline Vegetation Plantings for Austin Area Lakes. The applicant must demonstrate the posting of fiscal surety for revegetation.

D. Land Capture Prohibited - As per LDC 25-2-1174(C), backfill for the purposes of land capture or reclamation may not exceed the extent of the existing shoreline. Prohibition of land capture and land reclamation is consistent with the LCRA Dredge and Fill Standards on the Highland Lakes. Shoreline stabilization materials including non-structural methods, bulkheads, rip-rap revetments and boulders that are not in excess of the minimum needed for erosion protection are permitted beyond the existing shoreline.

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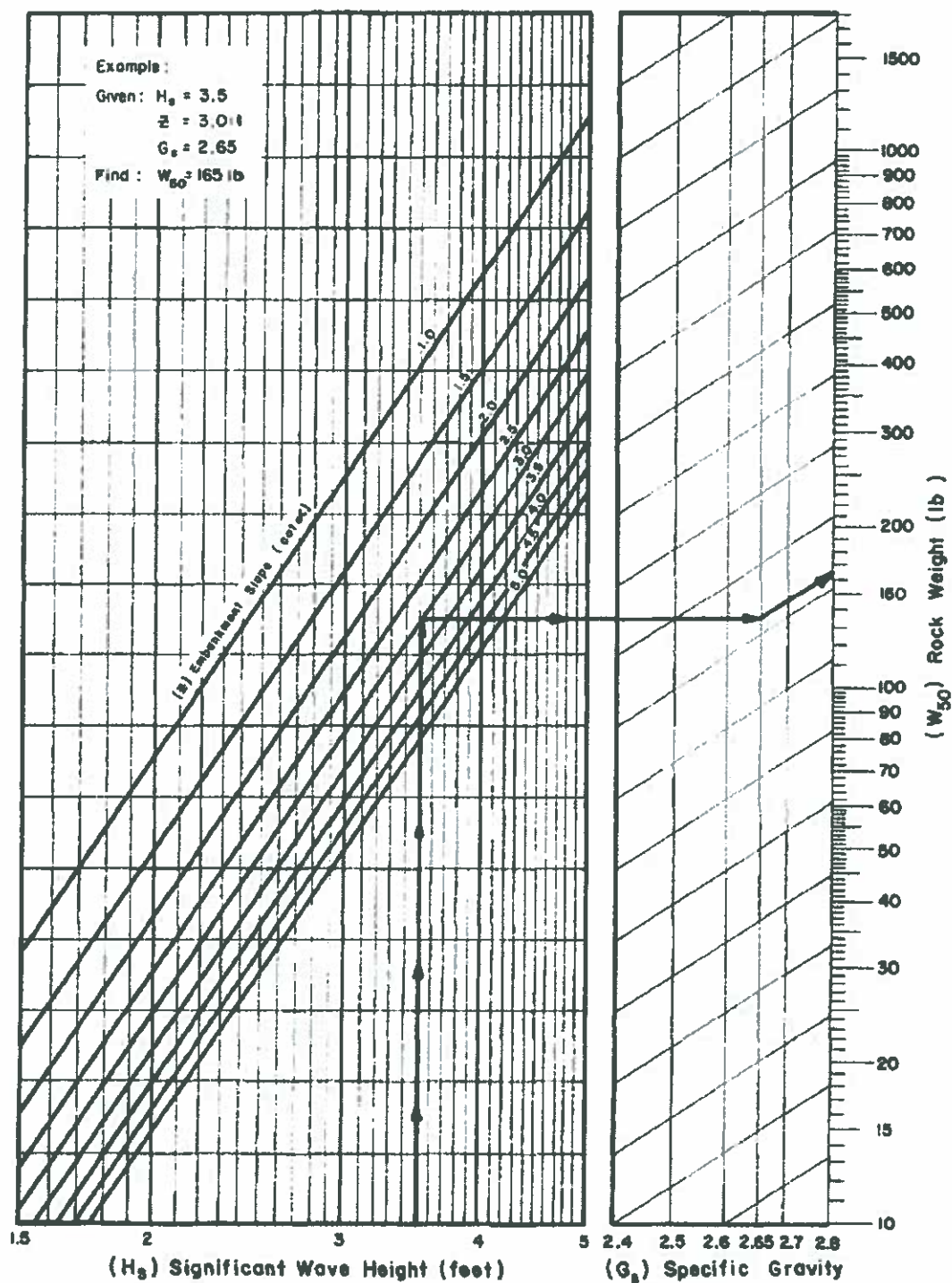
E. Boat Ramps Prohibited - As per LDC 25-2-1176(I), shoreline modification may not employ materials and methods which result in the construction of a boat ramp.

F. Materials – Internal structural components may include concrete and/or corrosion resistant steel and aluminum pilings, sheet piles, anchors and fasteners as necessary; however, external components must be composed of natural, non-toxic materials and/or bioengineered textiles. Materials approved for the external components include:

1. **Rock Riprap.** Riprap is a layer, facing or protective mound of stone randomly placed to protect the shoreline from erosion. When the riprap will be placed on an erodible soil, as determined by the Engineer or designated representative, a layer of filter fabric or granular filter material shall be placed, prior to placement of the Riprap material. Rock Riprap shall be of sufficient size(s) and slope to demonstrate stability under expected conditions. Riprap on a shoreline shall be sized appropriately for the weight, specific gravity and slope for a given wave height according to the Rock Size Selection method in Figure 1.13-2 (see also USDA 1983). Additional guidance for rip rap in lake and stream environments is provided in Slope Protection for Dams and Lakeshores (USDA 1997), Design of Riprap Revetments (Federal Highway Administration 1989), Riprap Design Criteria, Recommended Specifications and Quality Control (NCHRP 2006), Design of Coastal Revetments, Seawalls and Bulkheads (USCOE 1995) and Loose Riprap Protection (USDA 1989).

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C2
32



$$W_{50} = \frac{19.5 G_s H_s^3}{(G_s - 1)^3 \cot \alpha}$$

* This figure is adapted from the Soil Conservation Service Technical Release No. 69 Rip Rap For Slope Protection Against Wave Action (USDA, 1983)

Figure 1.13.-2. Rock Size Selection

C2
33

2. Soil Retention Blanket (SRB). SRB conforming to Standard Specification Item No. 605S, "Soil Retention Blanket", may be used for bank protection.

3. Coconut (Coir) Fiber rolls and mattresses. Coconut rolls and mattresses shall be manufactured from 100 percent mattress grade, non-sorted coconut fiber, encased in 100 percent coconut fiber mesh netting. Fiber interior of rolls shall be tightly packed into the mesh and have a minimum density of 7 pounds per cubic foot. Mesh shall have approximately 2 inch rhombic or square mesh openings with mesh junctions tied. Tensile strength per hand or machine yarn shall be 90 pounds when dry. Each coconut roll shall have a minimum diameter equal to 12 inches. Coconut fiber rolls and mattresses should be installed and anchored as per manufacturer specifications for site specific conditions.

4. Structural Geogrids. Structural geogrids shall consist of a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock or earth and function primarily as reinforcement. Material selection is site specific and it is the responsibility of the Engineer to determine the appropriate material for project.

5. Limestone Boulders. Limestone Boulders shall be durable weathered field limestone of suitable quality to promote longevity in the structure. Limestone Boulders shall be comprised of solid rock without excessive fractures, spalls, or weak layers, and shall have a minimum specific gravity of 2.1. Limestone Boulders shall be described as either "Natural Boulders" or "Cut Boulders."

A. Natural Boulders should be irregular in shape with a rough surface on all edges. No edges of the boulders shall be saw cut. If limestone boulders are to be stacked, the top and bottom of the units shall be approximately parallel. Boulders shall be relatively uniform in height (minimum dimension) and within 15% of the dimensions specified. The length dimension may vary, but should be greater than or equal to two times the height dimension. The width dimension may vary but should be greater than or equal to 1.5 times the height dimension (Figure 1.13-3).

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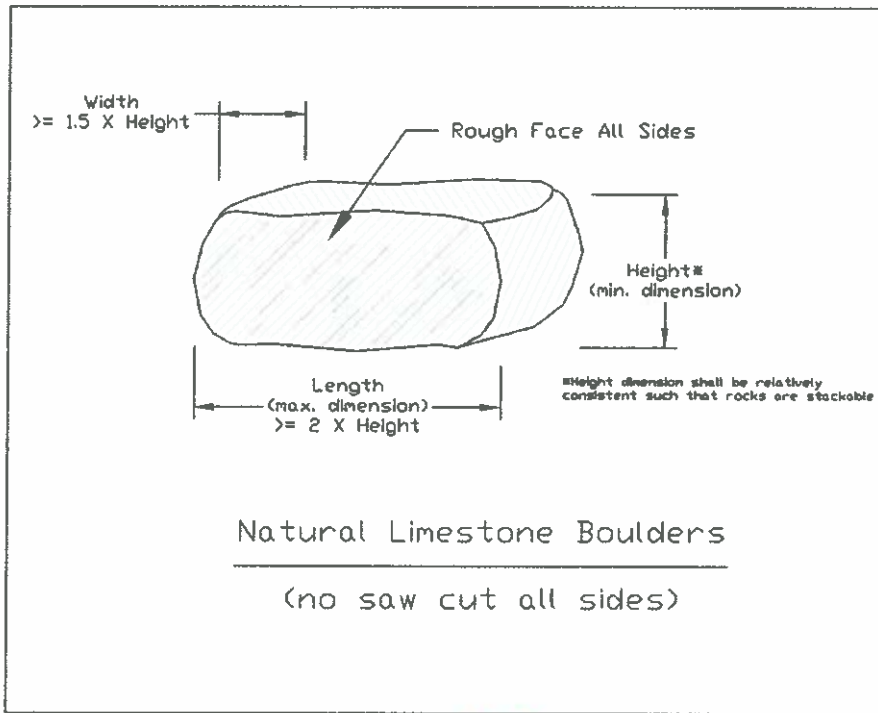


Figure 1.13-3. Natural Boulder Detail

B. Cut Boulders may have a rough surface on the face, but shall be relatively rectangular. The top and bottom of the units shall be parallel so that they are stackable. Boulders shall be uniform in height and within 8% of the dimensions specified. The split rough face (uncut) of the boulder shall be on the side with the plane created by the minimum dimension (height) and the longest dimension (length) as shown in Figure 1.13-4

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35

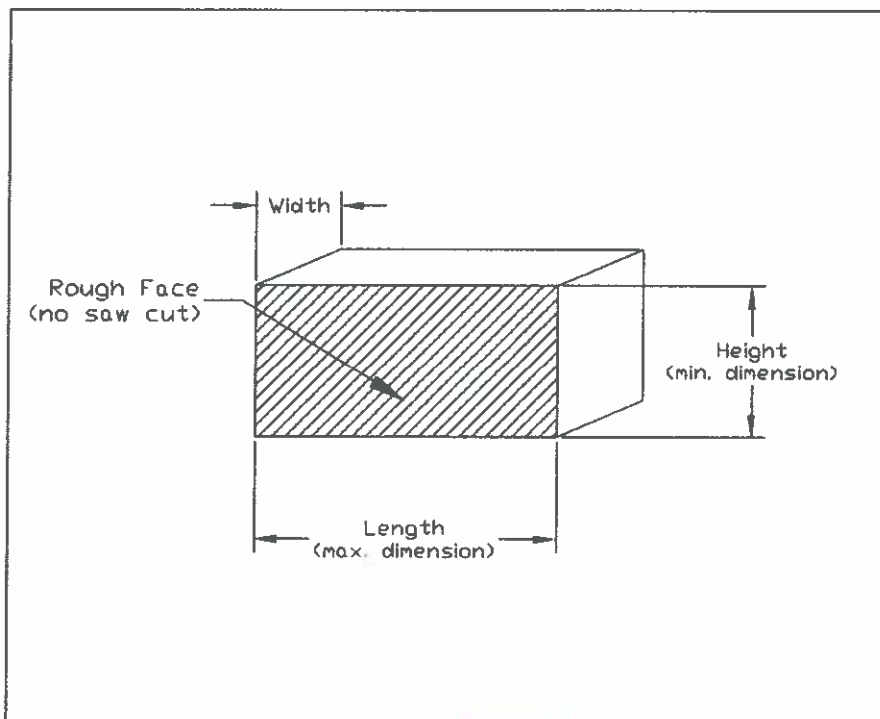


Figure 1.13-4. Cut Boulder Detail

6. Topsoil. Topsoil used for bank protection shall conform to Standard Specification Item No. 601S, "Salvaging and Placing Topsoil".

7. Alternative materials. Alternative materials may be approved on a case-by-case basis by the PDRD Environmental Reviewer or WPD Environmental Resource Management Reviewer.

1.13.7 Vegetation

Native and adapted vegetation plantings are required for shoreline modification and/or shoreline stabilization. Native and adapted emergent wetland plants provide shade and cover for fish, microhabitats for invertebrates, stabilization of the soft bottom sediments and sequestration of pollutants. Riparian vegetation of the lower and upper banks provide soil stabilization, erosion protection from overland flow, nutrient removal, shading and organic inputs for aquatic life. Together, the aquatic and riparian vegetation perform critical functions in the stability and ecological function of the lake. To maximize the success of vegetation plantings, it is recommended that the applicant consult a landscape architect or similar professional specializing in wetland plants to determine site-specific considerations including temporary irrigation or temporary protection from wave action.

A. Vegetation for Shoreline Modification and Stabilization

Shoreline modifications and stabilization projects must include plantings that compensate for the temporary and permanent impacts inherent in construction as per Table 1.13-2. The plants in Table 1.13-3 include an assortment of native and adapted riparian species from which a selection can be made to offset any difficulty in acquiring any particular specie due to variability in commercial availability. Shoreline stabilization measures should maintain existing shoreline vegetation to the maximum extent practicable and provide 1:1 mitigation for unavoidable loss of herbaceous and woody vegetation. The vegetation specifications of a site plan proposing shoreline modification or stabilization must:

1. Incorporate the planting of mature specimens of native and adapted riparian vegetation into the overall design by identifying the quantity, size, species and location of all plantings in the site plan. Plantings shall be located within the Lakeshore Vegetation Buffer Zone as define in Section 1.13.3 of the ECM.
2. Demonstrate by locating on the site plan the appropriate quantities of plantings commensurate with shoreline modifications. There are no requirements for planting density for non-structural methods, however recommended density is 1gallon containers on three foot centers. Minimum required planting quantities for Hybrid methods shall be either 1 plant (1 gallon containerized or equivalent) per 20 square feet of LOC or 2 plants (1 gallon containerized or equivalent) per running foot of shoreline modified. Planting quantities for Structural methods shall be 2 plants (1 gallon containerized or equivalent) per 20 square feet of LOC or 3 plants (1 gallon containerized or equivalent) per running foot of shoreline modified. Equivalency ratios are as follows:
 - one 1-gallon container = two 1-quart size or two 4-inch containers
 - two 1-quart size or two 4-inch containers = 4 bare root specimens.
3. Specify that plants will be free from contamination of invasive species and be sourced from within a 200 mile radius of Austin.
4. Achieve a minimum of 3 species required for projects impacting less than 100 linear feet of shoreline, and a minimum of 5 species required for larger projects.
5. Demonstrate utilization of required species or documentation of approval of alternative native and adapted species as approved by the PDR Environmental Reviewer, ERM wetland biologist or ERM landscape architect.

