

2. ENGINEERING CRITERIA

2.01 GENERAL

The following regulations and criteria will be utilized by the District in the review of plans, plats, as-builts, or other submittals.

2.01.1 DEFINITIONS

Definition and terms that are not defined below shall be given their ordinary and customary meaning or usage of the trade or will be defined using published, generally accepted dictionaries, together with any rules and statutes of the Agencies that have additional authority over the regulated activities.

“Aquatic plant” or “aquatic vegetation” means a plant, including the roots, which typically floats on water or requires water for its entire structural support, or which will desiccate outside of water. Also see “prohibited aquatic plant” definition.

“As-Built Drawings” means plans that accurately represent the constructed condition of the permitted facility that is certified by a Licensed Professional Surveyor and Mapper, including identifying any substantial deviations from the permitted design.

“Canal” means an artificial ditch utilized for confining surface water to a defined channel, the purpose of which is to receive runoff from adjacent land and to convey flows downstream to another canal, river or natural water body. Canals in this context refer to the primary canals owned and maintained by the SFWMD, the secondary canals maintained by the CBWCD, and canals on private property. . Canals also include those defined in § 403.803(2), F.S.

“Common Area” means real property which is subject to the common ownership of a single party for the benefit of all of the property owners which is responsible for such ownership, unified control, monitoring, operation, and maintenance of the drainage facilities located in the common area.

“Construction commencement” means the actual on-site, continuous and systematic activity of land surface alteration, construction and fabrication of a facility in accordance with a stormwater management works permit authorizing construction of the project in conformance with the terms and conditions of the permit. Minor clearing, dredging, or filling with an apparent purpose of keeping the permit active will not be considered to meet this requirement.

“Detention” means the collection and temporary storage of stormwater in an impoundment in such a manner as to provide for treatment through physical, chemical, and biological processes with subsequent gradual release of the stormwater.

“Discharge” means to allow or cause water to flow.

“Development” means: 1) the division of a plat, tract, parcel or lot of land into two (2) or more parcels that requires platting or re-platting by the municipality having jurisdiction or by Broward County; 2) the meaning given in §380.04, F.S.

“District Canal” or “District Waterway” means the canals, waterways, easements, rights and reservations, rights-of-way, maintenance strips, swales, and all and every work or facility appurtenant or adjacent to or utilized by the Central Broward Water District (the District) in connection with the functioning of its waterways.

“Exotic plant species” means a plant species introduced to Florida, purposefully or accidentally, from a natural range outside of Florida, including naturalized exotic species (an exotic plant that sustains itself outside cultivation) and invasive exotic species (an exotic plant that not only has naturalized, but is expanding on its own in Florida native plant communities). Exotic plant species are defined by the “Florida Exotic Pest Plant Council” (EPPC), and include cattails, melaleuca, Brazilian pepper, Australian pine, laurel fig (ficus) and other nuisance species that are not native to Florida, exhibit rapid growth, out compete native vegetation, and can clog lakes/ponds and canals. Additional information on Florida’s exotic plant species is available at: <http://www.fleppc.org/>.

“Filling” or “fill” means the deposition or to deposit, by any means, of materials in a lake/pond, wetland, canal, or other waterway.

“Licensed Professional” means an engineer, land surveyor and mapper, architect, landscape architect, or geologist licensed by the State of Florida practicing under Chapter 471, 472, 481, or 492, F.S., respectively, and includes any of the following designations: “licensed engineer”; “licensed professional engineer”; “professional engineer”; “registered engineer”; “registered professional engineer”; and similar “licensed...”, “licensed...professional”, “professional...”, “registered...”, or “registered professional...” regarding surveyors, architects, landscape architects, and geologists licensed under Chapter 472, 481, or 492, F.S.

“NAVD 88” means North American Vertical Datum of 1988.

“NGVD 29” means National Geodetic Vertical Datum of 1929.

“Nuisance plant species” means any species of flora or fauna, including exotic plant species, prohibited aquatic plants, and invasive nonnative plants whose noxious characteristics or presence in sufficient number, biomass, or areal extent that prevents, or interferes with, uses or management of resources, and which are native or naturalized in the area where it occurs. See § 369.251, F.S. for a list of invasive nonnative plants:

http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0300-0399/0369/Sections/0369.251.html

“Positive outfall” means discharge via a device or devices designed to convey discharges of stormwater from the applicant’s property across downstream properties and ultimately into a District canal by means of a system consisting of one or a combination of pipes, culverts, canals, swales, or ditches in a concentrated and not diffuse manner.

“Pre-development” means the land use immediately previous to submittal of an application for paving and drainage approval if no District water management works permit was issued for the property, or the land use and storm water management design described in the latest District approved water management works permit for the property.

“Prohibited aquatic plant” means any of the aquatic plants designated by the Florida Department of Agriculture and Consumer Services on the prohibited aquatic plant list in Rule 5B-64.011, F.A.C., or in an emergency order issued under Rule 5B-64.012, F.A.C.

See <https://www.flrules.org/gateway/ruleno.asp?id=5B-64.011>

“Record drawing” means plans certified by a Licensed Professional that accurately represent the constructed condition of an activity, including identifying any substantial deviations from the permitted design that are based on the As-built drawings submitted by the contractor and certified by a Licensed Professional Surveyor and Mapper.

“Retention” means a system designed to prevent the discharge of a given volume of stormwater runoff into surface waters in the state by complete on-site storage. Examples are systems such as excavated or natural depression storage areas, pervious pavement with subgrade, or above ground storage areas.

“Stormwater Management Facility” means a facility that is designed to treat, collect, convey, channel, hold, inhibit, or divert the movement of stormwater runoff on, through, and from a property. Such facilities are utilized to control or manage the path, storage, or rate of release of stormwater runoff. Such facilities may include canals, channels, culverts, inlet or outlet structures, lakes/ponds, retention and detention areas, spillways, storm sewers, swales, or other similar facilities.

“Structural slab-on-ground” means a slab that is cast directly on the ground and is a required part of a load path which transmits vertical or lateral loads to the ground and must conform to applicable structural building codes. Non-structural slabs-on-ground serve only as an architectural wearing surface and are not subject to structural building code requirements and are not subject to the six inches (6”) above berm elevation requirement.

