



MEMORANDUM

TO:	North Central Texas Council of Gove iSWM Implementation Subcommitte		April 2, 2021	
FROM:	Stephanie Griffin Ashley Lowrie Halff Associates	Ben Pylant		
EMAIL:	sgriffin@halff.comalowrie@halff.com	bpylant@halff.com		
SUBJECT:	Guidance on Developing a Regional Detention Program			

INTRODUCTION

The North Central Texas Council of Governments (NCTCOG) integrated Stormwater Management (iSWM) subcommittee of the Public Works Council (PWC) prepared the following summary guidance on regional detention for municipalities with support from Halff Associates, Inc. Detention ponds temporarily store stormwater runoff for a designated period of time to allow the collected runoff to be safely released downstream without causing downstream damages. Regional detention options presented in this memorandum include considerations for site locations, water quality, potential funding options, and implementation. Regional detention offers unique benefits to proposed developments in that a single detention facilities overall. Many communities throughout the NCTCOG region have expressed an interest in developing a regional detention program and this guidance document is intended to help inform the process.

CONSIDERATIONS FOR REGIONAL DETENTION LOCATIONS

Multiple factors must be considered when locating potential regional detention facilities. The natural topography and soils information are crucial to the decision-making process. The purposes of the detention basin include reducing the peak flow, controlling runoff from proposed or future development so the runoff mimics current or undeveloped flows leaving the property to the extent possible, and attenuating the peaks. The location, contributing drainage area, size, and obtainable detention volume determine the viability of potentially feasible regional detention ponds. (Halff Associates, Inc., 2011)

A detention basin is typically not effective when placed at the highest elevation within the watershed in soils that are highly porous or even dissolvable in water, such as gypsum. Thus, the pond needs to be located at the downstream end of the areas to be mitigated to best achieve this goal. Proposed developments that will contribute to the regional detention pond typically need to flow to the pond and/or be piped to the pond using gravity. The iSWM Technical Manual Site Development Controls provides additional details on siting detention ponds. (NCTCOG, 2014)

Based on the development regulations of the local jurisdiction, the regional detention basin will have to be sized to handle a particular size storm. This detention basin requires a specific area of land in order to contain the required volume and to discharge at rates allowed by the jurisdiction. The proposed location must consider potential upstream and downstream constraints, such as existing roads, culverts, railroads,





large power/utility easements, etc. All these factors must be considered prior to planning a regional detention location.

Detention facilities can be dry or wet and can incorporate open space and natural features. Dry detention basins remain dry most of the time but hold stormwater runoff during and following a storm event. Oftentimes, these areas can be multi-functional and serve as parks, trails, and sports fields, such that the development can use these areas for recreational purposes during dry weather. Wet-detention basins are always designed to hold a specific amount of water and accommodate an additional amount of stormwater runoff during and following storm events. Aerators are often incorporated in wet detention pond designs to keep the water from becoming stagnant and to reduce mosquito breeding. For iSWM purposes, only wet detention ponds receive credit for providing water quality benefits. The vegetation surrounding the pond and within the pond removes pollutants from the stormwater as it enters the pond. Sediments settle out of the stormwater in the pond. Please refer to the iSWM Construction Controls Technical Manual for more details on the benefits of wet detention ponds. (NCTCOG, 2014)



Figure 1. Laddie Place Phase III Regional Storm Water Facility resulted from a combined effort of Bexar County, the City of San Antonio and the San Antonio River Authority to convert a 28.5-acre shopping center that was almost entirely covered by impermeable surfaces except for heritage oak trees. The heritage trees are a defining feature of the former shopping mall that was converted to a regional detention facility and park with natural elements that improve the stormwater quality and increase stormwater volume.





On-channel (online) detention facilities are placed directly in the stream. Whereas off-channel (off-line) detention ponds are placed elsewhere on the site and a conveyance system is used to divert stormwater to the pond. (Harris County Flood Control District, 2020) Often, the required permitting, cost and time associated with developing an off-channel detention pond are less than an on-channel solution. Typically, runoff sheet flows into the off-channel pond or a network of pipes collects stormwater runoff from the surrounding development(s) that discharges into the off-channel detention pond. Smaller pipes or some other structure is used to control releases from the off-channel detention pond into a drainage culvert at a rate that the culvert can handle. An emergency spillway is required for on-channel and off-channel detention ponds to safely pass extreme flood flows without damaging the integrity of the structure. (NCTCOG, 2014) All local and state dam requirements must be met.

WATER QUALITY CONSIDERATIONS

ASSOCIATED WITH REGIONAL DETENTION

Native vegetation can be used to reduce the need for irrigation to maintain plant life in regional detention facilities. Vegetation filters some of the impurities from stormwater runoff, as well as within the wet pond itself. Please note that natural vegetation is also inviting to birds and animals that introduce fecal matter into the ponds, which can negatively impact water quality. The iSWM Technical Manual Site Development Controls provides additional guidance on design criteria for stormwater detention ponds that is applicable to regional detention ponds. (NCTCOG, 2014)

Erosion and sedimentation are natural processes within creeks and ponds. Erosion occurs when swift moving water picks up soil particles from the ground, banks and bottoms of creeks. Some soils erode at a faster rate than others. Erosion has the potential to negatively impact the capacity and function of regional detention facilities. Likewise, water released from the detention pond must be controlled to reduce erosion at the outfalls. The velocity flowing into and out of the detention basin needs to be slowed upon entry and exit of the facility to velocities that minimize erosion. Vegetation, such as grass and shrubbery, serve as natural forms of erosion protection. Large riprap rock and concrete baffle blocks are constructed options for controlling velocity and minimizing erosion.