C2
37Table 1.13-2 Shoreline vegetation planting guidance¹ for Austin-area lakes

Location	Common Name	Botanical Name	Required for hybrid methods	Required for structural methods
Shallow water (0-½ft below normal pool)	American water willow	<i>Justicia americana</i>		
Shallow water (0-½ft. below normal pool)	Delta arrowhead	<i>Sagittaria platyphylla</i>		
Shallow water (0-½ft. below normal pool)	Three-square bulrush	<i>Scirpus americanus</i>		
Shallow water (0-½ft. below normal pool)	Pickerselweed	<i>Pontederia cordata</i>		
Shallow water (0-½ft. below normal pool)	California bulrush	<i>Schoenoplectus californicus</i>		
Lower Bank (0-1ft above normal pool)	Horsetail	<i>Equisetum laevigatum</i>		
Lower Bank (0-1ft above normal pool)	Beaked Spikerush	<i>Eleocharis rostrata</i>		
Lower Bank (0-1ft above normal pool)	Sand Spikerush	<i>Eleocharis montevidensis</i>		
Lower Bank (0-1ft above normal pool)	Emory Sedge or Frank's Sedge	<i>Carex emoryii</i> or <i>Carex frankii</i>	X	
Lower Bank (0-1ft above normal pool)	Blue Flag Iris	<i>Iris virginica</i> or <i>fulva</i>	X	
Lower Bank (0-1ft above normal pool)	Cardinal flower	<i>Lobelia cardinalis</i>		
Upper Bank (1-4ft above normal pool)	Bushy bluestem	<i>Andropogon glomeratus</i>		
Upper Bank (1-4ft above normal pool)	Big Muhly	<i>Muhlenbergia lindheimeri</i>		X

C2
38

Upper Bank (1-4ft above normal pool)	Buttonbush	<i>Cephalanthus occidentalis</i>		
Upper Bank (1-4ft above normal pool)	Deciduous holly	<i>Illex deciduas</i>		
Upper Bank (1-4ft above normal pool)	Native Carex sedges	Carex cherokeensis Carex perdetada Carex blanda Carex levenworthii		
Upper Bank (1-4ft above normal pool)	Eastern Gama grass	<i>Tripsacum dactyloides</i>		X
Upper Bank (1-4ft above normal pool)	Bald Cypress	<i>Taxodium distichum</i>		

* Alternative native and adapted species may be substituted with the same quantity of another species as approved by the PDR Environmental Reviewer, ERM wetland biologist or ERM landscape architect.

B. Vegetation for Shoreline Access

Protection and maintenance of the herbaceous and woody vegetation of steep canyon slopes resists erosion, reduces sediment-laden runoff and maintains natural and traditional character. The screening of shoreline access, as required by LDC 25-2-1066 and environmental protection of vegetation as required by LDC 25-2-1179 during development of shoreline access can be accomplished by:

1. Maintaining the natural herbaceous and woody vegetation cover to the maximum extent practicable while avoiding the removal of any existing canopy, and
2. locating the shoreline access under existing canopy coverage to the maximum extent practicable, and
3. providing 1:1 mitigation for the clearing of woody and herbaceous vegetation in instances where impacts to vegetation are unavoidable, with native seeding with 604S.6 for temporary stabilization hydromulched (as per ECM 1.4.7) and native and adapted woody and herbaceous plantings (1 gallon containers) on ten foot centers. Recommended woody and herbaceous plantings are presented in Table 1.13-4, and
4. providing biodegradable erosion controls such as coconut fiber logs or mulch socks which provide stable substrate for plant growth during initial establishment.
5. Demonstrate utilization of recommended species or documentation of approval of alternative native and adapted species as approved by the PDR Environmental Reviewer, ERM wetland biologist or ERM landscape architect.

C2
39

Table 1.13.-4 Recommended plants for upland canyon slopes.

Location	Common Name	Botanical Name	Comments
Canyon slopes	Devil's Shoestring	<i>Nolina lindheimeriana</i>	bunchgrass
Canyon slopes	Basket grass	<i>Nolina texana</i>	bunchgrass
Canyon slopes	Meadow Sedge	<i>Carex perdistata</i>	sedge
Canyon slopes	Texas Mountain laurel	<i>Sophora secundiflora</i>	evergreen shrub/small tree
Canyon slopes	Silktassel	<i>Garcya ovala</i> spp. <i>lindheimeri</i>	evergreen shrub
Canyon slopes	Evergreen Sumac	<i>Rhus virens</i>	shrub
Canyon slopes	Blackfoot Daisy	<i>Metampodium leucanthum</i>	wildflower
Canyon slopes	Texas Persimmon	<i>Diospyros texana</i>	evergreen shrub/small tree
Canyon slopes	Evergreen Yaupon	<i>Illex vomitoria</i>	evergreen shrub/small tree

* alternative native and adapted species may be substituted with the same quantity of another species as approved by the PDR Environmental Reviewer, ERM wetland biologist or ERM landscape architect.

Consultation with a landscape architect or botanical professional is recommended to determine appropriate placement of plantings and need for a temporary irrigation plan.

1.13.8 Additional Permitting Considerations.

As per ECM 1.7.3(D), the applicant may be required to demonstrate application for a relevant state and/or federal permit if applicable.

For bank stabilization projects, this may apply if the scope of the project exceeds the criteria for the Nationwide Permit 13 under which the activities are authorized. These criteria can be accessed at:

<http://www.swf.usace.army.mil/pubdata/envIRON/regulatory/permitting/nwp/2007/07nw13.pdf>

For more information about the U.S. Army Corps of Engineers regulatory program and the criteria of Nationwide Permits can be accessed at:

<http://www.swf.usace.army.mil/pubdata/envIRON/regulatory/index.asp> and

<http://www.swf.usace.army.mil/pubdata/envIRON/regulatory/permitting/overview.asp>

1.13.9 Resource Guidance for Shoreline Modification

The figures provided in this section are for guidance purposes only to demonstrate methods which are consistent with the requirements in this section. The figures in this section are not requirements for shoreline modification and are not intended for use as construction documents. The applicant and/or engineer assume the responsibility for appropriate use of selected method.

Resources providing additional information for consideration of shoreline modifications and non-structural, hybrid and structural alternatives are available on-line and include: *The Shoreline Stabilization Handbook* (Northwest Regional Planning Commission 2004), *Streambank and Shoreline Protection* (USDA 1996), *Slope Protection for Dams and Lakeshores* (USDA 1997), *Green Shorelines* (City of Seattle 2008), *Shore Erosion Control - The Natural Approach* (Luscher and Hollingsworth 2005) and *The construction, aesthetics, and effects of lakeshore development: a literature review* (Engel and Pederson 1998).

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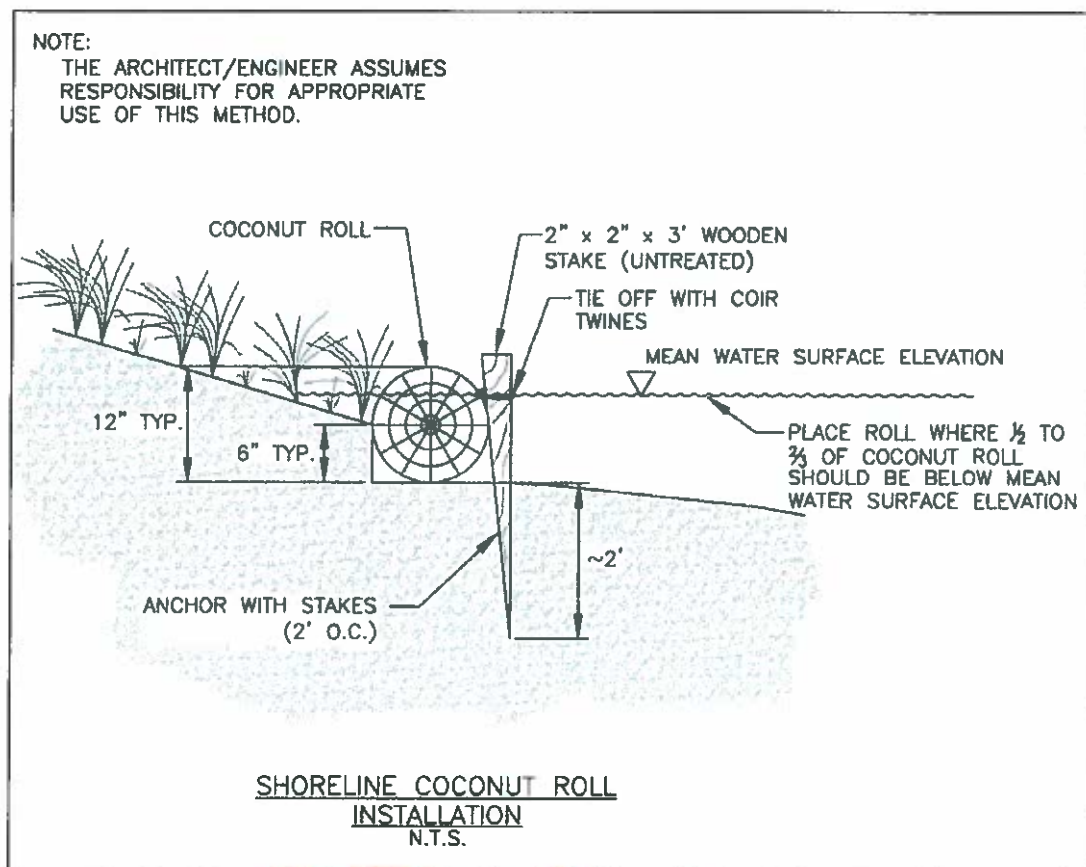


Figure 1.13-4 Coconut Roll Installation Shoreline Applications

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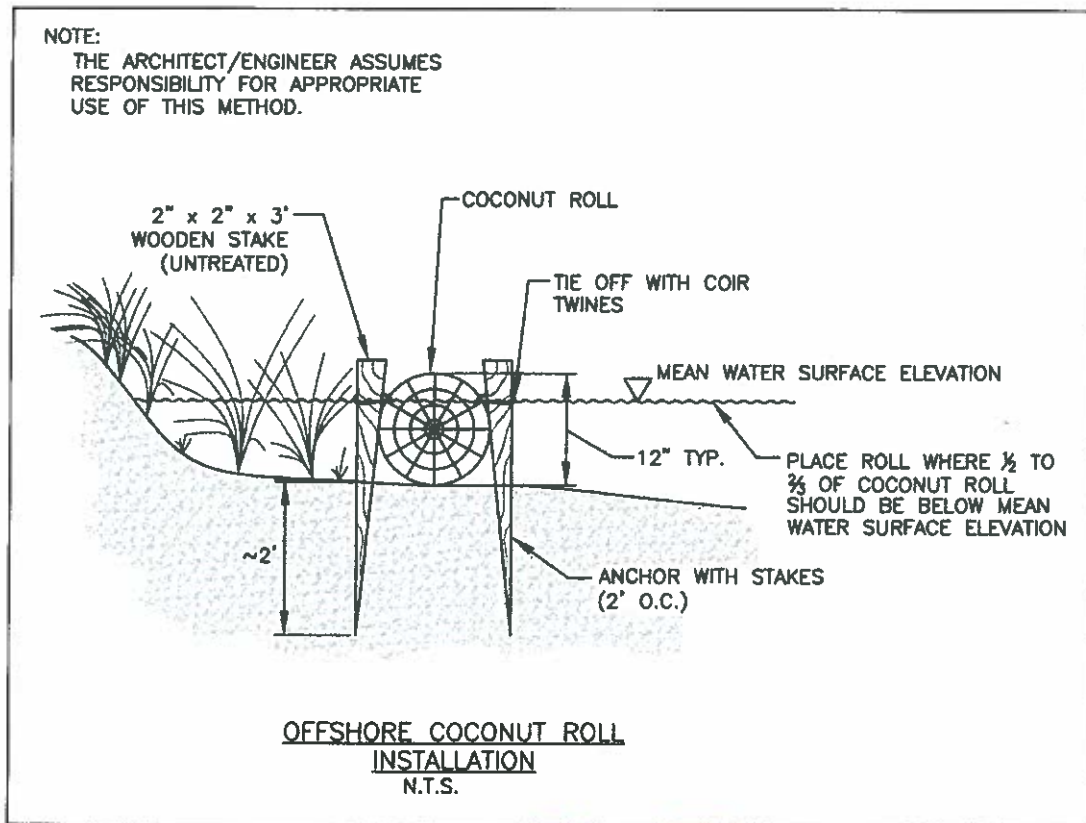


Figure 1.13-5 Offshore Coconut Roll Installation Shoreline Applications

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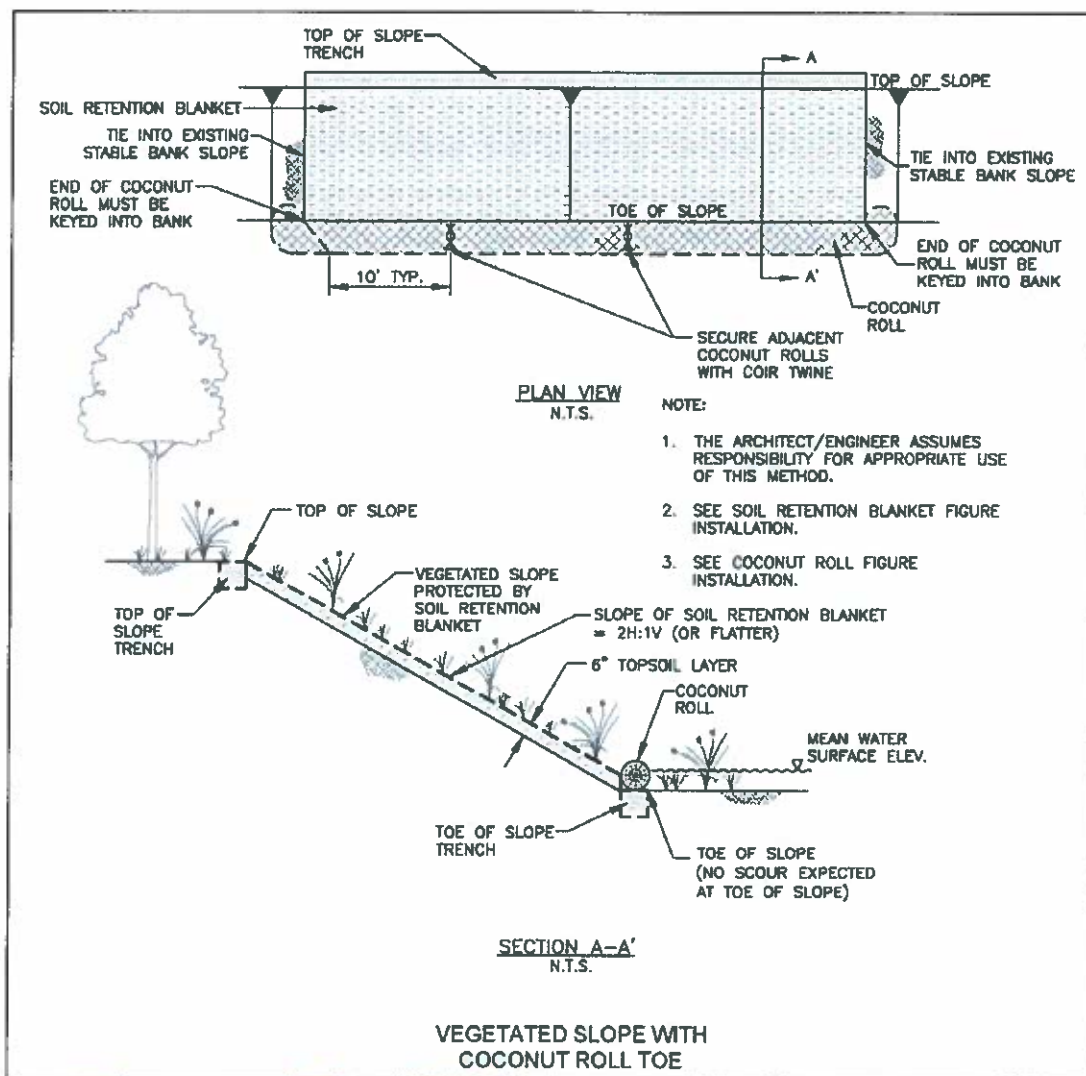