“Substantial Damage” means damage of any origin sustained by a structure (i.e., a building, storm sewer, culvert, or bridge) whereby the cost of restoring the

structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before damage occurred.

“Substantial Improvement” means any repair, reconstruction, rehabilitation, alteration, addition or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. The term does not, however, include any project for improvement of a building required to correct existing health, sanitary or safety code violations identified by the building official having jurisdiction and that is the minimum necessary to assure safe living conditions.

“Swale” means a manmade trench that: (a) Has a top width to depth ratio of the cross-section equal to or greater than 6:1, or side slopes equal to or greater than 3H:1V (horizontal:vertical); (b) Contains contiguous areas of standing or flowing water only following a rainfall event; (c) Is planted with vegetation suitable for soil stabilization, stormwater treatment, and nutrient uptake; (d) is designed to take into account the soil erodibility, soil percolation, slope, slope length, and drainage area so as to prevent erosion and reduce pollutant concentration of any discharge; and (e) has a channel invert no lower than one (1) foot above the water control elevation. The top of bank of the swale must be an observable and distinct break in slope between the toe of slope or swale invert and areas landward of the outer edge of the swale.

“Water Control Elevation” equals elevation: 0.4’ NAVD 88 east of the Turnpike; 1.4’ NAVD 88 south of the C-11 Canal between the Turnpike and Palm Avenue; 1.4’ NAVD 88 north of the C-11 Canal between the Turnpike and the N-17 Canal; 2.4’ NAVD 88 south of the C-11 Canal and west of Palm Avenue; and 2.4’ NAVD 88 north of the C-11 Canal and west of the N-17 Canal. The District’s standard differential between NAVD 88 and NGVD 29 datums for purposes of calculating the water control elevation and elevation references in these regulations is 1.60’ (e.g., 0.0’ NGVD 29 -1.6’ = (-)1.6’ NAVD 88). *[Revised on 9/10/20 to correct scrivener’s error regarding the stated WCE elevations.]*

2.01.2 VERTICAL DATUM

Elevation data in engineering documents and construction drawings submitted to the District shall be based on the NAVD 88 datum. Requests for modifications to permits issued prior to the updated FEMA Flood Insurance Rate Maps that took effect on August 18, 2014 shall include on the paving, drainage and grading drawings the site-specific conversion factor between NGVD 29 and NAVD 88 data for historical record keeping purposes.

2.02 FINISHED FLOOR, 100 YEAR ELEVATIONS

All habitable structures shall be set at or above the higher of:

2.02.1 Federal Emergency Management Act (FEMA) Flood Studies

2.02.2 Broward County 100 Year Flood Studies, latest edition

2.02.3 Eighteen inches (18") above the highest crown of road of the internal traffic circulation element bordering the structure. The traffic circulation element can be a public or private street, or an internal drive aisle. If the roadway is not crowned, or has an inverted crowned section, then the highest edge of pavement ~~cross section~~ nearest bordering the structure shall apply. In subdivision lots, the elevation shall be based on the highest crown of road along each lot frontage.

2.02.4 Stage storage calculations for the 100-year, 3-day rainfall with zero discharge

2.02.5 Florida Building Code in accordance with the American Society of Civil Engineers Standard 24 – Flood Resistant Design and Construction (ASCE 24), latest edition

Nonresidential structures shall be set at or above the higher of Criterion 2.02.1, 2.02.2, and 2.02.4 enumerated herein and six inches (6") above the nearest crown of road of the adjacent roadway, whichever is higher.

Applicants shall verify that structural slabs-on-ground elevations are at least six inches (6") above the proposed berm elevation.

2.03 ROAD FLOOD CRITERIA

All roadways (public and private) and parking lots (public and private) shall have a minimum crown elevation (normal or inverted) set at the higher elevation of:

2.03.1 10-year flood criteria map of Broward County

2.03.2 Peak stage storage calculations for the 10-year, 1-day rainfall

The minimum crown elevation for inverted road sections shall refer to the center of the roadway and the minimum crown elevation for parking lots shall refer to the centerline of each drive aisle.

Rims of drainage structures may be set no more than six inches (6") below the edge of the roadway, parking lot or drive aisle provided the structure is located outside of the limits of the driving surface (e.g., inside a green area adjacent to the driving surface).

2.04 EXCAVATIONS

All lake/pond, wetland, canal, or other waterway excavations shall be in accordance with South Florida Water Management District (SFWMD) Environmental Resource Permit (ERP) rules for Storage Areas unless specified herein.

2.04.1 CRITERIA COMMON TO LAKES/PONDS, WETLANDS, CANALS, OR WATERWAYS

2.04.1.1 All side slopes of excavations shall be stabilized with a suitable vegetative cover to provide stability against erosion in conformance with these criteria.

2.04.1.2 All lake/pond, wetland, canal, or other waterway maintenance areas shall be cleared of all trees and plants and no new trees or plants shall be planted.

2.04.1.3 Nuisance plant species shall not be planted in lakes/ponds, wetlands, canals, waterways, District property, or easements dedicated to the District.

2.04.1.4 The applicant shall provide evidence of site specific geotechnical investigations in a engineering report that documents the type and extent of soils found within areas to be excavated for water quantity or water quality storage purposes (e.g., Unified Soil or AASHTO Soil classification, standard penetration tests, sieve analyses, etc.). Soil borings shall be taken to a minimum depth of five feet (5') below the water control elevation for each ½ acre of storage area or fraction thereof. Deleterious soils shall be removed and filled with permeable material that will allow the stored water to infiltrate into the ground water. Locations of known deleterious soils such as muck layers shall be depicted on the construction drawings along with the appropriate notes requiring removal and disposal.

2.04.1.5 All lakes/ponds, canals or other waterways shall have stabilized maintenance easements that are twenty feet (20') in width, measured from the top of bank. Canal and waterway maintenance easements shall either be sloped up to a continuous 5% slope away from the canal, or up to a 10% slope that creates an inverted section at the midpoint of the access way. In either case, the maintenance way shall be sloped away (i.e., downward) from the top of bank of the canal or waterway to create a ridge along the top of bank.

