



Urban Drainage and Flood Control District

Maintenance Eligibility Program Guidelines For Flood Control Facilities Constructed By Others April, 2012

Introduction

The Urban Drainage and Flood Control District's (District) policy with regard to the eligibility for District maintenance assistance of flood control facilities constructed by, or approved for construction by, local public bodies is as follows (Board Resolution No. 26, Series of 1983):

1. The design of the facility must be in accordance with the "Urban Storm Drainage Criteria Manual" (USDCM).
2. The design of the facility must be approved by the District.
3. A certification acceptable to the District must be provided which certifies that construction of the completed facility has been accomplished in accordance with the approved design.
4. Satisfactory maintenance access and public access easements or rights-of-way must be provided in order to adequately maintain the facility.

All document references are available on the District's website, www.udfcd.org.

When Approval of Design is Required

Any flood control facility constructed by, or approved for construction by, a local public body after March 1, 1980, must be approved by the District to be eligible for District maintenance assistance (Board Resolution No. 67, Series of 1979). District funded projects do not follow this process as they are automatically eligible for District maintenance assistance.

Flood control facilities generally include components of the major drainage system. Major drainage, for the purposes of the Maintenance Eligibility Program, is defined as the system that collects, detains and conveys storm runoff for tributary basins exceeding 130 acres. Major drainage designation may also be considered for elements of a District sponsored drainageway master plan or outfall systems plan.

Approval Procedure

Local public bodies have the responsibility to submit to the District designs for proposed flood control facilities to be constructed by, or approved for construction by, the local public body. We accept submittals in the following order of preference:

1. Digital, many communities have migrated to digital platforms,
2. Half-sized in 11 x 17 format, and
3. Full size prints.

It is advisable, and highly recommended, that preliminary and final drainage studies be submitted to the District for review and comment prior to beginning final design. Early coordination with various federal, state, regional, and local permit programs is essential to the success of any design proposal. Apparent conflicts between permit requirements and District guidelines should be resolved as soon as possible in order to provide an acceptable solution. Additional permit programs include, but are not limited to:

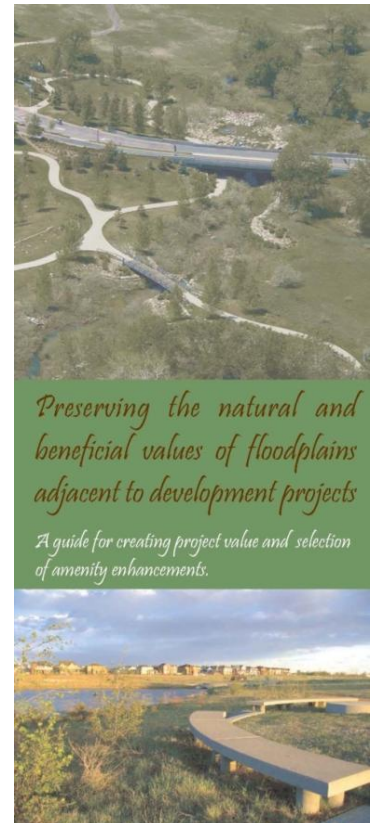
1. Department of the Army's Section 404 permit;
2. Local government stormwater BMP requirements;
3. State / local government construction erosion control requirements;
4. Local government floodplain development permit; and
5. FEMA conditional and final Letter of Map Revision process.

Local public bodies must submit written requests to the District for review of drainage studies and final designs. The District will not review drainage studies or final designs submitted by anyone other than the appropriate local public body. District staff will be available for consultation regarding design concepts and procedures.

The Floodplain Management Program has prepared a brochure describing how an approach that includes floodplain and riparian habitat preservation can be used to enhance a development project and increase profitability. Early integration of these ideals will add value to the proposed development and hasten the entitlement and approval process. The brochure is available at

http://www.udfcd.org/downloads/pdf/other/good_examples_brochure.pdf .