Figure 1.13-6 Vegetated Slope With Coconut Roll Toe

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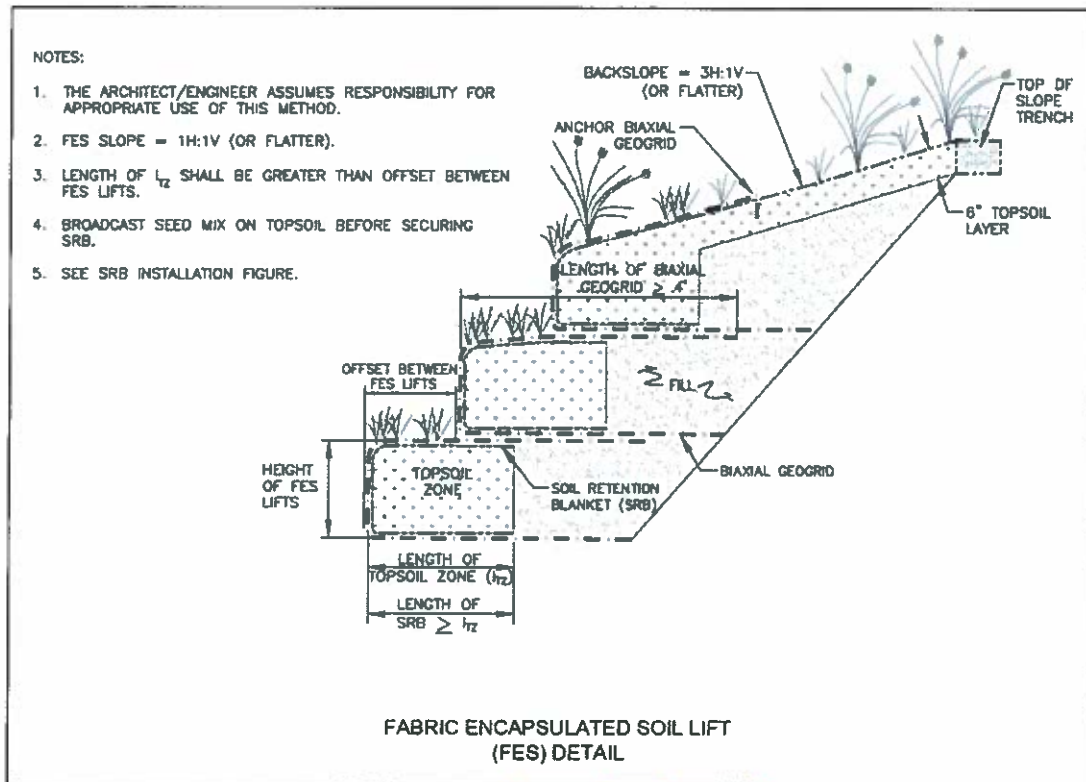


Figure 1.13-7 Fabric Encapsulated Soil Lift (FES) Detail

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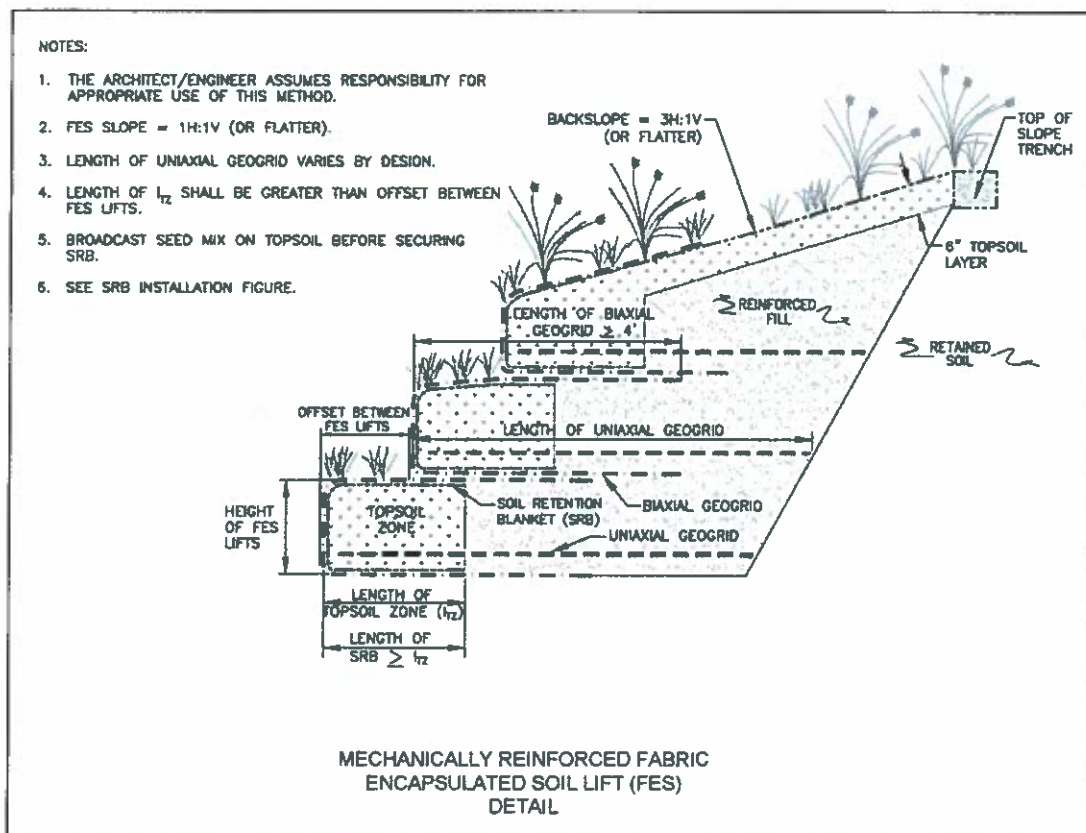


Figure 1.13-8 Mechanically Reinforced Fabric Encapsulated Soil Lift (FES) Detail

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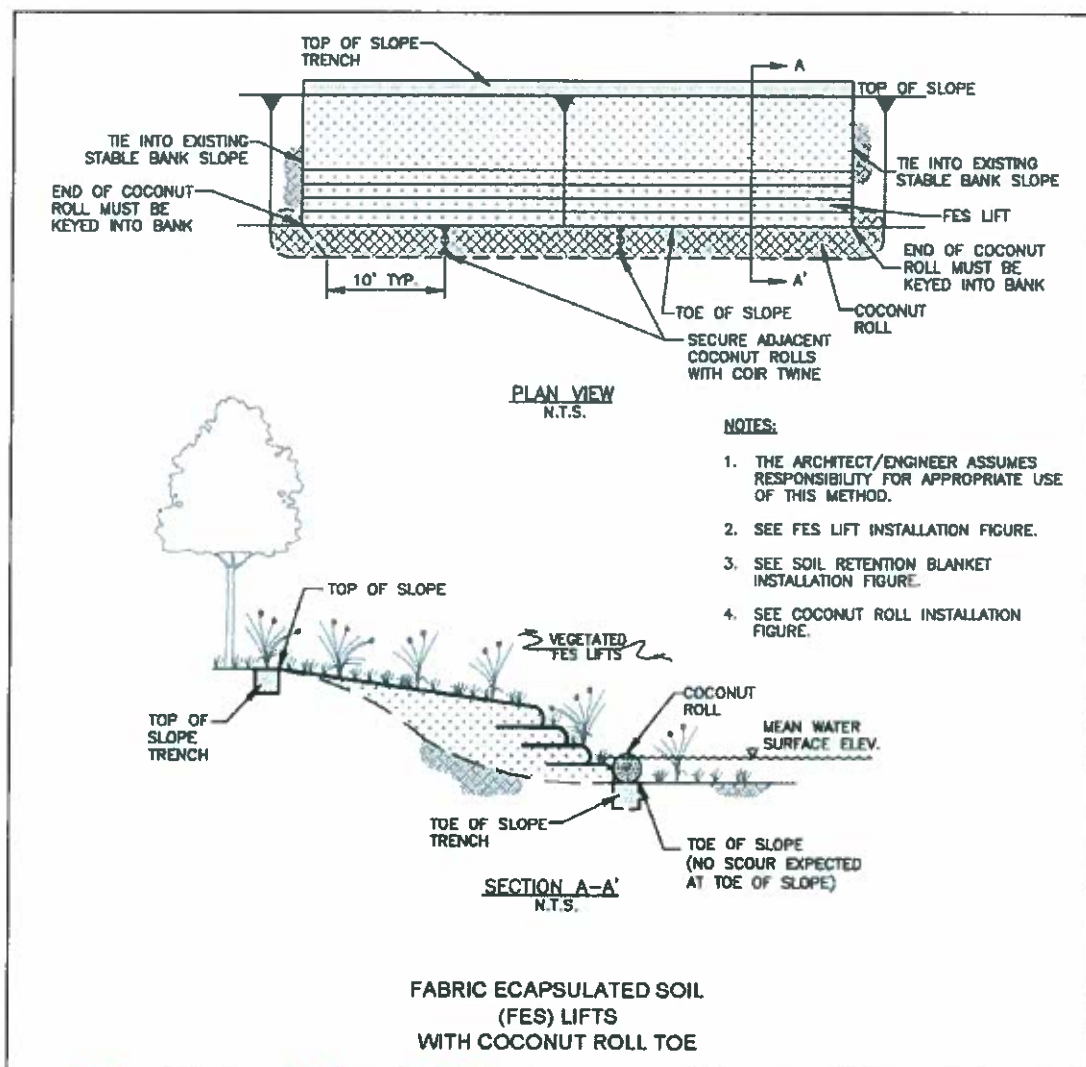


Figure 1.13-9 Fabric Encapsulated Soil Lifts with Coconut Roll Toe

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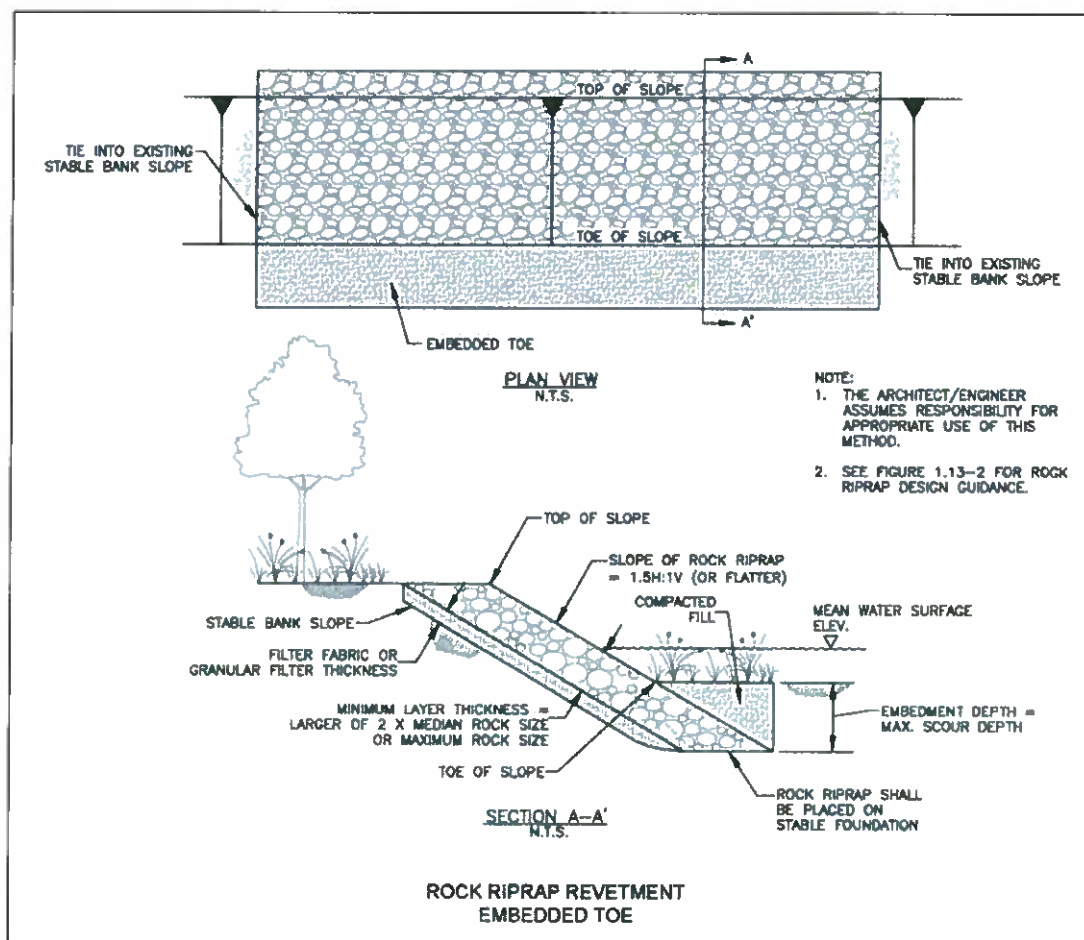


Figure 1.13-10 Rock Riprap Revetment Embedded Toe

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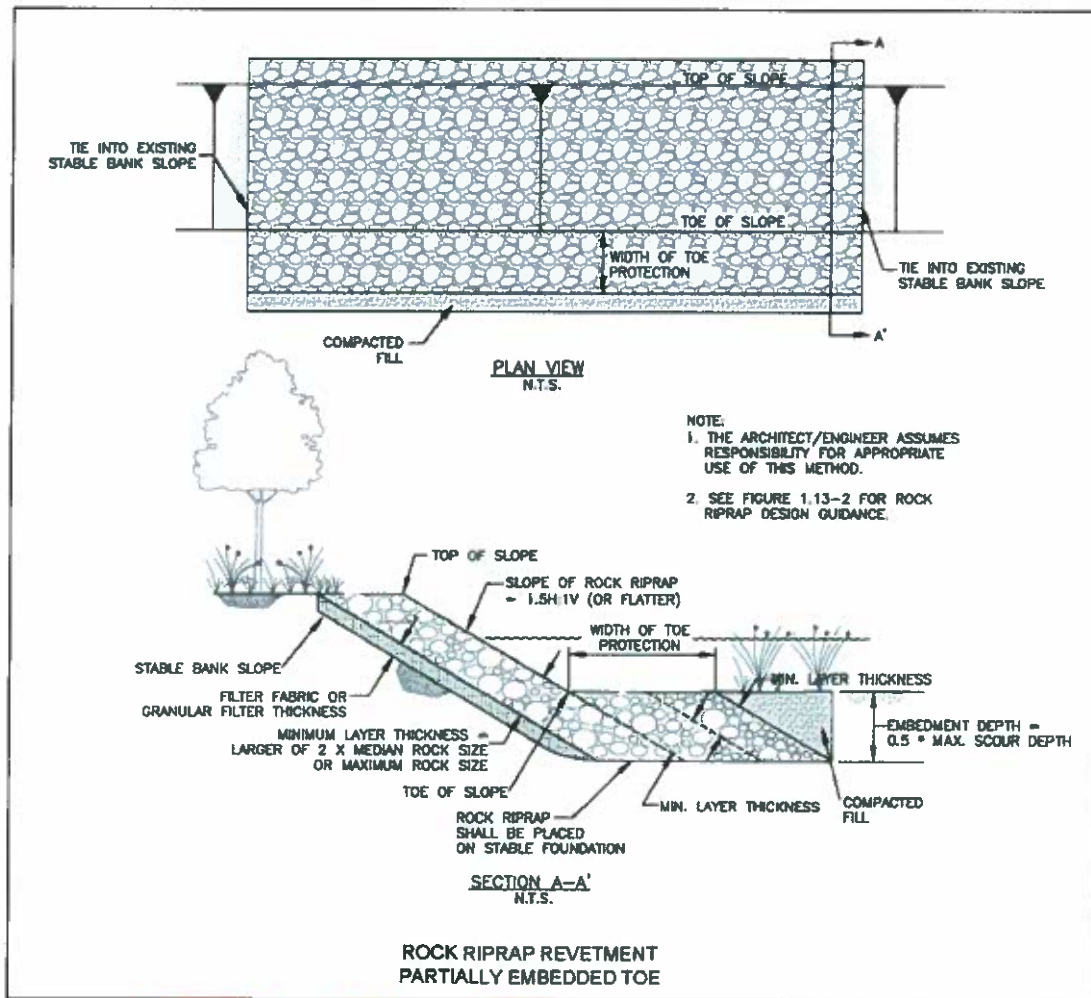