These twenty feet (20') shall be considered a setback for any buildings, structures, or water bodies and shall be suitable for vehicular traffic. For

the purpose of this paragraph, structure is defined as any installed, or erected object on or in the ground.

2.04.1.6 The top of bank must be an observable and distinct break in slope between the toe of slope and areas landward of the lake/pond, wetland, canal or waterway, including any freeboard, and coincides with the inner edge of the maintenance easement.

2.04.2 CANALS AND WATERWAYS

2.04.2.1 Canal excavation shall have a side slope that provides stability against erosion from the top of bank (minimum elevation equal to 3.4' NAVD88 east of Palm Avenue/SW100th Ave/Nob Hill Road and 4.4' NAVD88 west of Palm Avenue/SW100th Ave/Nob Hill Road three feet (3') below the water control elevation.

2.04.2.2 Canal side slopes shall be no steeper than 4H:1V from top of bank to three feet (3') below the water control elevation. Below this point, side slopes shall be as the material permits, but no steeper than 2H:1V unless a steeper slope can be justified based on supporting engineering and geotechnical information.

2.04.2.3 Canals shall be excavated to provide a minimum of ten feet (10') of depth below the water control elevation, or shallower at the discretion of the District Manager.

2.04.2.4 Existing District canals adjacent to properties applying for a water management works permit or plat approval shall be brought to the design standards of the District, including provision of a 20-foot (20') canal maintenance easement, and removal of all trees, plants, nuisance plant species, and encroachments from canal under the water surface, or on the banks, slopes, or maintenance easements.

2.04.2.5 Canal banks down to the water control elevation and canal maintenance easements shall be sodded.

2.04.3 LAKES/PONDS AND WETLANDS

A surface water body that provides attenuation, floodplain storage or water quality detention or retention storage shall be considered a lake/pond or wetland. All three are referred to as a lake/pond in the following sections.

2.04.3.1 All lake/pond shorelines shall be planted with aquatic vegetation in littoral zones around the entire perimeter of the pond excavation near the water's edge to create an average minimum littoral zone width of twenty feet (20').

2.04.3.2 As an alternative to planting all shorelines, an equivalent area of aquatic vegetation may be concentrated along one or more banks of one or more lakes/ponds, or the center of one or more lakes/ponds as an island or as an anchored floating treatment wetland.

2.04.3.3 Littoral zones shall be planted with aquatic vegetation from no higher than one foot (1') above to no lower than two feet (2') below the water control elevation or as recommended by the applicant's biologist, ecologist, landscape architect or environmental engineer. Exhibit "T" provides a list of suggested species and planting depths. Littoral zones not covered by aquatic plants above the water control elevation shall be seeded to prevent erosion due to bare soil.

2.04.3.4 The area planted shall have hydric soils suitable for wetland plants. A minimum hydric top soil (i.e., muck) depth of 0.5' shall be provided. 2.04.3.5 For shorelines planted with aquatic vegetation, side slopes shall be no steeper than 4H:1V from the top of bank down to the landward edge of the littoral shelf and from the waterward edge of the littoral shelf down to three feet (3') below the water control elevation. Beyond that point, side slopes shall be as the material permits, but no steeper than 2H:1V unless a steeper slope can be justified based on supporting engineering and geotechnical information.

2.04.3.6 The littoral shelf shall be no steeper than 8H:1V. Any combined width of 4H:1V bank and littoral shelf can be used to provide the twenty-foot (20') wide average minimum littoral zone.

2.04.3.7 Aquatic plantings adjacent to residential homes shall not exceed four feet (4') in height for mature plants as measured from the water control elevation.

2.04.3.8 For shorelines not planted with aquatic vegetation, side slopes shall be no steeper than 5H:1V from the top of bank to a depth of three feet (3') below the water control elevation. Beyond that point, side slopes shall be as the material permits, but no steeper than 2H:1V unless a steeper slope can be justified based on supporting engineering and geotechnical information. Grade transitions from 4H:1V to 5:1V banks must be gradual, continuous, and not steeper than 4H:1V. Shorelines shall be sodded or seeded from the top of bank down to the water control elevation.

2.04.3.9 The minimum top of lake/pond bank elevation shall be:

- 2.4' NAVD 88 east of the Turnpike
- 3.4' NAVD 88 south of the C-11 Canal from the Turnpike to Palm Avenue

- 3.4' NAVD 88 north of the C-11 Canal from the Turnpike to the N-17 Canal
- 4.4' NAVD 88 south of the C-11 Canal and west of Palm Avenue
- 4.4' NAVD 88 north of the C-11 Canal and west of the N-17 Canal

2.04.3.10 Lake/pond excavations shall have a minimum depth of ten feet (10') below the water control elevation and a maximum depth as governed by SFWMD Environmental Resource Permit (ERP) Applicant's Handbook Volume II or a bottom elevation of (-) 41.6' NAVD 88, whichever is less.

2.04.3.11 Permanent signs shall be visibly posted adjacent to lake/pond banks planted with aquatic vegetation to prevent removal of aquatic plants or spraying with harmful chemicals. The sign panel must be visible above the expected mature height of aquatic plantings. Exhibit "Y" provides a typical detail for the required signage. At least one (1) sign is required along each planted side of a lake/pond. Additional sign locations and spacing may be required by the District.

2.04.3.12 Restoration or repair of lake/pond and wetland slopes shall require plans, specifications, and supporting documentation submitted to the District Manager for review and approval. The District Manager may require any such plans to be signed and sealed by a Licensed Professional Engineer. Restoration or repair of slopes and banks shall utilize gradual slopes and erosion control products made of natural fibers, and the slopes sodded or seeded. For severe erosion, stabilization shall be accomplished using a combination of geofabrics and hardened materials such as interlocking concrete blocks, rip rap, etc., with appropriate soil stabilization measures.

2.04.3.13 The replacement of existing seawalls, bulkheads, and retaining walls is discouraged. However, if a seawall, bulkhead, or retaining wall is proposed to replace an existing one, the top of such wall shall be constructed no higher than 1 foot above the water control elevation and shall be aesthetically consistent with the established pattern of existing seawalls, bulkheads, and retaining walls within the lake/pond. Plans for seawalls, bulkheads, and retaining walls shall be signed and sealed by a Licensed Professional Engineer in conformance with the structural design criteria of the Florida Building Code, latest edition.