As an aid to the design review, construction certification and final acceptance process, submitted final designs and engineering studies should conform to generally accepted standard of care. This means plans should:



1. Be prepared in a professional, organized and coordinated manner.
2. Include hydrologic and hydraulic data on plan, profile and section views:
 - a. Plans should include the proposed 100-year floodplain;
 - b. Profiles should be stationed in an upstream direction and coordinated with District studies;
 - c. Profiles should include the hydraulic grade line and design discharge;
 - d. Closed conduit profiles should also include the energy grade line, exit velocity and Froude Number; and
 - e. Sections should include design discharge, n value, normal depth, water surface elevation and velocity.
3. Include hydrologic routing data on regional detention basin plans:
 - a. Tributary watershed area;
 - b. Stage/volume (or stage/area) and stage/discharge data presented in tabular or graphical form;
 - c. Required storage volume for critical events such as 100-year and water quality;
 - d. Critical water surface elevations in plan and profile views; and
 - e. Peak inflow and outflow for critical events.
4. Include enlarged details for all hydraulic features (outfalls, drop structures, etc.) including plan, profile and cross-section views (drawn at 1" = 20' minimum with existing and proposed contours).
5. Engineering studies should present detailed findings, as opposed to simply directing the reader to the appendix. Technical backup data should be indexed and tabbed in order to facilitate review.
6. The design consultant is responsible for quality control review prior to submittal.

District staff will review submitted drainage studies and construction documents for the following:

1. Conformance with the USDCM;
2. Provision of adequate maintenance access;
3. Compatibility with existing District master plans;
4. Preservation of the natural and beneficial functions (NBF) of the floodplain resource;
5. Availability of adequate public right-of-way;
6. Compliance with local floodplain regulations; and
7. Good floodplain management practice (minimize future flood risk).

Items 4 and 7 above are from the District's Good Neighbor Policy, adopted by the Board on February 1, 2011 (Resolution No. 8, Series of 2011). The District has long expressed preference for floodplain preservation (non-structural) over channelized (structural) approaches. The Floodplain Preservation Brochure discussed above provides guidance and examples. Channelization is a single purpose approach that limits multi-use opportunities and degrades stream corridors. Structural approaches are also more costly to maintain and replace. Thus, the District has a strong preference for proposals that maximize the NBF and the floodplain resource.

Any deficiencies with respect to the foregoing in the drainage studies or construction documents will be identified in a letter to the referring agency. The deficiencies must be corrected and revised documents submitted for review and approval. District review is limited in scope with respect to technical backup and hydrology / hydraulic models. The design consultant is responsible for the quality and completeness of submittals. Final submittals must be sealed by a Colorado registered professional engineer qualified in this area of practice.

In some cases, development must fit within the built environment (retrofit as opposed to new development). Should the project proponent not be able to meet District criteria, it must be demonstrated that the deficiency is unavoidable, minimized and mitigated.

Acceptable drainage studies will be approved by letter to the referring agency. Acceptable final designs (construction plans and specifications) will be approved by an "Approval of Design" memorandum (Attachment 1). Design approval will expire if construction does not begin within two years.

Certification Procedure

The flood control facility must be constructed in substantial conformance with the District approved design before it will be deemed eligible for District maintenance assistance. The following procedure will be utilized to assure satisfactory construction.

The local public body must provide a set of the approved plans and specifications; notify the District of the proposed date of start of construction; and must provide names, addresses and phone numbers of the contractor and owner (developer).

The District will have a representative visit the site from time to time as deemed necessary to observe construction for conformance with the approved final design. All grouted boulder installations must receive a pre-grout sign-off prior to grout placement. Please give 48-hours notice for observation requests. Construction deficiencies will be reported in writing to the local public body, which will be responsible for taking the necessary steps to have the deficiencies corrected. Such visits will not relieve the contractor or owner of the obligation to construct the project in accordance with the approved design. Site visits are also not a substitute for local public body construction observation. It is important that the design consultant maintain a construction phase presence in order to clarify design intent, and verify construction surveys and layout.