The Texas Commission on Environmental Quality (TCEQ) regulates water quality for all surface waters in Texas, including regional detention facilities. Implementing iSWM features to improve stormwater quality that collects in detention ponds should meet or exceed the TCEQ criteria as set forth in the Texas Administrative Code Title 30 Chapter 307 as authorized by the Clean Water Act and Texas Water Code. (State of Texas, 2014) Water quality parameters include dissolved oxygen, temperature, pH, dissolved minerals, toxic substances, and bacteria. The purpose of the water quality regulations is to maintain the quality of surface waters in Texas that supports public health and enjoyment and protects aquatic life.

Water quality improvements resulting from regional detention are essentially the same as those described in the iSWM manual for stormwater ponds. Therefore, water quality credits should be considered for regional detention projects that incorporate water quality in the iSWM program.





POTENTIAL FUNDING OPTIONS

Drainage facilities do not produce revenue like water and wastewater treatment facilities. Typically, drainage-related projects, including the design and construction of regional detention ponds, are funded by a community's stormwater (or drainage) utility, general budget, bond programs, and capital improvement programs (large projects). Communities have more needs than available funding, which makes funding regional detention projects difficult. Typically, regional detention facilities are intended as a proactive mitigation measure to facilitate development. Often, more pressing short-term projects are prioritized.

Public-private partnerships (P3s) can be established to fund the cost associated with large detention facilities. The partnership is an agreement between the community and the private developer to share the costs associated with the design, construction and/or operation and maintenance of the necessary detention facility. (U.S. EPA Region 3, 2015) The responsible party for O&M needs to be clearly defined. If the community is going to be responsible for the O&M, then the community needs to have a dedicated source of funding for that activity.

An often-considered source of funding for regional detention is a stormwater utility (or drainage utility) fee. Stormwater utility (SWU) fees are allowed by the Local Government Code Chapter 552 Subchapter C and provide a dedicated revenue stream to fund stormwater-related projects and activities. (State of Texas, 2009) A SWU can be used to fund the design, construction and maintenance of regional detention facilities. SWU fees are typically based on impervious area, such as parking lots, roofs, sidewalks, etc. because these are the surface types that prevent natural ground infiltration and increase runoff from a previously undisturbed site. Despite designing a detention facility to contain a 1% annual chance event, the developed site still impacts the natural runoff of the property. Several communities within the NCTCOG area provide a SWU fee credit, including Addison, Frisco and Lewisville.

Drainage impact fees are an option to communities to fund the design and construction of regional detention facilities. Drainage impact fees must follow the rules set forth in Local Government Code Title 12 Subtitle C Chapter 395. (State of Texas, 1989) A drainage impact fee may be imposed on the developer by a political subdivision to generate revenue for funding or recouping the costs of developing or expanding a detention facility. Drainage impact fees can be assessed within the limits of the political subdivision, as well as its extraterritorial jurisdiction (ETJ). The impact fee can be used to design and construct the regional detention facility but not for operation and maintenance. The fee must be assessed proportional to each of the anticipated developments who are anticipated to use the detention pond. The facility must be constructed within 10 years of collecting the fee, or the fee must be refunded.

Special districts, such as a Public Improvement District (PID), can be established as another mechanism to cover the expenses associated with regional detention facilities. PIDs can be established to finance the improvements that will benefit specific property owners within that specific district or area. A special assessment is collected from each of the properties within the district to fund the projects within the PID.

Another funding option is the establishment of a lake property owners' association, which is essentially a property owners' association with a specific focus on the regional detention pond. The lake property owners' association can establish its own bylaws and collect fees from the impacting properties to maintain the regional detention pond. The property owners' association should be incorporated, and an agreement should define the required maintenance and associated expenses attributed to each of the impacted property owners. No agency regulates property owners' associations. Therefore, any disagreement that





might arise between a property owner and the association is beyond the Texas Secretary of State's authority and would be left to the private parties to resolve with their own attorneys and at their own expense. (Texas Secretary of State, 2020)

This list of potential funding opportunities presented is not exhaustive. These funding ideas are the most common funding options for regional detention ponds. Other funding options may be available to the local jurisdictions and should be considered as appropriate.

IMPLEMENTATION OF REGIONAL DETENTION PROGRAM

The regional detention facility may be owned, operated and maintained by a private entity or the local jurisdiction. In either case, the ownership and maintenance responsibilities associated with the facility should be identified in a legal agreement. At a minimum, the pond should be inspected quarterly. An annual pond inspection report should be prepared by the responsible entity and submitted to the local jurisdiction. Any deficiencies found in the regular inspections and the resolution of each should be included in the annual report.