2.04.3.14 Where a conservation easement is in place or proposed to be dedicated to Broward County and/or South Florida Water Management District the twenty-foot (20') Lake Maintenance Easement (LME) may be reduced to a ten-foot (10') LME to allow for foot traffic only. However, the twenty-foot (20') setback to any building shall still apply. In addition, proper easements for maintenance and access shall be provided for any drainage structures or culverts. Lake maintenance easement areas that

are reduced to ten feet (10') adjacent to conservation easements may be planted with appropriate ground cover plants such as sedges and rushes in lieu of sodding.

2.04.3.15 All lakes/ponds shall be provided with a concrete boat ramp from the top of bank to two feet (2') below the water control elevation. The ramp shall be twelve feet (12') in width. A stabilized ingress/egress easement twelve feet (12') in width shall be provided from the nearest roadway or parking lot drive aisle to the ramp. Ramp locations must be designed to allow reasonable turning movements of truck and trailer completely inside the limits of the required ingress/egress or lake maintenance easement. Boat ramps are not required for lakes/ponds that are less than 0.25 acres in area as measured at the water control elevation.

2.04.4 DRY DETENTION OR RETENTION AREAS

2.04.4.1 Dry detention or retention areas shall have a side slope of 4H:1V below the top of bank and shall be excavated no deeper than one foot (1') above the water control elevation. The banks and bottom of dry detention or retention areas shall be sodded or seeded.

2.04.4.2 Walls shall not be allowed within detention or retention areas except for areas abutting perimeter retaining walls which shall be located in accordance with the Alternate Retaining Wall Detail in Exhibit "I". In this case, the outer limit of the drainage, flowage and storage easement shall coincide with the inner face of the retaining wall. Plans for retaining walls shall signed and sealed by a Registered Florida Professional Engineer in conformance with the structural design criteria of the Florida Building Code, latest edition.

2.04.4.3 The required drainage, flowage and storage easement must coincide with the top of bank. The top of bank must be an observable and distinct break in slope between the toe of slope and areas landward of the the outer edge of the detention or retention area, including any freeboard.

2.04.4.4 The applicant shall provide evidence of site specific geotechnical investigations in a geotechnical engineering report that documents (e.g., Unified Soil or AASHTO Soil classification, standard penetration tests, sieve analyses, etc.) the type and extent of soils found within areas to be excavated for water quantity or water quality storage purposes. Soil borings shall be taken to a minimum depth of five feet (5') below the water control elevation for each ½ acre of storage area or fraction thereof. Deleterious soils shall be removed and filled with permeable material that will allow the stored water to infiltrate into the ground water. Locations of known deleterious soils such as muck layers

shall be depicted on the construction drawings along with the appropriate notes requiring removal and disposal.

2.04.5 UNDERGROUND STORAGE

A variance in accordance with Section 7, Variance and Appeals, shall be required for underground or vault storage systems proposed for flood control or floodplain compensation storage. The District will only consider these requests when a hardship is proven and when open storage systems (wetlands, lakes/ponds, other waterways, or dry detention and retention areas) are not feasible to meet the criteria of the District. Land use plans that satisfy the criteria of other agencies but do not comply with District criteria do not satisfy the test of whether an open storage system is not feasible.

2.04.5.1 Underground storage systems shall provide for diversion of the first flush into isolated chambers with observation ports and full maintenance access with the intent of capturing at least 75% of sediments, or as required by the Statewide Environmental Resource Permit regulations. These chambers shall be accessible for periodic cleaning using readily available equipment.

2.04.5.2 The applicant shall provide evidence of site specific geotechnical investigations in a geotechnical engineering report that documents (e.g., Unified Soil or AASHTO Soil classification, standard penetration tests, sieve analyses, etc.) the type and extent of soils found within areas to be excavated for water quantity or water quality storage purposes. Soil borings shall be taken to a minimum depth of five feet (5') below the water control elevation for each ½ acre of storage area or fraction thereof. Deleterious soils shall be removed and filled with permeable material that will allow the stored water to infiltrate into the ground water. Locations of known deleterious soils such as muck layers shall be depicted on the construction drawings along with the appropriate notes requiring removal and disposal.

2.04.5.3 Underground storage shall amount to 100% of the required storage for vault storage and 200% of the required storage for seepage systems as determined by routing calculations. For underground storage in seepage systems, the SFWMD ERP Exfiltration Trench formula parameter " V_{add} " shall equal the flood control or floodplain compensation volume and the Factor of Safety, FS, shall be 2.0 (i.e., $V_{add} \times FS = 200\%$ of required storage volume). Refer to the SFWMD ERP Information Manual, Part III – References and Design Aids, Appendix G, Exfiltration Trenches, Equation 7 and 8.

2.04.5.4 A 3-year letter of credit or 3-year bond for 110% of the value of the underground system shall be provided as a condition of approval of the variance and water management works permit.

2.04.5.5 The water management works permit shall be renewed annually in accordance with Section 1.06, Renewals, as a condition for final release of the 3-year bond or letter of credit.

2.04.5.6 Minimum operation, inspection and maintenance procedures and schedules shall be depicted and annotated on the record drawings.

2.04.6 LAKE/POND, WETLAND, CANAL, OR WATERWAY FILLING

2.04.6.1 No natural or artificial lake/pond, wetland, canal, or other waterway— collectively referred to herein as a water body— shall be partially filled unless the remaining portion of the water body is hydraulically connected to a proposed water body and the storage volume of the proposed water body is greater than the volume of the existing water body to be filled. Partial filling of a waterbody that includes storage volume compensation described herein does not require a variance from these regulations. See Section 2.04.6.3 for additional submittal requirements.

2.04.6.2 Except as allowed per Section 2.04.6.1, no water body shall be filled unless a variance is granted by the Board of Commissioners of the Central Broward Water Control District. This section does not apply to the filling of water bodies having a bottom elevation higher than the elevation depicted in the Broward County Water Table Map for Average Wet Season, or the construction of culverts within the secondary system as covered under Section 2.12, Culverts.