Figure 1.13-11 Rock Riprap Revetment Partially Embedded Toe

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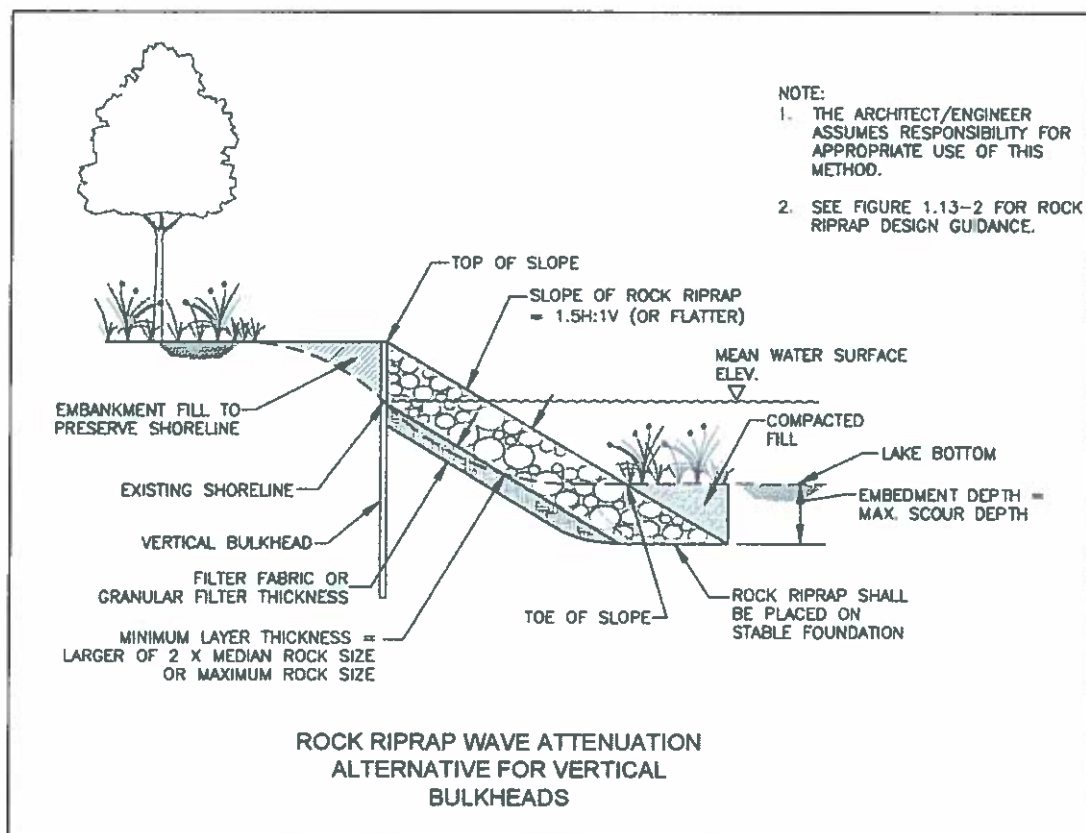


Figure 1.13-12 Rock Riprap Wave Attenuation Alternative For Vertical Bulkheads

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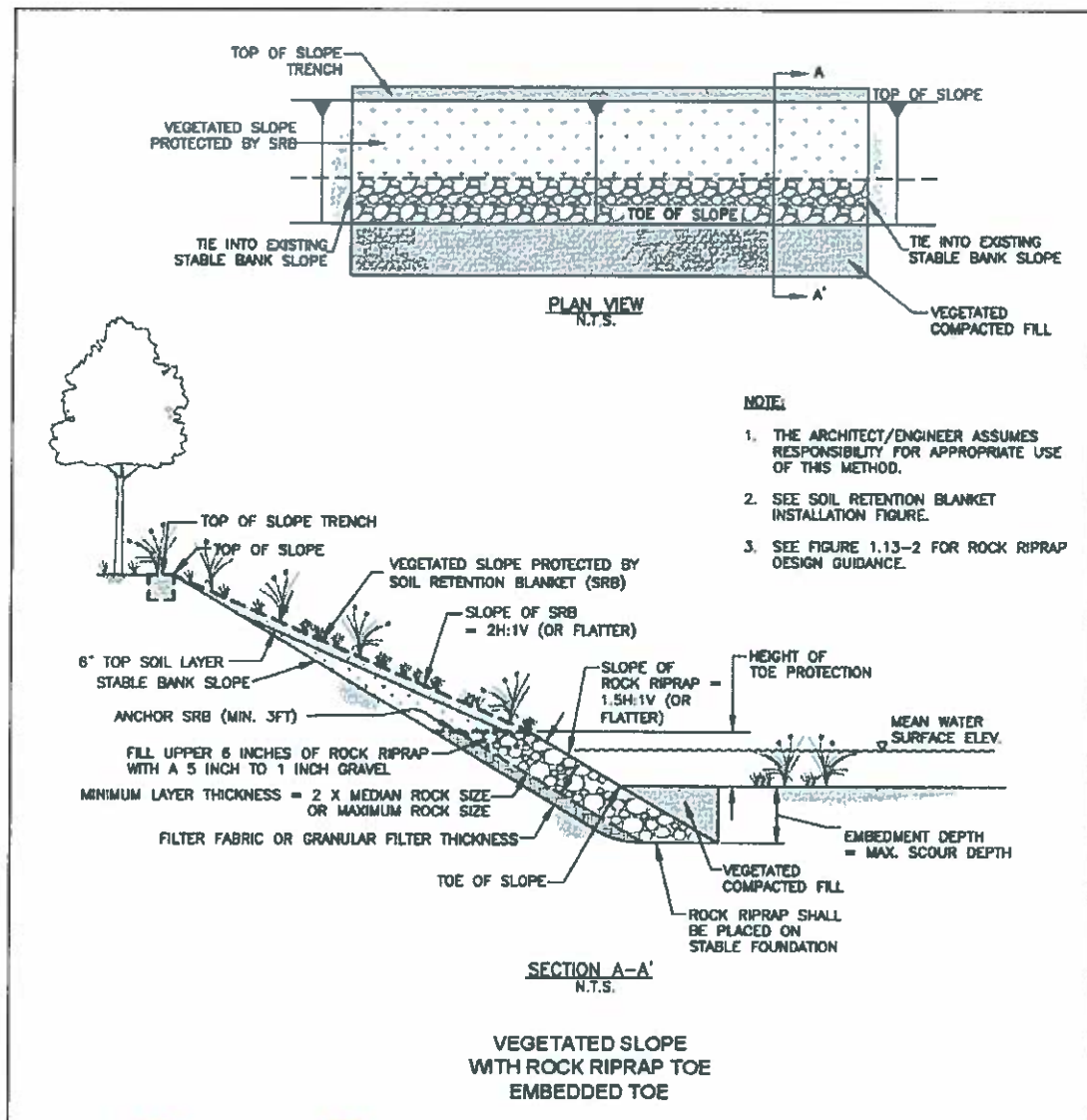


Figure 1.13-13 Vegetated Slope With Rock Riprap Toe Embedded Toe

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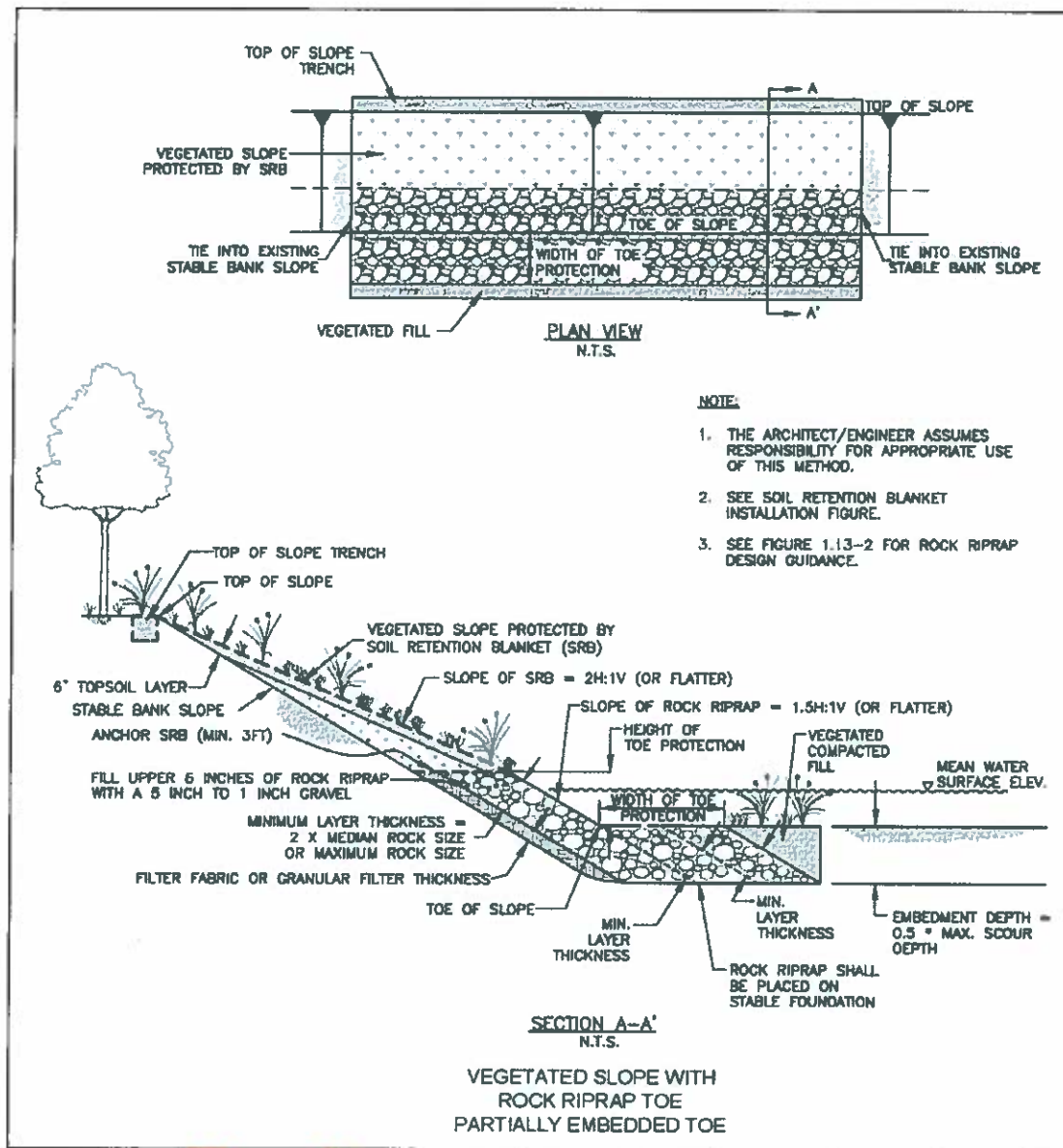


Figure 1.13-14 Vegetated Slope With Rock Riprap Toe Partially Embedded Toe

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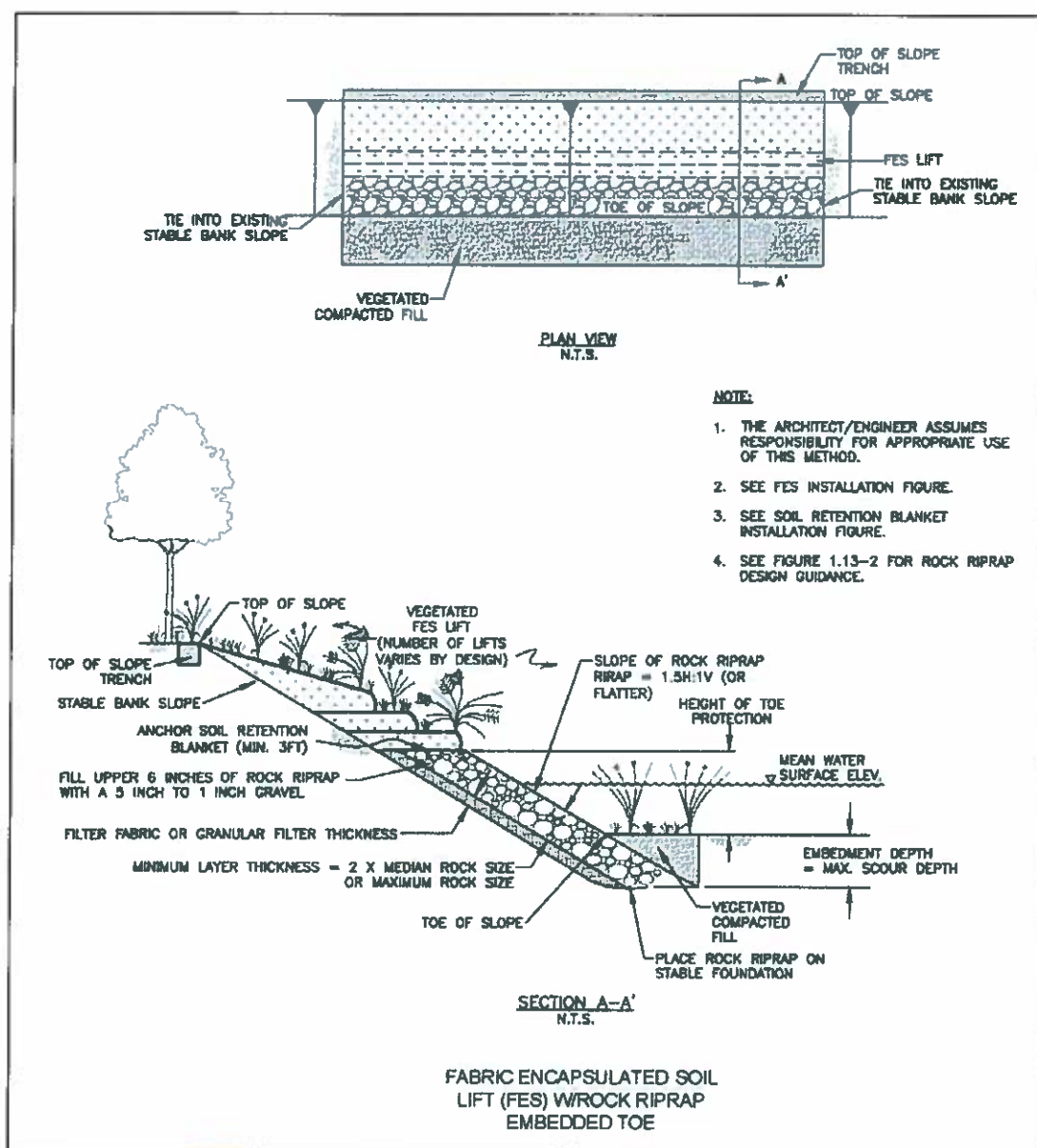