Upon completion of the project, representatives from the District, local public body, contractor, design consultant and owner (developer) shall conduct a walk-through inspection of the project and shall prepare a list of deficiencies (punch list). The local public body is responsible for arranging the inspection. When the punch list items have been corrected the owner (developer) or local public body should notify the District, and the District representative will conduct a final inspection. As-built documents will be required consistent with local public body requirements.

If the construction is satisfactory, a memorandum of "Acceptance of Construction of Project for Maintenance Eligibility" (Attachment 2) will be sent to the local public body. This memorandum does not make the project eligible, which is contingent on a successful revegetation effort.

Grass-lined facilities will be eligible for maintenance assistance upon satisfactory completion of seeding in accordance with the REVEGETATION chapter of the USDCM and after an adequate vegetative cover has been established.

A final "Certification of Maintenance Eligibility" memorandum (Attachment 3) will be sent to the local public body after an adequate vegetative cover is established and evidence of maintenance access is in hand. Ongoing permit requirements, such as 404 wetland maintenance, are a project responsibility.

Flood Control Facility Ownership

Legal maintenance access to the flood control facility must be provided to the District according to the following criteria:

1. Ownership of the facility by a public body which has accepted primary maintenance responsibility is preferred.
2. Ownership of the facility by a private entity (such as a homeowners association owning common areas) is acceptable provided that the public body which has accepted primary maintenance responsibility also has a public maintenance access easement which allows it to perform maintenance if the owner does not. Easements crossing individual lots are not acceptable.
3. Public body is defined as a local government (city or county), special district (such as a park district) or a metropolitan district which has a service plan that includes drainage facilities as a service which it can provide, and which also has a reliable funding source to fund long term maintenance activities.

Open Floodplain Design (Natural Channels/Floodplain Preservation)

When a developer chooses to stay out of the 100-year floodplain, the following requirements must be met:

1. If the total flow of the channel and floodplain is confined to an incised channel and erosion can be expected to endanger adjacent structures, 100-year check structures are required to control erosion and degradation of the channel area. See the HYDRAULIC STRUCTURES chapter of the USDCM for more information. In addition, sufficient right-of-way shall be reserved to construct a grass-lined channel meeting the requirements of the MAJOR DRAINAGEWAY chapter of the USDCM including necessary drop structures and maintenance access.
2. If the floodplain is wide and the low-flow channel represents a small portion of the floodplain area, low-flow check structures are usually required, unless it can be demonstrated that the channel will remain stable as the watershed urbanizes.
3. For either of the above cases, a continuous maintenance access trail must be provided (see trail discussion under Open Channel Guidelines below).



Open Floodplain Design

Open Floodway Design (Natural Channel With Floodplain Encroachment)

Although floodplain preservation is preferable, when the design involves preserving the floodway while filling and building on the fringe area, the developer must meet the "Open Floodplain" design requirements (above), and the fill slopes must be adequately protected against erosion with:

1. Fill slopes of 4H:1V or flatter that are vegetated according to the criteria in the REVEGETATION chapter of the USDCM.
2. Fill slopes protected by rock (not broken concrete or asphalt) riprap meeting the requirements of the MAJOR DRAINAGE chapter of the USDCM.
3. Retaining walls, no taller than 3 feet, with adequate foundation protection. Please check with the local public body on more stringent standards.



Open Floodway Design

Open Channel Guidelines

The design of grass-lined channels must meet the requirements of the MAJOR DRAINAGE chapter of the USDCM.

Levees (certified or uncertified) will not be considered for District maintenance assistance for new development (Board Resolution 10, Series of 2007).

Concrete lined channels will not be considered for District maintenance assistance.

Underdrains as trickle channels will not be considered for District maintenance assistance.