2.04.6.3 Any water body to be filled, excluding the construction of culverts within the secondary system as covered under Section 2.12 shall be accompanied by the following.

- A. Survey and engineering data to include:
 - a. area at top of bank, water control elevation, and bottom of water body to be filled
 - b. maximum/minimum depth from top of bank to bottom of water body
 - c. cross sections (top-of-bank to top-of-bank) every 100' of perimeter at top of bank
 - d. volume of fill to be placed from the District water control elevation to the 100-year flood stage at the top of bank
 - e. volume of fill to be placed from the District water control elevation to the bottom of the water body

- f. volume of material to be dredged above and below the District water control elevation
- B. Biological report showing no adverse impacts to aquatic life as a result of the proposed work. The report must include:
- a. the methodology and data sources used to assess aquatic life (both flora and fauna) present, or could potentially be present, at the subject site(s).
 - b. an assessment of flora and fauna present, or could potentially be present, at the subject site(s).
 - c. a determination with respect to whether the proposed work will adversely affect aquatic life at the subject site(s). If the determination concludes that the proposed work could adversely affect aquatic life, then it must include the proposed measures necessary to mitigate the impacts resulting from the proposed work at each site.

2.05 WATER QUALITY RETENTION VOLUME

All projects shall provide on-site retention for one inch of run off from the total project area, or 2^{1/2}" times SFWMD ERP percent impervious, whichever is greater.

The District shall require dry pretreatment for the first one half inch (1/2") of runoff for commercial projects, industrial sites, roadway projects, and other projects where the impervious area exceeds 60% of the total area. Water surface and roofed areas can be deducted from the site area only for the purpose of water quality pervious/impervious calculations.

All retention areas (dry, wet, and underground) must be capable of percolating the water quality design retention volume within 72 hours. One "open hole test" in accordance with SFWMD ERP Applicant's Handbook Volume II, shall be performed for each 500 feet or fraction thereof of retention area perimeter to determine the hydraulic conductivity of the soil. Copies of test results along with hydraulic calculations (Exhibit "X") shall be submitted to the District along with the permit application.

Projects located upstream of a secondary canal where the canal flow or elevation is controlled by a District operated control structure are exempt from the water quality retention requirement described in 2.05 provided: 1) the CBWCD has a valid Environmental Resource Permit that expressly allows the permit exemption described herein, and 2) with the exception that dry pretreatment shall be provided on-site for commercial and industrial projects, roadway projects, and other projects where the impervious area exceeds 60% of the total area.

Any water quality treatment mechanism or system allowed under the Statewide Environmental Resource Permit regulations (Ch. 62-330, F.A.C. and Ch. 40E,

F.A.C.) may be used to satisfy the required water quality retention or pre-treatment volume as modified herein. The treatment mechanism must be capable of retaining the required water quality retention and pre-treatment volume in vaults, chambers, seepage systems, or filtration units that are isolated upstream from the remainder of the underground storage components. Pollution retardant baffle(s) shall be placed on the influent side of all drainage structures leading to the isolated vault(s), chamber(s), filtration unit(s).

2.06 ADJACENT PROPERTY

In addition to the grant of easement required in Section 1.04 of this criteria, applicants shall be required to design and/or construct the drainage system so as not to preclude existing upstream drainage from reaching a District facility.

2.06.1 No developed property shall shed water on adjacent land. The applicant shall erect either a wall or berm, or combination thereof, to retain the runoff from the twenty-five-year, three-day storm event.

2.06.2 Perimeter berms shall be designed in accordance with Exhibit "I". Retaining walls and foundations shall be located sufficiently away from the applicant's property line to permit construction of the wall without encroaching into adjacent property, unless the applicant secures a written letter of no objection from the affected property owner to construct the wall prior to construction commencement.

2.06.3 Perimeter berm elevations shall be 6 inches (6") below structural slab elevations.

2.07 DISCHARGE CRITERIA

The maximum allowable discharge into the District's canals is outlined in SFWMD ERP Applicant's Handbook Volume II and is repeated herein. In the west C-11 basin (west of SW 100th and/or Palm Avenue) maximum discharge is three quarters of one inch (3/4") per day, or 20 CSM (cubic feet per second per square mile). In the east C-11, maximum discharge is one and one-half inches per day, or 40 CSM. Maximum allowable discharge is computed on the twenty-five-year, three-day event.

Projects located upstream of a secondary canal where the canal flow or elevation is controlled by a District operated control structure are exempt from the maximum discharge requirement.

2.07.1 Project discharge shall be the sum of individual discharge values determined for the project. In determining allowable discharge, the capacity of all elements in the control structure (notches, orifices, etc.) shall be considered.

2.07.2 Discharge shall be evaluated at the control elevations established herein.

2.07.3 Minimum allowable orifice size shall be the equivalent of a 3-inch (3") diameter for circular orifices, or the equivalent for other geometries.

2.07.4 All properties shall provide for a positive outfall with the capacity to discharge the allowable discharge.

2.08 RUNOFF

Ground storage capacity may be taken into account in determining total runoff volume. Storage capacity of soils are described in the SFWMD ERP Applicant's Handbook Volume II. For the purpose of determining soil storage, the wet season water table shall be the water control elevations established by the District.

2.08.1 ROOF RUNOFF

Roof runoff from roofs of 2500 square feet or more, and from zero lot line housing, shall be specifically addressed on the plans as it relates to erosion and protection of adjacent property. Details shall be provided which indicate points at which runoff will be collected and the method utilized to control it.

Drainage easements in accordance with Section 3.04 of these criteria shall be required.

2.08.2 Pervious, porous or permeable pavements such as porous concrete, porous asphalt, permeable interlocking concrete pavers, etc. specifically fabricated, engineered and designed to infiltrate surface runoff through the pavement section may be considered as pervious area for the purpose of ground storage and runoff calculations. The pavement must have sufficient porosity and permeability high enough to allow water to readily pass and thus significantly influence hydrology.