Figure 1.13-15 Fabric Encapsulated Soil Lifts with Rock Riprap Toe Embedded Toe

C2/53

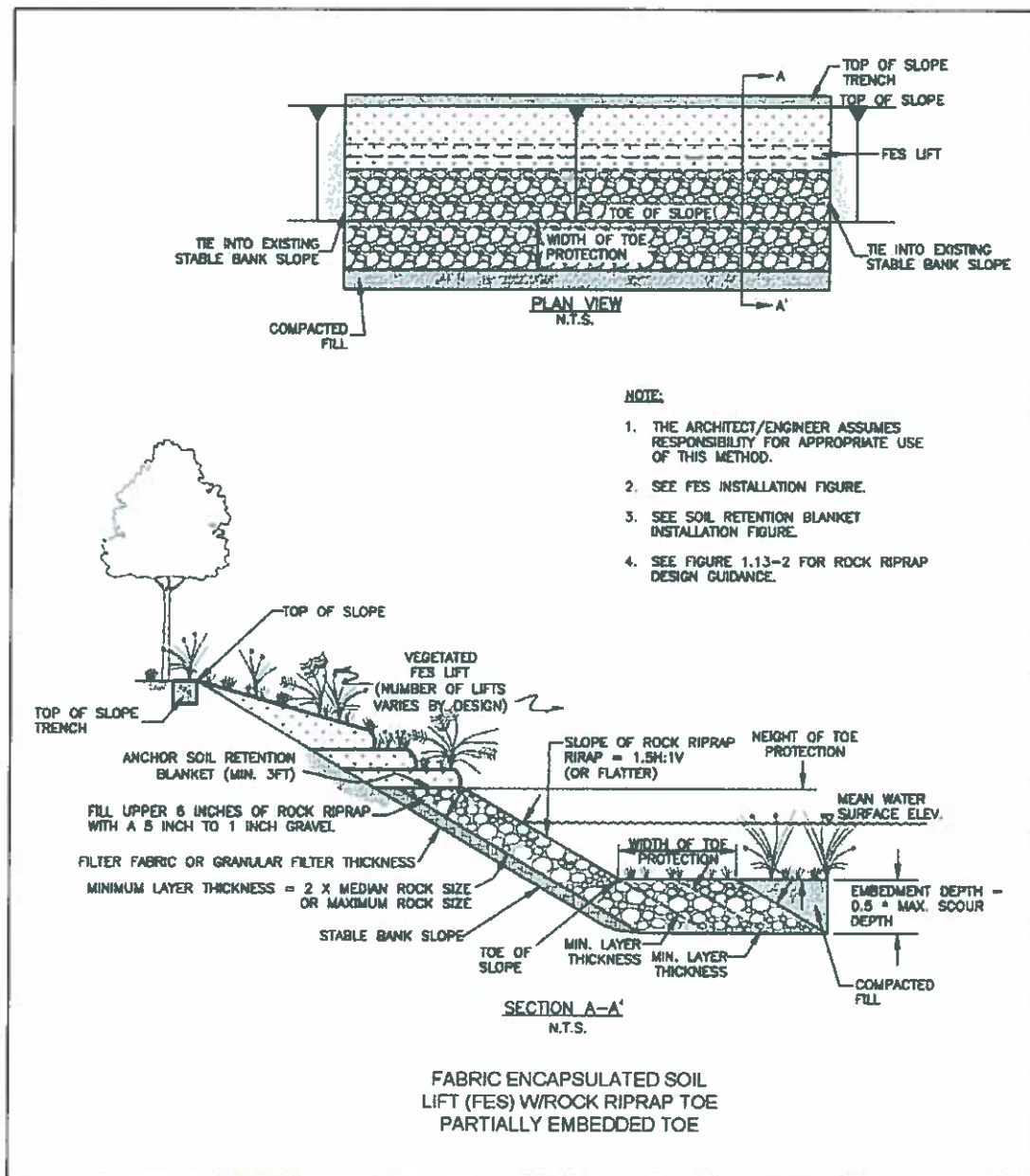


Figure 1.13-16 Fabric Encapsulated Soil Lifts with Rock Riprap Toe Partially Embedded Toe

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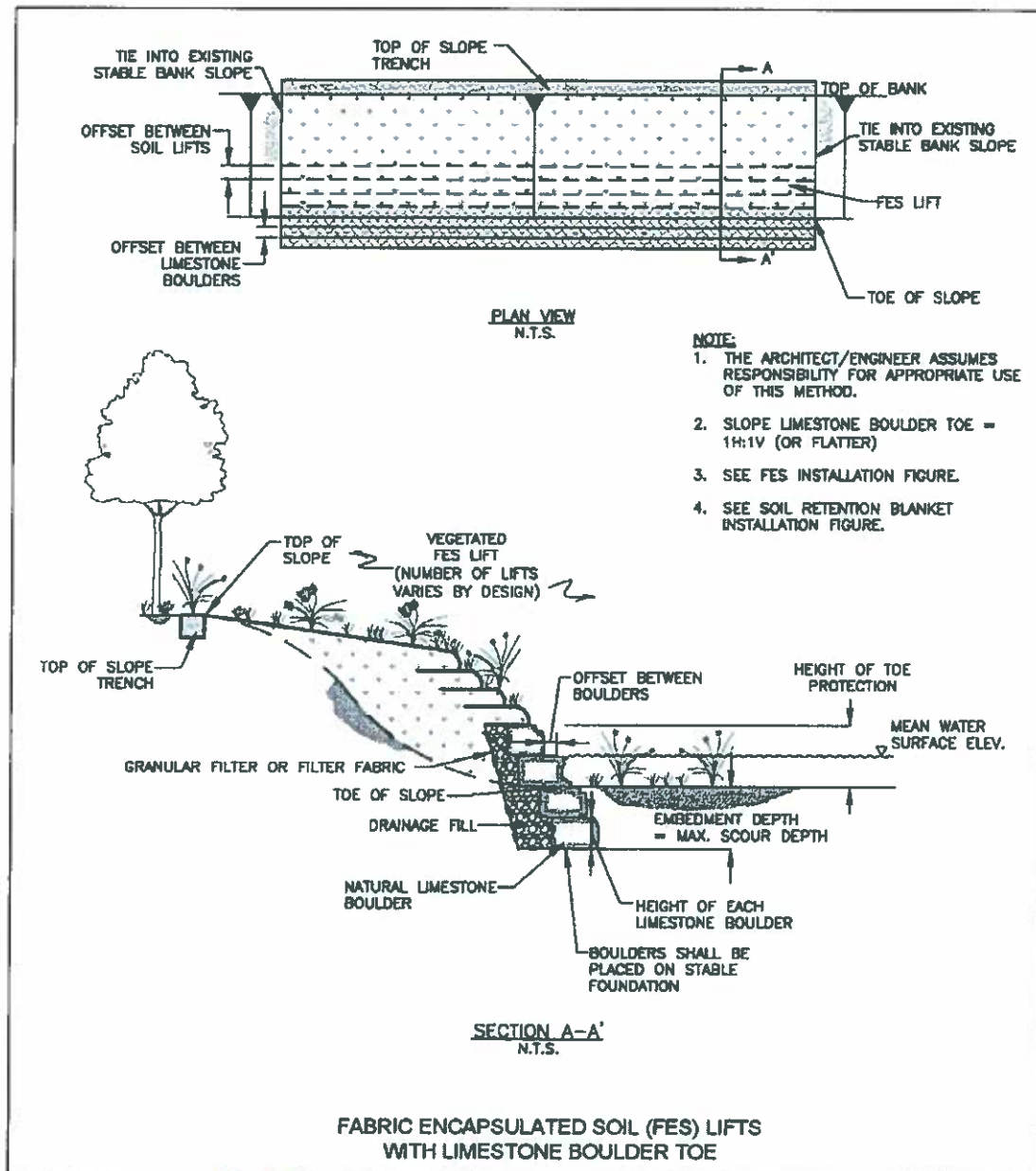


Figure 1.13-17 Fabric Encapsulated Soil (FES) Lifts With Limestone Boulder Toe

C2/53

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57

2005 Propose Criteria and Standard Details (Public Works)

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/58

VERTICAL BULKHEADS
with
WAVE ATTENUATION REVETMENTS

PROPOSED CRITERIA
And
STANDARD DETAILS

City of Austin PARD
December 2, 2005

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59

Vertical Bulkheads with Wave Attenuation Revetments

Vertical bulkheads including retaining walls and steel pilings, that are intended to preserve or restore the shoreline, may be constructed on the main body of the lake as long as the vertical bulkhead is appropriately designed for the expected soil and environmental conditions and a wave attenuation revetment installation, approved by _____, is strategically constructed in front of the lakeside wall face. The vertical bulkhead shall be designed by a registered professional engineer, who is licensed in the State of Texas. The design shall be supported by geotechnical information appropriate to the soil conditions for the site of the proposed bulkhead installation. Drawings displaying the bulkhead design and installation details shall be stamped and dated by the Design Engineer and shall be submitted to _____ for review and approval. The City may also require submittal of bulkhead design calculations by the Design Engineer.

The wave attenuation revetment installation shall consist of either sloping rock rip rap, rock filled gabions or other revetment installation approved by _____ and shall occupy a space below a line that extends from a position on the vertical bulkhead 12" above the normal lake water level along an approximate 1:2 slope (i.e. 1V to 2H) until the toe of the slope reaches a depth below the existing lake bottom (minimum depth of 12") where undermining due to wave action is minimized as established by the design engineer.

The configuration and requirements for a wave attenuation revetment installation are presented visually in Standard Detail PD-1, while acceptable installation alternates are presented as Standard Details PD-1A (rock rip rap) and PD-1B (gabions).

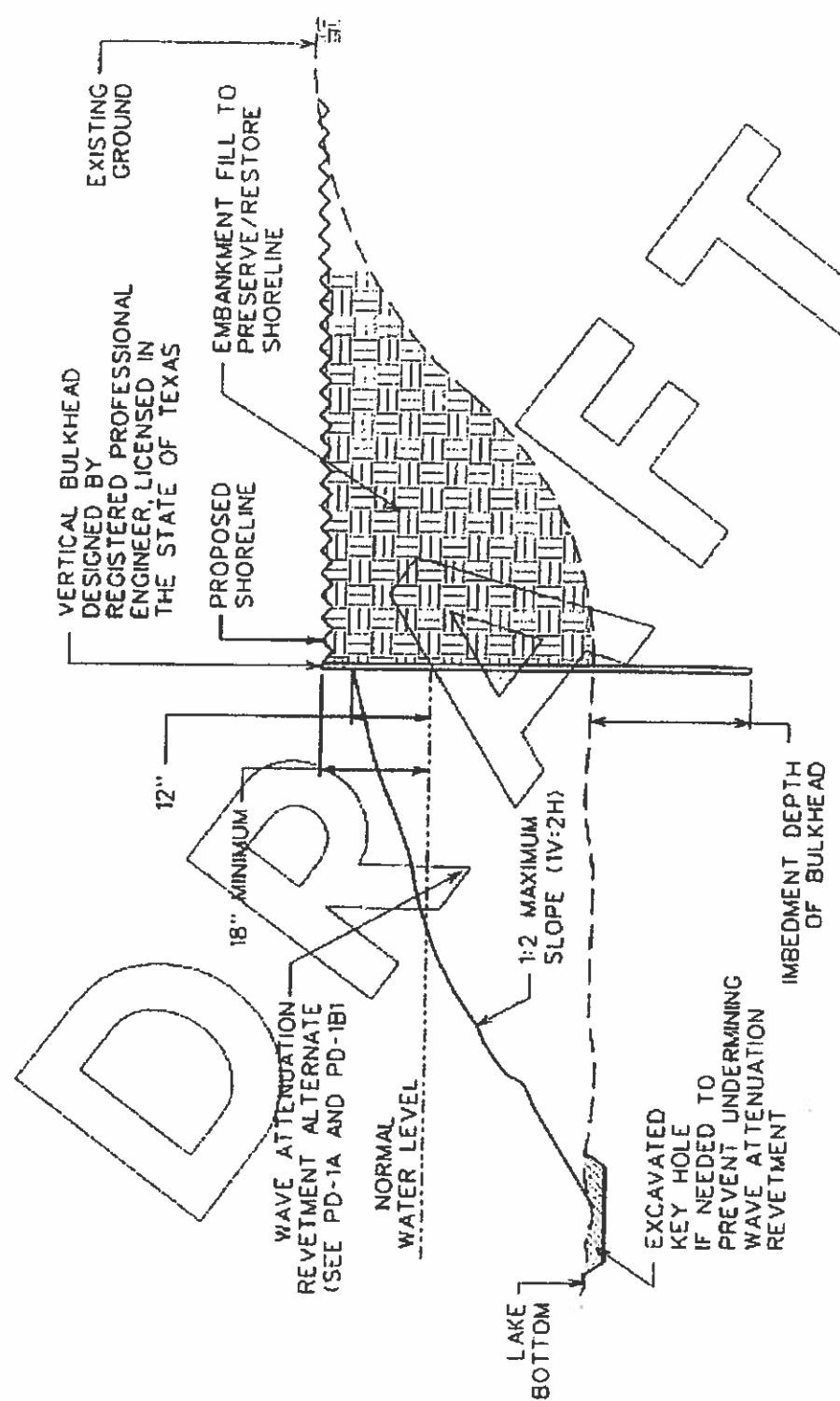
Multi-tiered Mortared Rock Wave Attenuation Installation

A multi-tier mortared rock wall may be approved for use as a wave attenuation installation for a proposed vertical bulkhead, that is appropriately designed for the expected soil and environmental conditions and is intended to preserve or restore the shoreline, as long as the mortared rock wall is constructed in front of the vertical bulkhead with a minimum of three tiers at different elevations as indicated in Standard Detail PD-2, sheet 1 and in a serpentine configuration throughout its length as indicated in Standard Detail PD-2, sheet 2. The open space between the back of the mortared rock wall and front face of vertical bulkhead, that varies between minimums of 3 and 15 inches, shall be filled with gravel.

The overall vertical height of the mortared rock wall shall be established as the vertical distance from a position on the vertical bulkhead 12" above the normal lake water level to the depth below the existing lake bottom (minimum depth of 12") at the toe of the wall where undermining due to wave action is minimized as established by the design engineer. The overall wall thickness at any point along the length of the wall shall at a minimum be equal to the overall vertical height (Standard Detail PD-2, sheet 1).

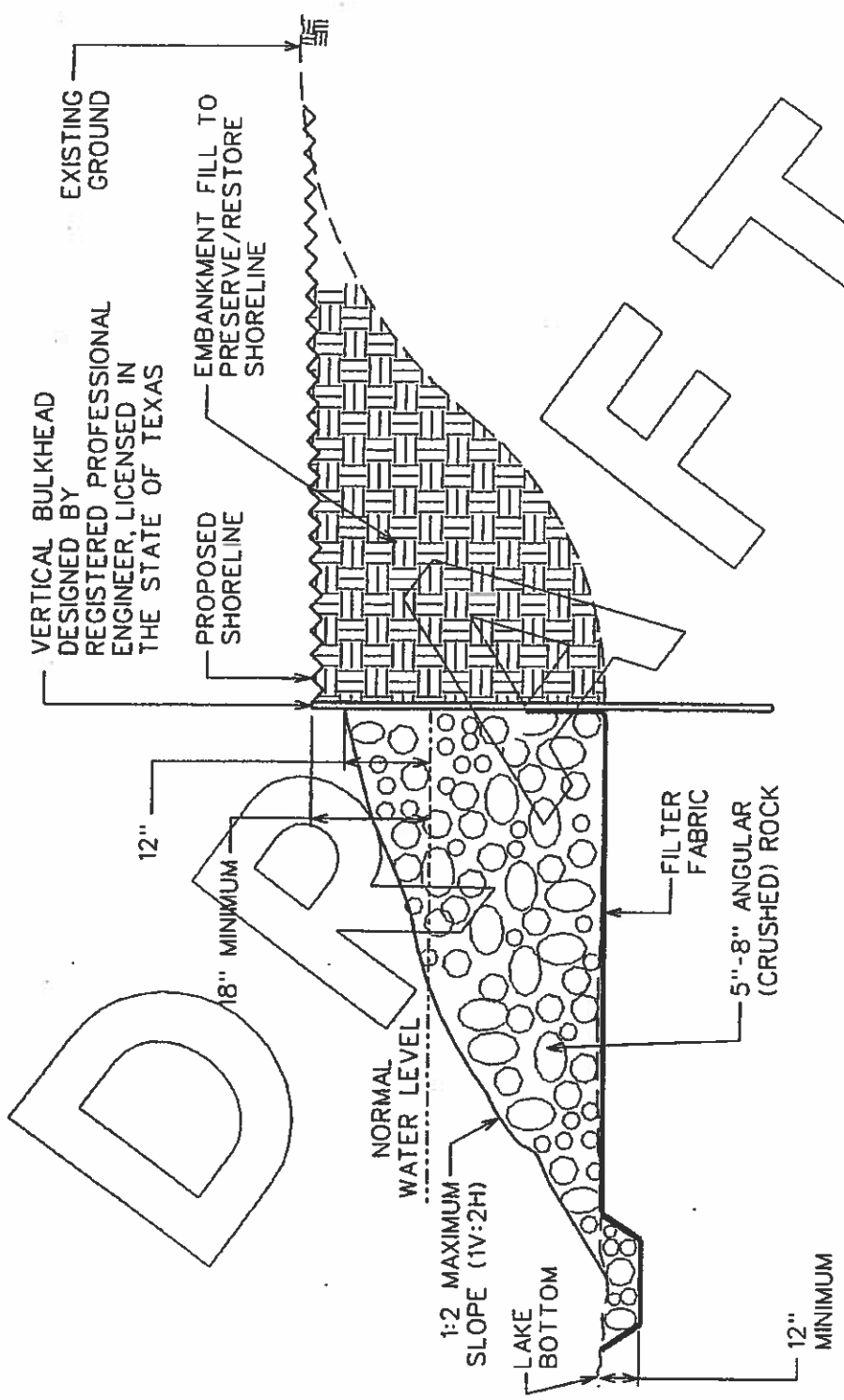
The vertical bulkhead shall be designed by a registered professional engineer, who is licensed in the State of Texas. The design shall be supported by geotechnical information appropriate to the soil conditions for the site of the proposed bulkhead installation. Drawings displaying the bulkhead design and installation details shall be stamped and dated by the Design Engineer and shall be submitted to _____ for review and approval. The City may also require submittal of bulkhead design calculations by the Design Engineer.