Grouted riprap is not acceptable; please refer to the HYDRAULIC STRUCTURES chapter of the USDCM for grouted boulder guidance.

A continuous maintenance access trail must be provided. Maintenance trails often double as recreation trails and thus should, at a minimum meet District Trail Criteria. Minimum vertical separation between the stream invert (or normal water surface for perennial streams) and the trail grade should not be less than 2 feet. Trail profiles will typically be required in critical areas such as roadway crossings, stream crossings and drop structures. Access trails should connect to public streets by means of a curb ramp. Local government trail criteria may be more stringent.

Grade separation at street crossings may include any of the following conditions in order of preference:

1. Bridges;
2. Single span three-sided concrete arch, three-sided concrete box, or concrete box culverts;
3. Multiple-barrel culverts that maintain the minimum vertical separation between the low flow invert or base flow and trail grade.



Grade separation at a bridge



Grade separation using a single span three-sided concrete box culvert.

In no event shall proposals that include floodwalls (with or without pumped systems) be considered for District maintenance eligibility.

District maintenance assistance is generally limited to the level necessary to maintain the flood carrying capacity of the stream or drainageway. The District encourages multi-use of stream corridors; however the level of maintenance is commensurate with native grass or natural environment.

Grade control check structures should be constructed by driving and capping sheet pile (PZ-22 minimum) or, where soils allow, by filling an excavated trench (12-inch minimum width) with concrete. The District does not endorse open excavations, footings and formed concrete stem walls in the construction of grade control check structures. Cut-off depth should be 10-feet minimum below grade for sheet pile, or 6-feet below grade for concrete; and contain at a minimum, the 2-year flow depth (2-feet minimum depth).



Grade control check structure

Regional Flood Control (Detention) Basin Design

Regional detention basins are very effective for controlling the peak discharge rates in urbanizing watersheds. However these facilities do not control the increased volume of runoff. Therefore, care should be taken in discharging developed, detained flows to unstabilized downstream reaches. The design for a regional detention basin must meet the requirements of the STORAGE chapter of the USDCM and the following criteria:

1. A detention basin will be recognized by the District as a "regional facility" provided it meets the following standards:
 - a. Controls the entire major drainage watershed tributary to the basin;
 - b. Controls at least 130 acres or is part of an overall District master plan; and
 - c. Has a demonstrated beneficial downstream effect, usually greater than 25% reduction in downstream peak discharge.

2. Proposals to replace a master planned regional detention basin with multiple smaller basins must demonstrate that the master planned regional basin is no longer feasible (not just inconvenient) and that short term capital investment and long term maintenance costs of the replacement basins and connecting conveyance facilities will not be significantly higher than those anticipated for the master planned facilities.



Regional detention basin

3. Flood attenuation at existing detention basins may be acknowledged provided the facility meets all the criteria listed above and:
 - a. Is located on property meeting Flood Control Facility Ownership criteria (see above);
 - b. Was originally designated as a flood control facility; and
 - c. Is operated and maintained according to the original intent. This generally means the local public body performs annual inspections and observed deficiencies are corrected.
4. Non-regional detention and/or water quality basins (on-site basins) may not be located on-line with the major drainageway.
5. Trickle or low flow channels may not be required for constructed wetland ponds or water quality retention ponds (see below). It should be noted that, while the District generally provides a reduced level of maintenance of these areas, the District encourages this approach where it is appropriate.
6. District maintenance will be limited to the level required for the facility to function as a detention basin. Maintenance will be limited to the 100-year flood pool and spillway. No formal park level of maintenance will be performed. However, formal park-use of detention facilities will not be discouraged, and in fact will be encouraged.
7. Plan submittals must include a District Maintenance Site Plan (See Guidelines for UDFCD Maintenance Site Plan).