Regarding the in-situ soils to remain under the pervious pavement, the applicant shall provide evidence of site specific geotechnical investigations in a geotechnical engineering report that documents (e.g., Unified Soil or AASHTO Soil classification, standard penetration tests, sieve analyses, etc.) the type and extent of soils found. Soil borings shall be taken to a minimum depth of five feet (5') below the water control elevation for each ½ acre of pervious pavement or fraction thereof. Deleterious soils shall be removed and filled with permeable material that will allow the stored water to infiltrate into the ground water. Locations of known deleterious soils such as muck layers shall be depicted on the construction drawings along with the appropriate notes requiring removal and disposal.

2.09 GRADING

Grade slopes away from structures to be protected and toward drainage facilities. A grading plan shall be prepared and submitted to the District; said plan shall clearly indicate that no runoff from the applicant's project shall discharge or flow onto adjacent property (refer also to 2.06 this criteria).

2.09.1 Roadways and roadway swale sections shall have a minimum gradient of three tenths of one percent (0.3%) or .003 foot per foot. A maximum run of three hundred feet (300') between high point and low point shall be permitted. No roadway swale shall be permitted which has an elevation less than one foot above the District's Water Control Elevation.

2.09.2 In addition to a longitudinal gradient herein specified, all roadways and parking lots shall have a minimum cross pitch (transverse gradient) of one eighth of an inch per foot (1/8" per foot) or one percent (1.0%), and a maximum gradient of five percent (5.0%).

2.09.3 Swales utilized for water quality treatment and conveyance purposes may have a longitudinal gradient of zero percent (0%) and include downstream ditch blocks or raised inlets to retain the treatment volume. This type of swale must be located in Common Areas within a drainage, flowage and storage easement. The paving and drainage application must include engineering calculations and soil percolation tests demonstrating drawdown of the swale within the required time described in Section 2.05.

2.09.4 Swales utilized solely for conveyance purposes (i.e., "conveyance-only swales") must not have standing water after the end of a three-year one-hour rainfall event. Conveyance-only swales that remain flooded beyond one (1) hour due to a hydraulic connection to another stormwater management facility are not permissible. The paving and drainage application must include engineering calculations and soil percolation tests demonstrating drawdown of the swale within the required time.

2.10 DRAINAGE SYSTEMS

All roadways and parking lots shall have a drainage system designed to convey the runoff from a three-year rainfall event. The rational formula, $Q = CIA$, shall be used for design. The rainfall intensity (I) shall be obtained from the Florida Department of Transportation (FDOT) Zone 10 Intensity-Duration-Frequency curve described in Exhibit F. The starting time of concentration shall be ten (10) minutes. Design of the drainage system shall be such that the energy grade line is no higher than the lowest edge of pavement nearest each drainage structure in the system.

2.10.1 Minimum drain pipe diameter in the District:

- “Building Storm Drains” and “Building Storm Sewers” (as defined in the Florida Building Code) downstream to first yard drain, catch basin, or manhole: size according to the Florida Building Code – Plumbing – Storm Drainage chapter, latest edition
- Pipes that: convey runoff from greater than 0.25 acres of contributory drainage area, or; form part of a storm sewer main trunk line that discharges into a stormwater detention or retention facility, or outfall: 15” minimum
- Perforated or slotted pipe in exfiltration trenches, excluding under drain systems in detention/retention areas: 15” minimum
- Lake/pond interconnecting pipes: 48” minimum or the minimum diameter necessary to result in a head loss of less than or equal to 0.1’, whichever is greater.

2.10.1.1 The maximum pipe spacing between structures shall be as follows:

<u>Diameter (inches)</u>	<u>Spacing (feet)</u>
Up to 18”	300’
24” to 36”	400’
42” and up	500’

2.10.2 Any drainage pipe material permitted by the Florida Department of Transportation (FDOT) or Broward County is acceptable. The Manning Roughness Coefficient “n” shall be per the FDOT *Drainage Design Guide*. Pipes under roadways in public rights-of-way shall be reinforced concrete pipe unless other pipe materials are allowed by the entity that owns the right-of-way.

2.10.3 Hydraulic design of storm sewers shall utilize a static tailwater elevation equal to the design head over the outlet weir in an exfiltration trench network, the stage inside the on-site point of discharge to a wet pond or dry detention/retention area corresponding to hour 12 of a 3-year 1-day rainfall event, or the design head over any intermediate control structure(s), whichever is higher.

2.10.4 Catch basins and drainage collection structures shall be designed with an eighteen inch (18”) vertical sump from the invert elevation (or bottom of baffle) to the bottom of the structure. In addition, a twelve-inch (12”) diameter open sump, filled with washed grade rock, no larger than one and one-half inches (1^{1/2}”) shall be placed in the base of the structure. Prior to discharge to any body of water or any seepage trench, a pollution retardant baffle shall be installed.

2.10.5 All outfalls shall be protected with an appropriately designed headwall of either concrete or rip-rap. In the case of rip-rap, a six inch (6”) poured concrete cap is required (Exhibit “H”). Mitered end sections (M.E.S.) may be

utilized only in dry detention or retention areas. The invert of the M.E.S. shall be no lower than the bottom of the detention/retention area.

2.10.5.1 The top of the headwall shall be set one foot (1') above the water control elevation for culvert crossings of the secondary canals (Exhibit "H") and project outfalls to secondary canals. Each existing and proposed headwall for pipes discharging into a District canal shall include a permanent benchmark stamped with the corresponding NGVD29 and NAVD88 elevation.

2.10.5.2 The crown of pipe(s) shall be set no higher than the water control elevation (Exhibit "H") for lake/pond outfalls.

At the discretion of the District Manager or Engineer, headwalls of deep outfalls to lakes/ponds may be replaced with a metal pipe attached to a concrete jacket in accordance with FDOT design standards.

2.10.6 When routing stormwater to a wet detention treatment facility, inlets to the facility shall be directed to the opposite side of the facility from the discharge structure.

2.10.7 Pipes interconnecting lake/pond systems shall be sized to comply with all the provisions of this Section 2, Engineering Criteria. Stage-storage routing shall be performed to demonstrate that interconnected lakes/ponds comply with the criteria for all design storm events (3-year, 10-year, 25-year, and 100-year).