C2
60



CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS	RECOVERED/PRESERVED SHORELINE: VERTICAL BULKHEAD W/WAVE ATTENUATION REVETMENT	
ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	DETAIL NO. PD-1

C2
61



CITY OF AUSTIN
DEPARTMENT OF PUBLIC WORKS

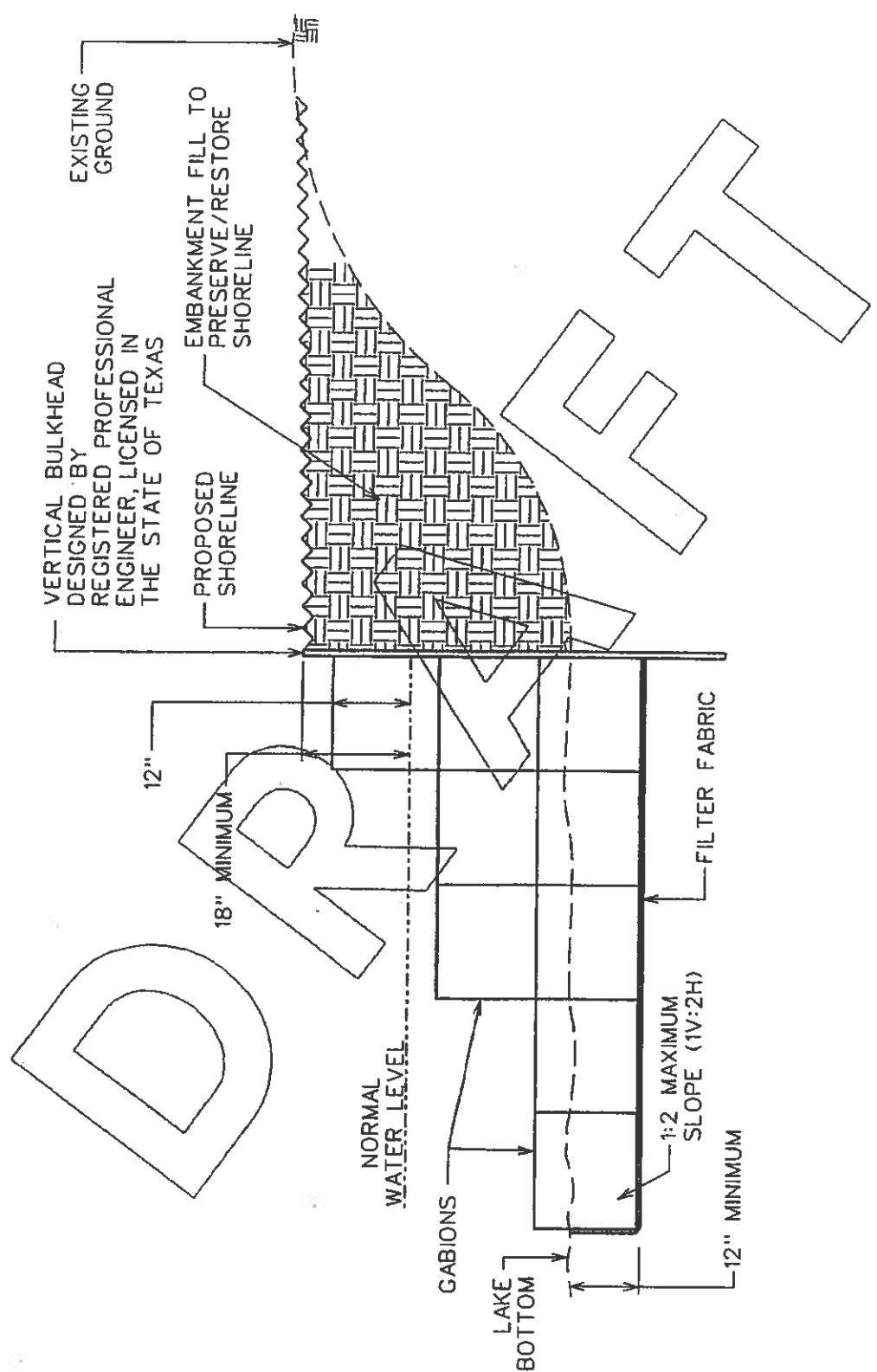
RECOVERED/PRESERVED SHORELINE: ROCK
RIP RAP WAVE ATTENUATION ALTERNATE

THE ARCHITECT/ENGINEER ASSUMES
RESPONSIBILITY FOR APPROPRIATE USE
OF THIS STANDARD.

DETAIL NO.
PD-1A

ADOPTED

C2
62



<p>CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS</p>	<p>RECOVERED/PRESERVED SHORELINE: GABION WAVE ATTENUATION ALTERNATE</p>	
<p>ADOPTED</p>	<p>THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.</p>	<p>DETAIL NO. PD-1B</p>

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63

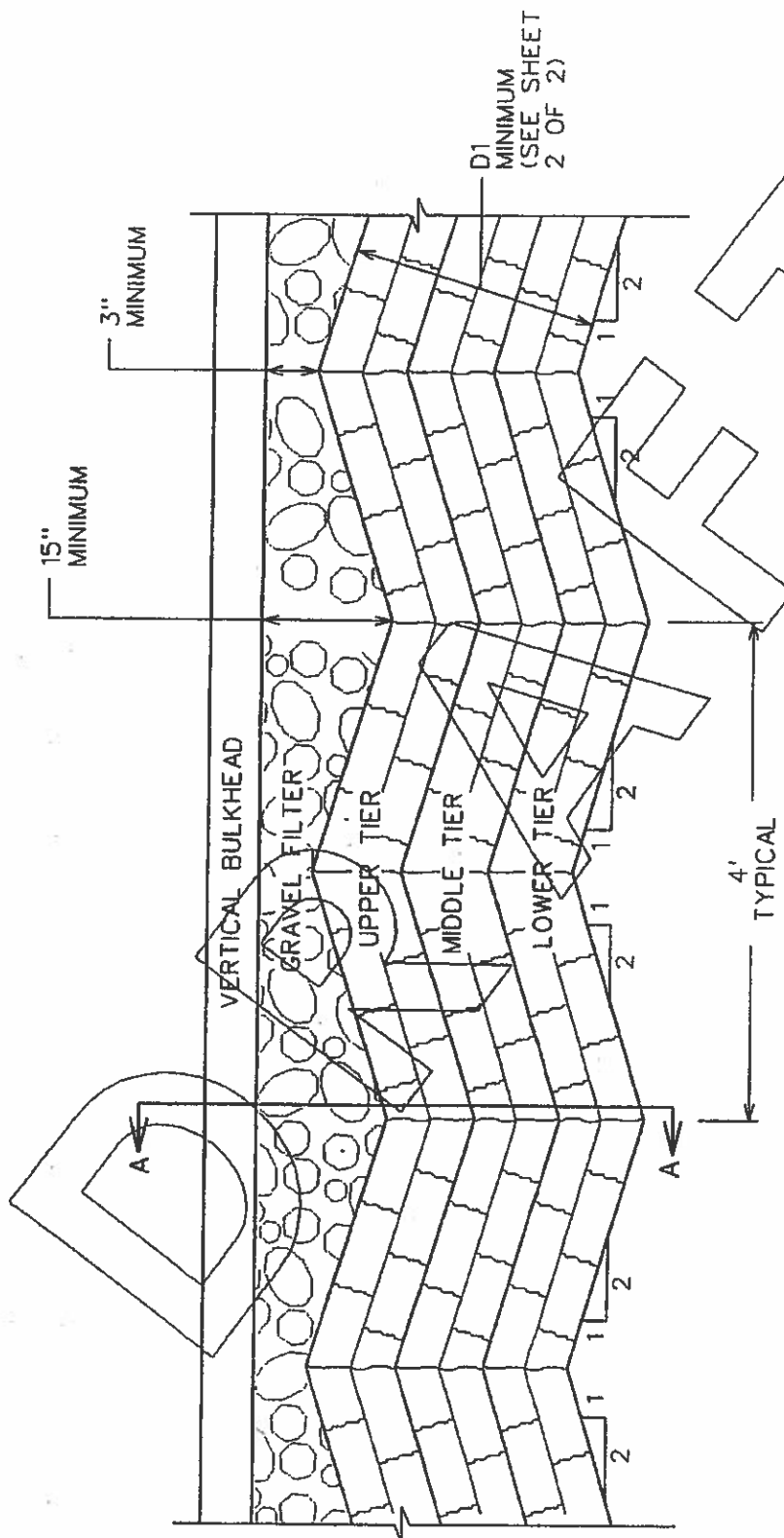


VERTICAL BULKHEADS
with
WAVE ATTENUATION REVETMENTS

PROPOSED WAVE ATTENUATION
TIERED/SERPENTINE
MORTARED WALL CONFIGURATION

City of Austin PARD
December 2, 2005

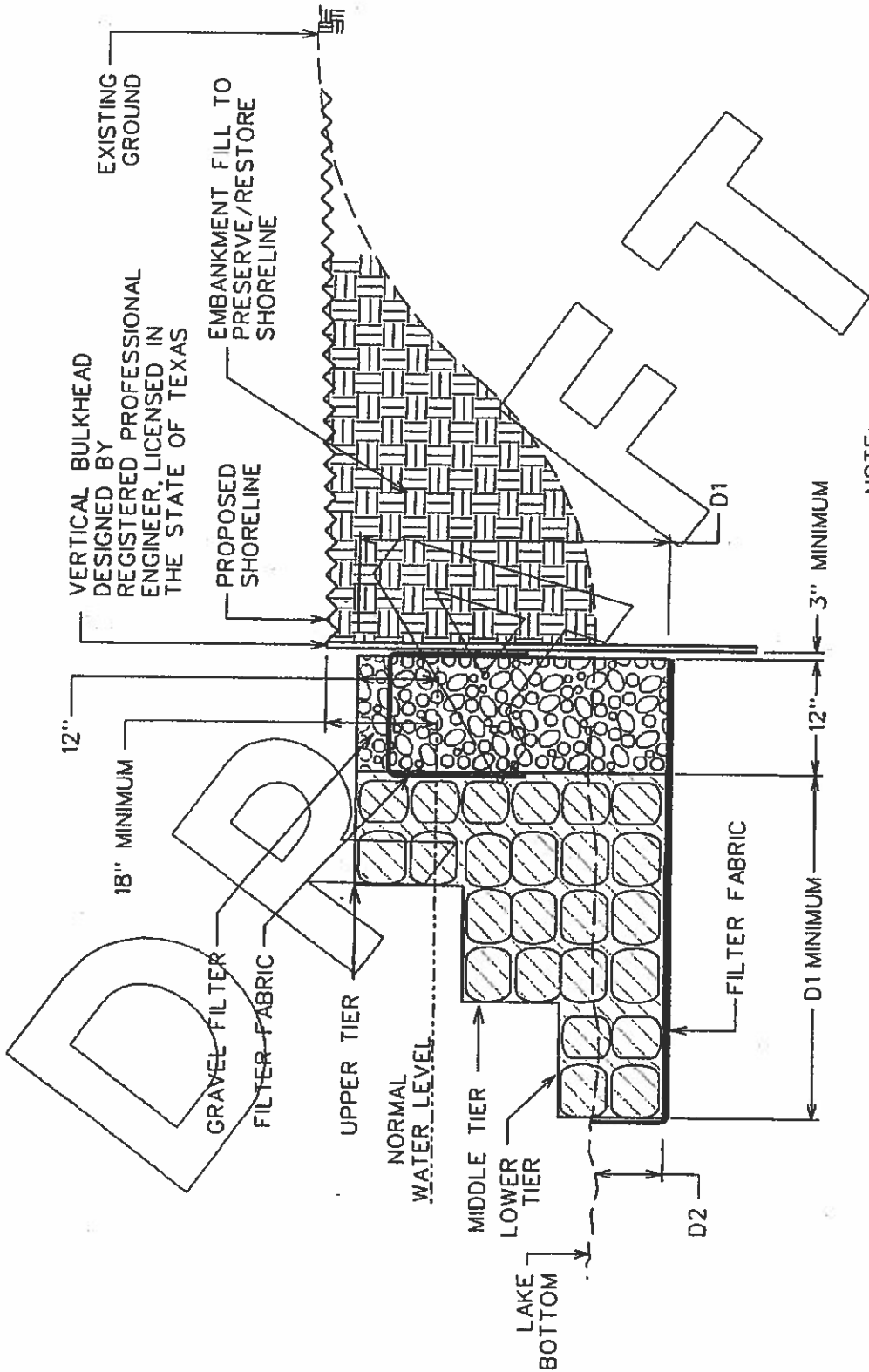
C2
64



PLAN VIEW
MORTARED ROCK WALL ALTERNATE

<p>CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS</p>	<p>TIERED MORTARED ROCK WALL WAVE ATTENUATION ALTERNATE</p>	
<p>ADOPTED</p>	<p>THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.</p>	<p>DETAIL NO. PD-2 1 OF 2</p>

C2
65



NOTE:
D1 IS THE TOTAL VERTICAL WALL HEIGHT.
D2 IS THE DEPTH BELOW EXISTING LAKE
BOTTOM TO STABLE SOIL CONDITIONS
(MINIMUM OF 12").