Regional Water Quality Design

Tributary watersheds should range between 130 acres and 640 acres. Designs outside the specified range will require prior consultation with District staff. Operation and maintenance plans are now required for all regional water quality basins and ponds. The following policies apply to these water quality facilities:

1. Extended Detention Basins (EDBs) constructed within the flood pool of larger flood control facilities will be eligible for District maintenance assistance provided they are designed for the entire tributary watershed and designed in accordance with the appropriate sections of Volume 3 of the USDCM.
2. Extended Detention Basins (EDBs) constructed specifically for water quality purposes will be eligible for District maintenance assistance provided they serve a regional purpose, are designed for the entire tributary watershed, and are designed in accordance with the appropriate sections of Volume 3 of the USDCM.
3. Water Quality Retention Ponds (RPs) and Constructed Wetland Ponds (CWPs) (those with a permanent pool), whether constructed within a larger flood control facility or as a primary water quality facility, will be eligible for District maintenance assistance for all hydraulic features (such as outlet works) and removal of sediment above the

normal water surface elevation. District maintenance assistance for sediment removal below the normal water surface will be determined on a case by case basis.

4. Plan submittals must include a District Maintenance Site Plan (See Guidelines for UDFCD Maintenance Site Plan).

Closed Conduits (Storm Sewers & Culverts)

Conduits will generally not be eligible for District maintenance assistance. However, the following criteria can be followed by anyone considering conduits:

1. At this time, because of funding limitations, local storm sewer systems will not be considered for District maintenance assistance. Outlets of local storm sewer systems to eligible major drainageways or regional detention basins will be considered for maintenance eligibility if adequate energy dissipation and erosion protection are provided.
2. Major drainageways placed in conduits by developers (in other words, not a remedial project) will not be considered for District maintenance eligibility.
3. For major drainageways with very steep longitudinal slopes (2.5%) the District will consider, on a case-by-case basis, conduits which are designed for the 100-year discharge and which also have an unobstructed emergency (in case of an obstructed conduit or greater than 100-year event) open space swale (i.e., not a roadway) over the top of the pipe. The swale need not meet District grass-lined channel criteria. Maintenance assistance for closed conduits will require local government matching funds.
4. Roadway crossings at major drainageways frequently double as grade control features, thus the District will review the entrance and exit design for maintenance eligibility. Therefore, all culvert features except the barrel section will be considered for District maintenance eligibility.
5. Eligible portions of closed conduits must meet the applicable criteria in the USDCM as well as the following guidelines:
 - a. Appropriate energy dissipation must be provided at storm sewer outfalls and could include culvert outlet protection, low tailwater basins, rundowns or impact basins.
 - b. Outfalls to existing regional detention basins with concrete trickle channels must include a connecting concrete trickle channel.
 - c. The end treatment at all outfalls and culverts must be concrete. Appropriate end treatments could include flared end sections with joint fasteners (concrete collar if connecting to non-concrete pipe material) and cutoff walls, and head and wing walls. Outfalls less than 18-inches in diameter may use a modified headwall, mitered to channel side slope and energy dissipation appropriate for the peak discharge.
 - d. Roadway culvert energy dissipation could include grouted boulder stilling basins, impact stilling basins, or preformed riprap stilling basin (See Hydraulic Engineering

Circular 14). The low tailwater basin is not appropriate for inline major drainage culverts.

- e. Vertical separation between the outfall invert and the receiving stream invert should be 18- to 30-inches. Drops greater than 30-inches will require a grouted boulder rundown.
- f. Outlets with high velocities and Froude Numbers greater than 2.5 will require impact stilling basins.
- g. Use of trash racks must meet the requirements of the USDCM.

MEMORANDUM

TO:

FROM: Bill DeGroot, Manager, Floodplain Management Program

SUBJECT: Approval of Design

DATE:

The construction plans and specifications for _____ dated _____, are hereby approved. The project will be eligible for District maintenance assistance upon satisfactory construction in accordance with the approved design, as determined by the District. Construction must begin within two years of the date of this memorandum, or the approval will expire. This project may require federal, state or local permits in addition to this design approval.