2.11 SEEPAGE SYSTEMS

Seepage systems may be used for purposes of water quality retention but shall not be used for purposes of flood control. The storage and exfiltration capacity of a seepage system shall not be credited to pipe routing calculations. The storage and exfiltration capacity of seepage systems may be credited toward stage-storage routing calculations, provided that the maximum amount of credit shall not exceed the water quality design volume of the seepage system. Excess seepage system capacity beyond the required water quality design volume shall not be credited toward stage-storage routing calculations.

On-site subsurface retention, seepage system, or french drain shall be considered as being a perforated pipe system (fifteen-inch (15") minimum diameter) surrounded by three quarter of an inch (3/4") washed rock and protected on four (4) sides by a pervious geotextile (Mirafi, Typar, etc.).

2.11.1 Design and length of seepage systems shall be in accordance with SFWMD ERP Information Manual, Part III – References and Design Aids, Appendix G, Exfiltration Trenches. An applicant may include the parameter "V_{add}" to determine the length of exfiltration trench required to store any additional volume beyond the required water quality treatment volume only if the applicant receives approval for the use of underground storage in accordance with Section 2.04.11.

2.11.2 One standard open hole falling head percolation test shall be taken for each five hundred feet (500') or fraction thereof of seepage system designed, copies of which shall be submitted to the District with hydraulic calculations.

2.11.3 Depth to water table shall be from finished grade to the District Water Control Elevation.

2.11.4 No seepage system shall be considered as dry retention unless the invert of the perforated pipe is at or above the District Water Control Elevation.

2.11.5 Maintenance structures shall be placed at the terminal ends of all french drains/seepage systems and pollution retardant baffles shall be placed on the drain field side of all drainage inlets.

2.12 CULVERTS

Culverts shall be installed where roadways and driveways cross District canals. The size of new culverts or culvert replacements shall be determined by the District Engineer, but in no case shall be less than required to pass the allowable discharge for the basin or 48 inches in diameter, whichever is higher. The applicant shall provide calculations to demonstrate that the proposed culvert will pass the 100-year peak design flows with a head loss under 0.1 feet including entrance losses; or has the equivalent hydraulic capacity of 110% of the design cross-section of the channel as determined by the District. Additionally, the applicant will be required to excavate the canal to two feet (2') below the proposed culvert invert for a distance of fifty feet (50') upstream and downstream of the crossing. No driveway culvert shall be installed within fifty feet (50') of an existing culvert. As a condition of permitting, the District may require dedication of a roadway easement for adjacent property owners.

2.12.1 Notwithstanding the provisions of this section, no additional culverts will be permitted in the District's S-35 canal (Hancock Road), N-27 canal (Boy Scout Road), N-25 canal (SW 136 Avenue), S-22 canal (SW 106 Avenue), S-24 canal (SW 48 Street), and S-25 canal (Hiatus Road). All future crossings on these canals shall be made by a bridge with a clear span of 15 feet (15') and a minimum bottom of structure elevation of 6.0' NGVD 29 [4.4' NAVD 88]. An applicant may utilize a concrete culvert, box culvert, or arch culvert in lieu of a bridge crossing provided the culvert creates no more than 0.01' of total head loss (including form, entrance and exit losses) and meets the other requirements of this Section. The District may impose additional conditions such as improving the conveyance capacity of existing nearby culverts as mitigation for anticipated head loss resulting from the addition of a culvert in the Canals referenced in this sub-section.

2.12.2 No culverts in the secondary canal system shall exceed 100 feet without a variance.

2.12.3 All culverts in the secondary canal system shall be made of reinforced concrete.

2.12.4 The culvert crown elevation shall be set at the District's Water Control Elevation.

2.12.5 A minimum safety factor of 12 inches (12") shall be added to the minimum calculated culvert size.

2.12.6 Culvert replacements and driveway culverts on Secondary Canals that provide access to buildings undergoing substantial improvement shall conform to the design requirements of new culverts.

2.13 UTILITY CROSSINGS

2.13.1 Overhead power, telephone, cable, and other utility crossings must have a minimum vertical clearance of twenty-five feet (25') between low wire elevation and the elevation of the maintenance berm or natural ground.

2.13.2 Over water crossings shall be supported on piling with a minimum spacing between piles of twenty feet (20'). A clear height of six feet (6') from the District control elevation to the underside of any portion of the structure shall be provided.

2.13.3 Submarine or subaqueous crossings of any nature shall be laid to a depth of three feet (3') below the depth and cross section of the District's canal's ultimate or design bottom elevation. The subaqueous crossing length shall be the full width of the canal if utilizing a horizontal directional drilling installation method, the minimum clearance between the canal bottom and the outside of the pipe shall be three feet (3'). The applicant shall install an object marker with the appropriate message along the centerline of the crossing and within five feet (5) of the top of bank on both sides of the canal. The message shall describe the type of utility crossing (e.g., Gas, Electric, Sewer, Cable, etc.)

2.13.4 Notwithstanding the provisions of this section, the utility system owner which owns or will own the utility, shall be required to enter into a hold harmless and indemnification agreement, indemnifying and holding the District harmless from any and all damages as a result of the utility line being constructed in the District's property.

2.14 DOCKS, DECKS, AND OTHER STRUCTURES

2.14.1 Docks and Decks may be erected in a drainage, flowage and storage easement, or lake maintenance easement with permission of the District.

2.14.1.1 In order to obtain permission the property owner shall be required to enter into an agreement with the District. The agreement is described in Exhibit "S", Dock and Deck Agreement.

2.14.2 No structure of any nature (refer to 2.04.6) shall be erected which would encroach into a canal, canal right-of-way, canal easement, or canal maintenance easement.

2.15 SINGLE FAMILY HOMES

Single family home sites not covered under a District approved stormwater management permit shall, at a minimum, comply with the following requirements. Compliance with other provisions of the engineering criteria shall be at the discretion of the District Manager.