SECTION A-A
(SEE SHEET 1)

<p>CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS</p>	<p>TIERED MORTARED ROCK WALL WAVE ATTENUATION ALTERNATE</p>	
<p>ADOPTED</p>	<p>THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.</p>	<p>DETAIL NO. PD-2 2 OF 2</p>

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66

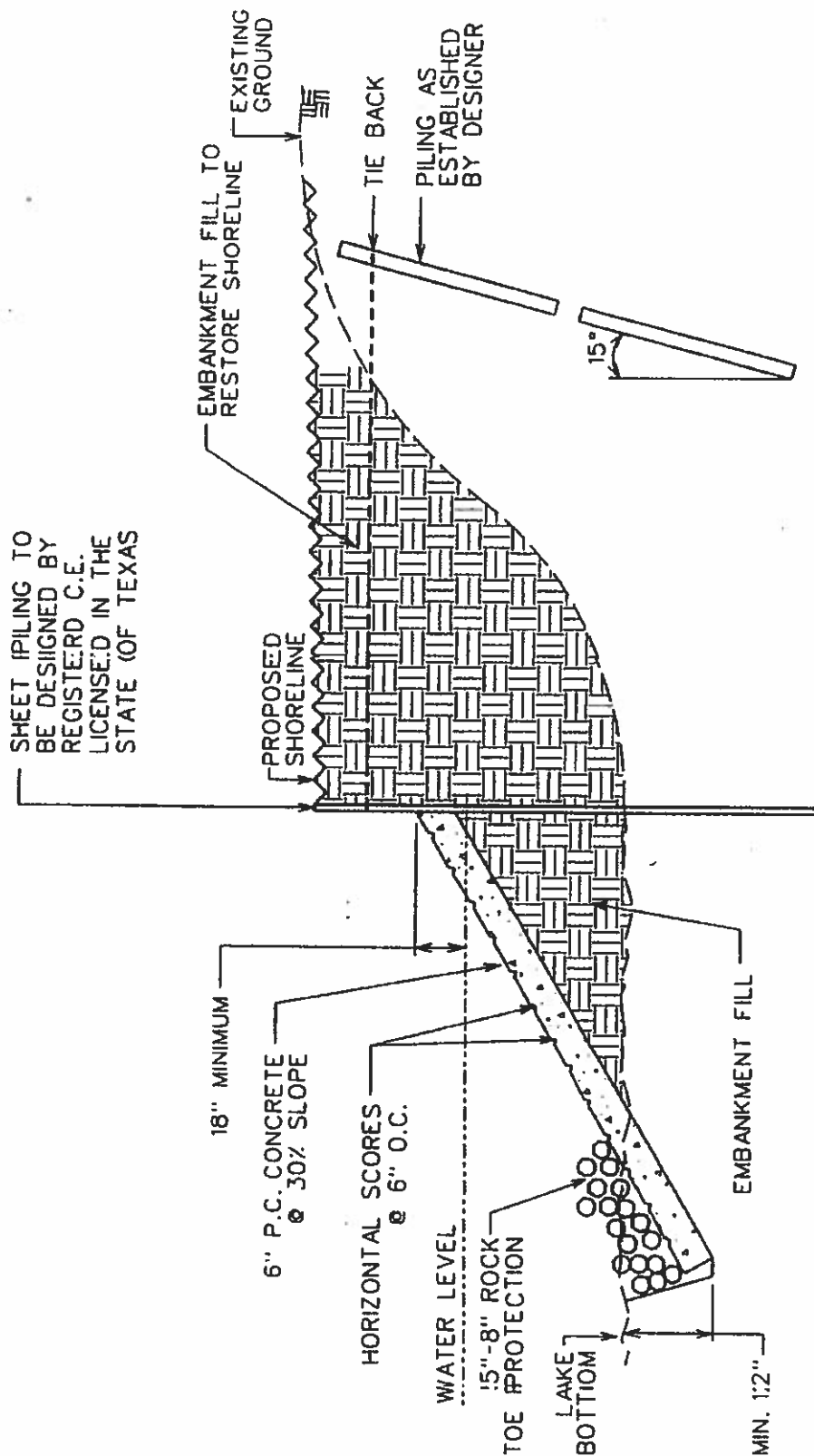


VERTICAL BULKHEADS
with
WAVE ATTENUATION REVETMENTS

WAVE ATTENUATION
OPTIONAL ALTERNATES

City of Austin PARD
December 2, 2005

C2
67



NOTE: For use in lake areas with existing easily erodable and/or soft soil conditions.

CITY OF AUSTIN
DEPARTMENT OF PUBLIC WORKS

RECOVERED SHORELINE
SHEET PILING-ALTERNATE 3-LAKE AUSTIN

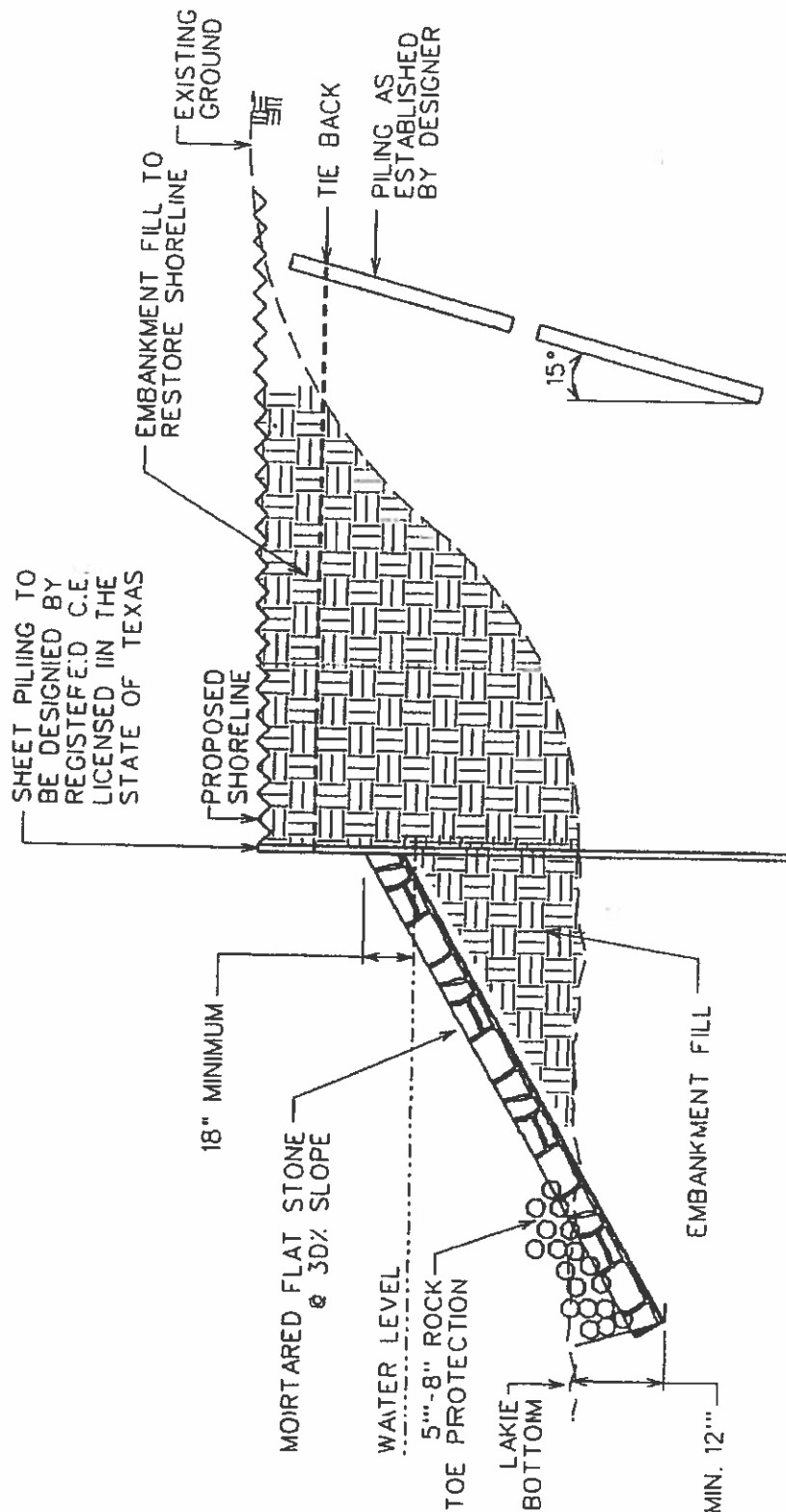
THE ARCHITECT/ENGINEER ASSUMES
RESPONSIBILITY FOR APPROPRIATE USE
OF THIS STANDARD.

DETAIL NO.

4-C

ADOPTED

C2
68



NOTE: For use in areas of the lake with existing easily erodable and/or soft soil conditions.

CITY OF AUSTIN DEPARTMENT OF PUBLIC WORKS	RECOVERED/STABILIZED SHORELINE SHEET PILING-ALTERNATE 4-LAKE AUSTIN	
ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.	DETAIL NO. 4-D

C2
69

2005 Stakeholder recommendations: Sam Crowther (LAAP) and John McIntyre

C2
/10

LCRA LAKE AUSTIN ADVISORY PANEL

October 16, 2005

The City of Austin Parks and Recreation Board

Attn: Mr. Clint Small, Navigation Committee 4209 Prickly Pear 78731

Mr. Randy Scott, Parks and Recreation Department, 200 S. Lamar 78704

The Lake Austin Advisory Panel (LAAP) is a group of people selected by LCRA to review issues and make recommendations relating to issues on Lake Austin. The current LAAP consists of about 18 people who live or may live on Lake Austin, have a business on the Lake

or have other reasons to be interested in the Lake. Information about LCRA River and Lake Panels is referenced at the end of this letter.

C2
71

On February 1, 2005, Mr. Rusty Signor and several landowners and developers met with the LCRA Lake Austin Advisory Panel (LAAP) on February 1, 2005 and presented their concerns about the delay in approval by the City of Austin on many applications for bulkhead construction on Lake Austin. The Panel was asked to look into the matter. At the Panel's request, Mr. Clint Small of the City Park and Recreation Board Navigation Committee and Mr. Randy Scott met with the Panel on March 8, 2005 and presented the City procedures and goals. Randy Scott had previously shared with the Panel that the City has been trying to develop bulkhead standards. Based on documents and letters presented by Mr. Signor and prior discussions by the Panel with Randy Scott, the Panel has understood that the purpose of a good bulkhead is to both reduce shoreline erosion and minimize wave return.

The Panel decided to develop an independent understanding of what type of bank protection would be effective in reducing erosion and minimizing wave return. Because most of the Panel had little or no expertise in this area, we arranged wave testing on Lake Austin in order to obtain direct observable knowledge of the effect and behavior of waves on various banks, bulkheads and shorelines. In two separate tests conducted August 22, 2005 and September 8, 2005, large waves were thrown by a wake board boat at 22 selected banks/bulkheads having widely different characteristics. Each test was also observed by representatives from the City of Austin and Signor Enterprises, Inc. Panelists were in other "observation" boats near the test bank. All observers were asked to observe, evaluate and record how each type of bank handled the waves. The sizes of the direct and reflected waves were measured on three consecutive passes of the wake board boat on each of the 22 banks. Other observations were recorded. The detailed test data and accumulated notes and interpretations are included in the attached Excel and Word files.

Based on testing and our many discussions, the LAAP recommends that the City issue a set of desirable bulkhead features rather than specifying only a few specific designs or standards for bulkheads and specifying materials of construction. Simple observation of wave action on existing lake banks and bulkheads clearly demonstrates many bank and bulkhead features that are effective in minimizing both bank erosion and wave return. However, the best solution largely depends on the characteristics of a particular bank. Some of the bank characteristics include:

- Water depth at proposed bulkhead location

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- Existence of a beach at the shoreline
- Slope of the bank near the shoreline
- Shape of the shoreline in plan view
- Existing shoreline protection from natural rocks and vegetation
- Location of bank on the river (inside or outside of a bend for example)
- Compatibility of proposed bulkhead with adjacent shorelines

For purposes of our inquiry, LAAP considers a shallow beach as a gently sloping bank that is not more than 2 feet deep 15 feet from the shoreline and preferably not more than 4 feet deep 30 feet from the shoreline. Some beaches on the lake are 4 feet deep or less 100 feet or more from the shoreline! A shallow beach type bank will deplete a large wave of most of its energy before it reaches the shoreline and very little shoreline protection is needed. If not shallow, the bank is regarded as a steep or deep bank where much of the wave's energy is still available to do damage to the shoreline upon impact. For the deep type bank, additional protection is needed as described below.

Because there are so many different types of banks and shorelines on the lake, a wide variety of bank protection options is needed. Innovation, if not competition for the best solutions, should be encouraged by the City. In developing proposed bulkheads or other solutions to bank erosion, LAAP recommends that the City approve bulkhead construction proposals that appropriately incorporate several of the following features:

1. For steep banks: Bulkhead with several feet of shoreline or bulkhead stagger back and forth in plan view (looking from above). Materials options should include wood, concrete, stacked rock or stone, rock gabions, rip-rap, etc. Any extended stagger out from the existing shoreline should not exceed 5 feet. Stagger divides incoming waves, turns the wavelets crashing against each other to spend their energy, and minimizes wave return.
2. For steep banks with vertical straight, flat bulkheads: One or more horizontal wave interrupters mounted a foot or less above normal water level and a foot or more below normal water level and protruding out 2" to 6".
3. For steep banks with vertical or sloped bulkheads: Vertical wave interrupters that protrude out several inches and are mounted vertically every 10 feet or less along the bulkhead. LAAP suggests these be approved on a trial basis to determine effectiveness, size and spacing.

C2
73

4. For steep banks: Bulkhead base that is 6 feet or more below normal water level. A somewhat shallower base would be acceptable if there are one or more horizontal wave interrupters a foot or more below the normal water level to break up the plunging wave component. It may be beneficial to locate one interrupter just a few inches above the intersection of the existing lake bottom and the bulkhead face to help turn the wave out and minimize toe-under erosion of the bulkhead.
5. For steep banks: Bulkhead height of 3 feet or more above the normal water level to minimize splash over.
6. For steep, stabilized rock and tree banks on the outside curves of most river bends where no noticeable erosion has occurred over many years, no additional bulkhead requirement should be required. These wave eating banks already have the necessary features listed in this letter.
7. For shallow beach banks: Bulkheads of cypress trees with staggered rock, stone, or rip-rap between and around trees to protect exposed soft bank.
8. For shallow banks: Shoreline protection with thick natural vegetation or a small bulkhead of any material (metal, wood, concrete, stacked rock or stone, rock gabions, rip-rap, etc.).
9. For any bank: Sloped or stepped bulkheads of any material. (Sloped or stepped back into the bank)
10. For any bank protected by a vertical, sloped, or stepped bulkhead of any material: A 1" to 3" protruding cap on top or other protrusion at the top and all the way across the bulkhead to prevent splash over.

General Items:

1. Place fabric filter behind and below all wood, rock, stone, and rip-rap bulkheads.
2. Install deadman retainers back into the bank behind vertical bulkheads and tie the retainers to the bulkhead.

- C2
74
3. Encourage the planting of cypress trees along the bank at the shoreline. Cypress trees can easily be seen as providing the very best root system to protect shorelines. However, honor requests by owners who may not want any trees at their shorelines.
 4. Encourage all property owners along any river or lake who have trees at or near the shoreline to keep grape vines from growing up into the trees. The grape leaves will shade the tree leaves and eventually damage the tree. This is especially important for cypress trees which have the very best root systems to protect the bank.

This letter amends and expands a previous letter dated March 18, 2004 to Mr. Randy Scott in which the LAAP recommended disapproval of vertical, flat bulkheads having no potential to minimize wave return. That recommendation still stands unless several features for vertical bulkheads are incorporated as described above.

Thank you for your consideration of these recommendations. Please let me know if you need further information or other LAAP actions.

Sincerely,

[ORIGINAL SIGNED AND MAILED TO THE CITY OF AUSTIN]

Sam Crowther, P. E., Chair (512 263 5180, samcrowther7@earthlink.net)

Cc: LCRA Stan Casey, LAAP Public Affairs, P.O. Box 220, Austin, Texas 78767-0220

Rusty Signor, Signor Enterprises

C2
15

McIntyre & McIntyre

INCORPORATED
Consulting Architects and Engineers
9807 Brandywine Circle * Austin, Texas 78750

Claire B. McIntyre, AIA, CCS
John F. McIntyre, P.E.

Tel : 512.219.9200
Fax : 512.219.9399

October 20, 2005

Signor Enterprises
11912 Hamilton Pool Road
Austin, Texas 78738
Attn : Rusty Signor

Re: Lake Austin Bulkhead Designs

Subject: Design considerations for wave abatement

It is the intent of this letter to summarize various wave abatement features and configurations that can be incorporated into the design of shoreline bulkheads to minimize wave return and reduce wave action as required by the City of Austin Development Code, Chapter 25-2-1174. While not all of these can be incorporated into any single design and existing shoreline configurations will preclude the use of some items, incorporating several of the features and/or configurations into the bulkhead design and construction will greatly reduce reflected waves and thus wave action on the lake.