In order to facilitate observation of the proposed construction we ask that you provide the information requested below on the enclosed copy of this memorandum and return the copy to us with one set of approved construction plans and specifications as soon as possible.

The District will follow the procedure listed below to ascertain the acceptability of the construction effort. Your assistance with this procedure will be necessary in order to qualify the project for District maintenance assistance. The District staff, or consultants retained by the District, will observe the construction.

1. The District and/or its consultant may conduct site visits during project construction as deemed necessary to observe construction for conformance with the approved plans and specifications. All grouted boulder installations must receive a pre-grout sign-off. Construction deficiencies will be reported to your contact who should take the necessary steps to have the deficiencies corrected. Such visits will not relieve the owner (developer) or the contractor of the obligation to construct the project in accordance with the approved design. Site visits are also not a substitute for local public body construction observation. The design consultant should maintain a construction phase presence in order to clarify the design intent, and verify construction surveys and layout. Please provide 48-hour notice for requested site visits.
2. Upon completion of the project, representatives from the District, local public body, contractor, design consultant, and owner (developer) shall conduct a walk-through inspection of the project and shall prepare a list of deficiencies (punch list). You are responsible for arranging the inspection.

3. When the punch list items have been corrected, the local public body should notify the District, and the District representative will inspect the project again. If the project is satisfactory, written notice of acceptance of the facility for maintenance eligibility will be sent to you.
4. Grass-lined facilities will be eligible for maintenance assistance after an adequate vegetative cover has been established.
5. Changes to this approved design can only be made by use of the District's "Notice of Change to Approved Design" form (copy enclosed).

We look forward to working with you on this project.

Bill DeGroot
Manager, Floodplain Management Program

Contact Address Phone

Local Government

Owner (Developer)

Contractor

Date of Start of Construction _____

UD ID _____

WGD/DLM/

Enclosures: Copy of this memo
Sample Notice of Change to Approved Design

NOTICE OF CHANGE TO APPROVED DESIGN



Change No. _____

Date: _____

Design Approval Date: _____

NAME OF PROJECT: _____

Description of Change (attach appropriate drawings, specifications and calculations) made to the Approved Design:

Justification:

Impact of change on function of the facility:

APPROVALS REQUIRED:

OWNER (DEVELOPER)

DESIGN CONSULTANT

LOCAL GOVERNMENT

CONTRACTOR

UDFCD

MEMORANDUM

TO:

FROM: Bill DeGroot
Manager, Floodplain Management Program

SUBJECT: Acceptance of Construction of Project for
Maintenance Eligibility

DATE:

The construction of _____

_____ (Project) at _____

_____ (Location) is accepted for District maintenance assistance. This acceptance is based upon visual inspection of those elements of the project which are visible to the naked eye, and should not be construed as a certification of the structural integrity of any element of the project. A final determination of maintenance eligibility will be made upon establishment of an adequate vegetative cover. It is your responsibility to advise the District in writing when you feel an adequate cover exists; and we will then arrange to inspect it with you or a representative.

Bill DeGroot, P.E.
Manager, Floodplain Management Program

UD ID _____
WGD/DLM/
Enclosure (completion report)
cc: David Bennetts, UDFCD

MEMORANDUM

TO:

FROM: Bill DeGroot, Manager, Floodplain Management Program

SUBJECT: Certification of Maintenance Eligibility

DATE:

The construction of _____
_____ in
Section _____, T_____, R_____, _____ County, Colorado is eligible for District
maintenance assistance. This approval is based upon visual inspection of those elements of the
project which are visible to the naked eye, and should not be construed as a certification of the
structural integrity of any element of the project.

Bill DeGroot, P.E.
Manager, Floodplain Management Program

UD ID _____
WGD/DLM/
cc: David Bennetts