2.15.1 Prior to initiating any construction activity, including clearing grubbing, or earth moving operations, applicants shall submit two sets of plans and the information in Exhibit "W", Checklist for Single Family Homes Plan Approval, for review and approval by the District Manager. The plans and water management calculations must depict the proposed and planned ultimate or future build-out areal extent of buildings, building extensions, structures, decks, pools, site filling, and any other encroachment that would reduce floodplain storage below the required minimum volume.

2.15.2 No developed property shall shed water on adjacent land. The applicant will be required to erect either a wall or berm, or combination thereof, to retain the runoff from the twenty-five year three-day storm event.

2.15.3 At a minimum, thirty percent (30%) of the site shall remain at existing grade to provide for storage of the 25-year, 3-day rain storm event. Proposed grade shall be one foot above the water control elevation. Higher proposed elevations may be allowed provided that ground elevations in the general area are naturally higher and that the proposed grade elevation is no higher than ground elevations of adjacent properties.

The surface water management area (30% of the site) shall be designated and recorded with the Broward County Board of County Commissioners, County Records Division, Recording Section, 115 South Andrews Avenue, Room 114, Fort Lauderdale, FL 33301, utilizing the forms provided in Exhibit "Z".

2.15.4 If offsite discharges are designed to occur during 25-year and lesser storms, the applicant shall utilize best management practices, in accordance with these engineering criteria, to reduce pollutant discharges.

2.15.5 Prior to receiving the Certificate of Occupancy, the applicant shall submit as-built drawings in accordance with the Checklist for Single Family Homes Plan Approval (Exhibit "W") for the review and approval of the District

Manager. Applicant shall grant District staff access to the property for the purpose of conducting visual inspections.

2.15.6 Refer to Section 1.08 regarding enforcement of violations and imposition of penalties.

2.16 FLOODPLAIN ENCROACHMENT

No net encroachment into the floodplain shall be allowed that adversely affects the existing rights of others. With regard to runoff storage, the volume of useful storage available to the basin shall not be decreased as a result of proposed development or redevelopment. The area subject to no net encroachment shall extend from the peak 100-year 3-day water surface elevation for the nearest District canal to the water control elevation. Calculations to demonstrate no net floodplain encroachment shall follow the same guidelines as the SFWMD ERP Applicant's Handbook Volume II. In addition, the applicant shall provide calculations demonstrating that the allowable storage to the basin has not been reduced at the District 100-year flood encroachment elevation. The District 100-year flood encroachment elevation shall be provided by the District Engineer.

A request for a variance from this Section does not require demonstrating a genuine hardship with respect to Sub-Section 7.02.1 of the Criteria. Any variance requested shall be the minimum necessary deviation from the Criteria to afford relief considering the flood heights or flood hazard. In lieu of demonstrating a genuine hardship, the District may require alternative mitigation measures be provided as part of any request for variance. Alternative measures include, but not necessarily limited to, upgrading existing secondary canal culverts, providing additional off-site flood plain storage, or providing a basin-specific capital improvement or maintenance project.

2.16.1 Applicants have the option of performing floodplain encroachment calculations using the guidelines of the SFWMD ERP Applicant's Handbook Volume II or providing a lake/pond size of 25% of the area of the property for properties exceeding 10 acres in size, or 15% of the property for properties of 10 acres or less. In either case, these percentages are the maximum lake/pond area required after the applicant demonstrates to the District Engineer that the site grading has been lowered to the maximum extent practicable. Lake/pond areas shall be measured at the top of bank.

2.16.2 If selecting the 15%/25% options, applicants may utilize a lake/pond, a detention or retention area, or vault-style underground storage provided that the site storage of the detention/ retention area(s) or vault(s) is no less than the site storage provided by the required lake/pond area, as measured from the water control elevation proceeding upward to the lake's/pond's top of bank elevation up to the 100-year water surface elevation of the nearest District canal. The use of vault-style underground storage for floodplain compensation does not include seepage systems described in Section 2.11.

2.16.3 Projects located upstream of a secondary canal where the canal flow or elevation is controlled by a District operated control structure shall maintain pre-development flood plain storage volumes on-site or provide the necessary flood plain storage volume based on a site-specific engineering analysis that complies with District criteria, whichever is greater.

2.17 LANDSCAPING

Stormwater management permit applications shall include a landscape plan identifying proposed vegetation and existing vegetation to remain along with a legend identifying all species. The landscape plan shall show the location of all vegetation in relation to existing or proposed easements, rights-of-way, stormwater management systems, drainage structures, and overall site plan.

Except as provided for herein and in Section 1.04.5 of this criteria, easements dedicated to the District (canal easements, canal maintenance easements, drainage, flowage and storage easements, lake maintenance easements, and drainage easements) shall be cleared of all trees, plants, and nuisance plant species, and no new trees or plants shall be planted.

2.17.1 Trees where the lateral extent of the drip line of the canopy at mature height is expected to encroach within ten (10) feet of the near edge of a storm sewer shall require the following pipe protection measures.

2.17.1.1 Trees should be limited to the following species: *Lysiloma Bahamensis* (Wild Tamarind); *Ilex cassine* (Dahoon Holly); *Tabebuia heterophylla* (Pink Tabebuia); or *Coccoloba diversifolia* (Pigeon Plum); native (i.e., "Florida Friendly") palm species that develop non-invasive roots. Other species may be utilized if found to be acceptable by the District Engineer with respect to safeguarding the integrity of the storm sewer.

2.17.1.2 All storm sewer pipes within an easement shall be installed such that the outside top of pipe is at least one (1) foot below the water control elevation. Root barrier shall be installed in the same trench excavated for the storm sewer pipe from below the invert of the storm sewer pipe to one half (1/2) inch above finished grade if the outside top of pipe is less than one (1) foot below the water control elevation,

2.17.2.4 Trees shall be planted with a minimum three (3) feet offset from the tree centerline to the near edge of a twenty (20) feet drainage easement that encompasses a storm sewer pipe. For drainage easement widths greater than twenty (20) feet, the tree may be planted just outside the easement boundary.

2.18 EXHIBITS

Exhibits referenced in these regulations and criteria form a part thereof and are incorporated by reference. In the case of conflict, the more stringent shall apply. Copies of the exhibits are available at the District's office and on the District's web site:

<http://centralbrowardwcd.org/documents/exhibits/>