1. Install serpentine, curved, saw tooth, trapezoidal or other irregularly shaped walls (in plan view) with irregularities at least every 20 feet along the wall
2. Install layered and raked-back (away from water) rock assemblies
3. Installation of rock gabions
4. Installation of construction approach rip rap at toe of bulkhead
5. Install base of bulkhead at least three feet below lake bottom (mudline) to prevent under scour
6. Construct bulkhead cap with minimum 3" horizontal projection on water side of wall
7. Install minimum 6"x6" horizontal waler at or slightly above waterline
8. Use corrugated sheet piling with at least a 7" profile
9. Install bulkhead with a 15 degree (from vertical) slope away from water
10. Install bulkhead with at least 24" freeboard above normal water level
11. Install filter fabric behind bulkhead assembly
12. Install tie back anchor system to top end of bulkhead
13. Plant trees (e.g. cypress) at 10 feet centers along the shoreline
14. Existing shore has established trees sufficiently close to exhibit erosion protection
15. Existing shoreline has less than 3:1 (horizontal: vertical) slope at least 15 feet into lake from shoreline
16. Existing shore has sufficiently large rocks that demonstrate wave abatement
17. Existing shoreline has existing underwater vegetation that demonstrates wave abatement

C2
76

18. Construct bulkhead assembly with piling on lake side of structure
19. Construct recesses at least 10 feet wide and 3 feet recessed into shoreline at least 100 feet on center along the length of the bulkhead wall.
20. Install docks recessed into existing shoreline
21. Install groin walls at edges of boat docks
22. Install groin walls perpendicular to shoreline at regular intervals
23. Install soil breakwater projections along lake bottom at deeper shorelines to a point not closer than 3-1/2 feet from upper water surface
24. Install perforated or slotted breakwater at least 1/2 average wavelength in width (about 6' minimum)

According to Chapter 25-2-1174 of the City of Austin Development code: "... A retaining wall, bulkhead, or other erosion protection device must be constructed of stacked stone, natural rock rip-rap, concrete, steel pilings or wallings, or aluminum. A smooth vertical surface is not permitted on the main body of a lake. The surface of a wall or bulkhead constructed on the main body of a lake must be designed to minimize wave return and reduce wave action."

If several of the above features and configurations are incorporated into the design of a shoreline bulkhead, the required criteria will be met. Incorporating several features. Recent testing on Lake Austin has indicated that factors other than bulkhead wall itself will have a much larger effect on wave action than the construction itself, ...

Shoreline definitions

If you have additional questions or require further information, please do not hesitate to contact me at the above address.

Sincerely,

McIntyre & McIntyre, Inc.
By John F. McIntyre, P.E. / Tx. Reg. # 52646
C:\mmt\2005work\250xx-01

Response to stakeholder questions from August 17, 2010 Codes and Ordinances in addition to previous board presentation and subcommittee meetings

C2
77

Questions/comments from stakeholders from the August 17th 2010 Codes and Ordinance Subcommittee:

C2
18

Bruce Aupperle:

- What Lake Austin water quality data was used on initiate these changes?

Response (Clamann): Initiation of changes to the code were not based on water quality data. Observations of degraded riparian habitat associated with vertical bulkheads prompted City of Austin Surface Water Team members to investigate the effects of bulkheads on the environment. A review of existing code language and existing conditions on Lake Austin revealed that current development practices were not consistent with existing code language. In addition, a literature review of bank stabilization methods supported the assertion that vertical bank stabilization does not provide adequate wave abatement and is nationally recognized to have undesirable negative consequences on water quality and aquatic integrity. Current data is consistent; a draft report by the LCRA does indicate that some parameters are showing decreasing water quality, and preliminary City of Austin biological sampling indicates lower diversity of shoreline benthic organisms compared to Lake Lady Bird.

- Why is the City prohibiting boat ramps?

Response (Clamann): It is current PARD policy to reject requests for new boat ramps. There are currently four public boat ramps distributed along Lake Austin to provide entrance/egress. Unlimited access via private boat ramps is not desirable for the future growth and increasing intensity of recreational use of Lake Austin.

Phil Moncada:

- All of the resource/guidance/examples are from northern states.

Response (Clamann): Resource material, recommendations and guidance has been gathered from southern states (Georgia DNR, North Carolina Coastal Federation, and Texas GLO) as well as federal authorities. Regardless, erosion, wave action, and shoreline protection are ubiquitous.

Rusty Signor:

- Rip-rap will prohibit access by people and boats from the bank.

Response (Clamann): Rip-rap is not a required method. Pedestrian access can be achieved through stairs, docks, piers and beaches etc. The 2005 recommendations from former LAAP president Sam Crowther discouraged access to boats from bulkheads for safety reasons.

- The proposed strategies are too expensive.

Response (Clamann): Resource guidance and comparisons of shoreline stabilization methods from different regional authorities indicate that hard-armored bulkheads and walls are among the most expensive methods^{1,2,3}. This guidance indicates that Bioengineered, Hybrid, and Biotechnical methods are as expensive, or less expensive than walls. In-house knowledge of streambank restoration is consistent with the observation that hard-armored walls is more expensive than rip-rap, and rip-rap is more expensive than soft-armoring.

C2/79

- The City should use the previous work done by the Friends of Lake Austin and the LCRA LAAP Lake Austin Advisory Panel in 2005

Response (Clamann): These reports were reviewed and utilized during the development of code and criteria. Several of the LAAP recommendations are consistent with the proposed code and criteria draft.

- The onus of the shoreline protection should not be put on the landowners, but rather on the boaters that create big wakes. Fatsacks, plows, wake boarding and surfing cause the problem

Response (Clamann): It is logistically difficult to both determine the proportionate responsibility for individuals contributing to erosion of the shoreline, and to separate the contribution from natural and non-natural erosion forces. In addition, vertical bulkheads have been constructed on Lake Austin independent of exposure to large wakes both historically and currently. Identifying appropriate methods of shoreline development is instrumental in supporting the future biological and physical integrity of our aquatic resources.

- Land reclamation should be allowed by using the locations of old submerged walls, trees out in the water, historic aerial photos, and adjacent properties.

Response (Clamann): The prohibition of land capture (including land reclamation) is consistent with the LCRA Dredge and Fill Standards for the Highland Lakes. Methods of determining where and when shorelines have been located historically are imprecise and open to subjective interpretation.

John McIntyre:

- Landowners with long, shallow areas in front of their shoreline should be exempt because shallow areas reduce wave and wave return.

Response (Clamann): Although shallow areas reduce incoming wave energy, the literature shows that installation of a vertical wall can erode the soft lake bottom over time. Therefore, areas that are currently shallow may not remain so in the future. In addition, areas with reduced wave action offer excellent opportunities for more inexpensive bioengineering or soft armor approaches that maintain the natural character and integrity.

- The City should use the previous work in 2005 by McIntyre & McIntyre - 24 wave mitigating design recommendations

Response (Clamann): ERM reviewed this document early in the process and the proposed code and criteria supports several of the recommendations. However, some of the 24 design strategies were not supported by resources found in the literature review and were not employed.

C2
80

**Addition stakeholder questions and comments from
previous board, subcommittee, and stakeholder input:**

- Hydrilla and milfoil provide plenty of wildlife habitat and water quality benefits, why does the city want more plants on the shoreline? (Bruce Aupperle)
Response (Clamann): City initiatives to reduce hydrilla are consistent with the promotion of native plants to replace and compete with nuisance species.
- Are stairs on slopes preferred over trams? (Bruce Aupperle)
Response (Clamann): There are no preferences in the proposed code or criteria
- Why 45 degrees? Is a 45 degree slope required? (Clint Small)
Response (Clamann): Current code prohibits “smooth, vertical bulkheads.” Stakeholders requested clarification of the term “vertical.” A 45 degree angle was determined to be the threshold of a vertical vs non-vertical bulkhead. Slopes less than 45 degrees are compliant. The ECM provides guidance on the recommended maximum slope based on materials and expected wave height.
- Will the winter drawdown on Lake Austin just kill the plants that the City is requiring? (Phil Moncada)
Response (Clamann): No, recommended plants in the ECM are adapted to fluctuating water levels
- The City formerly promoted the burlap bottom-barriers to inhibit hydrilla growth, isn't that contradictory to promote shoreline vegetation? (Sam Crowther)
Response (Clamann): There is no code language or criteria regarding bottom-barriers for Hydrilla control. Although the City Hydrilla webpage formerly provided some guidance on the do's and don'ts of bottom-barriers they have not been found to be reliably effective and are no longer recommended.
- Will the bulkhead/shoreline stabilization require trees to be cut down?
Response (Clamann): No. The non-vertical approach does not require cut of existing soil and can be designed to avoid or incorporate trees.
- This is just another layer of rules infringing on personal property rights initiated at the city level, not citizen level. (former Friends of Lake Austin rep)
Response (Clamann): This is a revision to an existing rule to clarify requirements based on inconsistencies in interpretation
- City Staff never contacted Friends of Lake Austin (Clint Small)
Response (Clamann): As requested by Clint Small, Andrew Clamann attempted to contact Eric Moreland both by email and phone message, however no response was provided.
- Most waves strike the shoreline at 30 to 15 degree angles from passing boats (John McIntyre)
Response (Clamann): Waves approach the shoreline at all angles, therefore shoreline protection must be designed accordingly.
- Corrugated sheet pile reduces wave return (John McIntyre)

C2
81

Response (Clamann): A review of reports, federal, regional, state and local resources and recommendations did not provide any literature that supports for this assertion. In addition, qualitative observations by Staff of wave interactions with corrugated sheet pile on Lake Austin did not provide compelling results.

- Vertical bulkheads should be allowed in backwater sloughs (Clint Small)

Response (Clamann): Backwater sloughs have reduced wake intensity are more suited to less expensive and less environmentally disruptive shoreline stabilization methods. In addition, they are ecologically important areas for aquatic and riparian life.

- Some existing structures are unsafe, so the City should provide site plan exemptions for pilings/remodel/redecking (Rusty Signor)

Response (Clamann): The proposed code provides site plan exemptions for all decking and some activities for compliant docks and bulkheads.

- The Friends of Lake Austin and LCRA Lake Austin Advisory Panel studied this in 2005 and the City Public Works department provided PARD with proposed wave abating strategies (Jeff Walker)

Response (Clamann): The proposed wave abating strategies provided by PW were not incorporated into the criteria or standards, nor do they appear to have been widely used. The proposed ECM uses similar recommendations as those provided in 2005.

- Shoreline stabilization off the main body of the Lake should be required to use structural, engineered stabilization due to voids and soft spots under the bed and alluvial banks (Signor)

Response (Clamann): Current code requires a PE seal for alteration or improvement of a bed or bank of a waterway to certify that the hydraulic and structural design is adequate (LDC 25-7-62). In addition, the proposed ECM section recommends consultation with an engineer to determine the most appropriate stabilization strategy.

- Some landowners can't install huge boulders or bring in large rock from land (Clint Small)

Response (Clamann): Proposed code and criteria provide options and therefore do not require these specific materials.

- Rip rap slopes on the shoreline might trap trash and attract snakes (Phil Mondaca)

Response (Clamann): According to the Park Ground Supervisor of Emma Long Park, debris washes up along all types of shorelines at Emma Long, whether it is composed of rip rap, roots, grass or the sandy beach. Snakes are observed on any stable shoreline substrate above wave action, including boat docks and bulkheads. Regardless, rip-rap is not a required material.

- An exemption to the non-vertical rule should be allowed under docks (Bruce Aupperle)

Response (Clamann): The non-vertical rule applies to the wave action zone of the shoreline. It is unclear why a dock design cannot accommodate a 45 degree shoreline.

- Horizontal wave breakers (2x4 or similar fastened to bulkhead) reduce wave return (Sam Crowther)

Response (Clamann): A review of reports, federal, regional, state and local resources and recommendations did not provide any literature that supports for this assertion. In

C2
82

addition, qualitative observations by Staff of wave interactions with corrugated sheet pile on Lake Austin did not provide compelling results.

- The City should provide a list of criteria instead of specifications (Sam Crowther)
Response (Clamann): The proposed ECM section provides a list of criteria, no specs.
- Bulkhead slopes in narrow channels will prohibit boat traffic (Bruce Aupperle)
Response (Clamann): The code exempts narrow, man-made canals that are less than 50ft in width from the non-vertical requirement
- The new City requirements will cause applicants to exceed the fill material threshold for USACE Bank Stabilization permit. (Phil Moncada)
Response (Clamann): It is not anticipated that the code and criteria changes will require any applicant to exceed the Nationwide Permit requirements.
- Under the proposed code change for bulkheads, the no capture or recapture of land requirement in Section 25-52-1174 (C) requires that the shoreline be maintained at its existing location or be pushed back onto land to meet the 45-degree or flatter shoreline slopes requirement. This then requires that the existing bank be cut to meet the required bank slope. If the shoreline is pushed onto the land, the Water Quality Zone and building setback line are pushed concurrently landward, which in turn diminishes the use of the residential lot and could possibly turn a complying use into a non-complying use. Shoreline trees in the bank cut area will be impacted. Under the new tree ordinances, permission to impact those trees may not be given. Is this a setup for a standoff or "Catch-22"? (Bruce Aupperle)
Response (Clamann): No, the proposed code amendments will maintain the shoreline at the existing location; it does not require an existing bank to be cut. The 45-degree slope requirement is not for existing land, but strictly for the bulkhead itself which is placed to protect the shoreline. The bulkhead or revetment can be placed in front of the existing shoreline in a manner that does not capture land with backfill. Structures such as boat docks, piers, bulkheads and revetments are not the capture of land; they are structures which protect the land.
The purpose of this requirement is to ensure that applicants do not add backfill to extend their developable land into the lake beyond the shoreline and to promote consistency with LCRA Dredge and Fill Standards specifically which expressly states "No capture of land".
- Relative to shoreline access, what portion of the Lake Austin shoreline is not zoned LA or P and would be eligible to utilize a lift, tram, incline elevator or escalator for shoreline access? (Bruce Aupperle)
Response (Clamann): Based on GIS data, the majority of Lake Austin is zoned LA and P. A rough estimate indicates that approximately 2/3rd of the shoreline is currently zoned LA and P cumulatively.
- There are many reasons to provide code clarifications for commercial marinas, residential clustered docks and lake safety. Why was this not addressed? (Bruce Aupperle)

Response (Clamann): Our endeavor was to address the topics that were requested in the Parks Board, Environmental Board and Planning Commission, which included

C2
83

shoreline modifications and trams. Early discussions included several suggestions for additional clarification to other items such as but the Parks representative and Law Department determined that it was not within the scope of the resolution passed by Parks and Environmental Board.

- Can the City prohibit lakeside property owners use of their lake shoreline by denying them access? (Bruce Aupperle)

Response (Clamann): These code amendments do not deny access, it merely provides guidelines for the manner of access that is in the public interest, environmental protection and maintenance of water quality.

- Does the City have any obligation to stop ongoing shoreline erosion? (Bruce Aupperle)
Response (Clamann): This proposed amendment provides guidelines for methods of shoreline protection as requested by Parks Board, Environmental Board and Planning Commission. It is the City's policy to protect water quality and this amendment furthers that policy.

- What is the definition of "revetment"? (Bruce Aupperle)

Response (Clamann): According to the existing language in the Environmental Criteria Manual; Revetment - Facing of stone or other materials, either permanent or temporary, placed along the edge of a stream or shoreline to stabilize the bank and to protect it from the erosive action of water.

Literature Cited

¹Northwest Regional Planning Commission. 2004. The Shoreline Stabilization Handbook for Lake Champlain and Other Inland Lakes. NOAA Lake Champlain Sea Grant Publication LCSG-04-03 <http://nsgd.gso.uri.edu/lcsg/lcsg04001.pdf>

²City of Seattle, Washington. 2008. Green shorelines: Bulkhead alternatives for a healthier Lake Washington. City of Seattle. Department of Planning and Development. http://www.cityofseattle.net/dpd/static/Green_Shorelines_Final_LatestReleased_DPDS015777.pdf

³Luscher, Audra and Carol Hollingsworth. 2005. Shore Erosion Control - The Natural Approach. Maryland Resource Conservation and Development, USDA Natural Conservation Resource Service, National Oceanic and Atmospheric Association.