When the water velocity slows, the sediment falls out of the water flow and settles to the bottom of the pond. The settled deposits of soil particles build up over time and are referred to as sedimentation. The sedimentation needs to be removed periodically to maintain the effective volume of the detention basin. The frequency required for sedimentation removal, or dredging, depends on the rate of buildup within the pond. Ponds should be designed to accommodate a certain rate of sedimentation to reduce the frequency of necessary dredging activity. Stilling basins with permanent access ramps could be added upstream of the detention pond to collect sediment for easier removal. Dredging activities may require a National Pollution Discharge Elimination System (NPDES) stormwater permit.

Local jurisdictions typically do not have the staff to perform regular inspections or funding to pay for necessary maintenance and repairs to regional detention ponds. The local jurisdiction should consider requiring a Pond Operation and Maintenance (O&M) agreement with the property owner. The O&M agreement should clearly state the roles and responsibilities of each party. The document should be filed with the appropriate county for the respective property. This approach reduces the chances of the local jurisdiction receiving the O&M responsibilities as a result of the property owner deeding the pond to the jurisdiction without the jurisdiction's knowledge. An example of what this agreement document could look like is provided in Appendix A. This template is based on agreement documents utilized by the City of Fort Worth and the City of Grand Prairie.

Additional Considerations

Local community land use planning and zoning regulations should reflect the FEMA minimum or higher standards with regards to development in and around floodplains. These local regulations naturally provide open space within a floodplain area that may be suitable for conversion to regional detention. If such an approach is not feasible, then the regional detention should be placed outside the floodplain and be designed to work with the natural flows within the floodplain.

Regional detention facilities may be considered dams. A dam is defined by the Texas Administrative Code Title 30 Part 1 Chapter 299 Subchapter A as being "any barrier or barriers, with any appurtenant structures,





constructed for the purpose of either permanently or temporarily impounding water." (State of Texas, 2009) Any dam that has a height greater than or equal to 25 feet and a maximum storage capacity greater than or equal to 15 acre-feet or has a height greater than six feet and a maximum storage capacity greater than or equal to 50 acre-feet is required to adhere to the TCEQ dam requirements. The Texas Commission on Environmental Quality (TCEQ) requires that all dams that impound water have a water rights permit. TCEQ requires dams to be designed to handle the probable maximum flood (PMF) and the 1% annual chance flood event.

When considering the appropriate size and location for a regional detention facility, the property downstream and its potential use should be considered. While the property may be vacant now, the future land use plan may show that the property is anticipated to become residential development(s) and change the dam classification to high hazard. High hazard dams have additional operation and maintenance responsibilities that must be considered and included in the development. Ultimate development or ultimate land use should be used as the basis for sizing regional detention ponds. (Halff Associates, Inc., December 2014) The ultimate land use impacts the manner and speed at which runoff moves across the development, which in turn impacts the size and location for the pond.

A best management practice, if not already required by the state or local jurisdiction, includes having an emergency action plan for potential issues with the dam or impoundment holding the stormwater in the detention pond. TCEQ's Guidelines for Developing Emergency Action Plans for Dams in Texas provides details on which dams are required to have emergency action plans and the specific information that must be included in those plans. (TCEQ, December 2019) The emergency action plan should identify the area that would likely be damaged in the event of a dam failure. The plan should also include the actions to be taken and the department or personnel who are responsible for implementing the plan.

The United States Army Corps of Engineers (USACE) must be consulted if the location of the proposed detention facility is planned for an area that may contain wetlands, thus requiring a Section 404 permit. Impacted wetlands are required to be mitigated. Ideally, the detention pond should be located to avoid wetlands. When wetlands cannot be avoided, the developer should plan for a lengthy and potentially costly permitting process.

Regional detention is intended to reduce flood risk up to a specified storm design size. The reduced flood risk benefits the proposed development within the project area and downstream of the detention pond discharge point. The runoff from the proposed development will collect in the detention pond and be discharged at a rate such that it does not increase the flow in the creek above what the creek received prior to the proposed development. Therefore, the flood risk to properties downstream should remain unchanged up to the design storm of the detention pond. As with any detention facility, flood risks still exist with regional detention ponds. (Halff Associates, Inc., December 2014) Storms may exceed the capacity of the facility's design. If development plans change, the potential flooding may also change or may require modifications to a regional detention pond to accommodate the increased flows.





REFERENCES

- Halff Associates, Inc. (December 2002). *City of Richardson, Urban Lake Study Final Report.* Capital Projects/Engineering. Richardson, TX: Halff Associates, Inc.
- Halff Associates, Inc. (December 2014). *Cottonwood Creek Headwaters Detention Feasibility Study Final Report.* Richardson, TX: Halff Associates, Inc.
- Halff Associates, Inc. (July 2011). *City of Balch Springs Hickory Creek Flood Protection Planning Study Final Report*. Richarsdon, TX: Halff Associates, Inc.
- Harris County Flood Control District. (2020, December 3). *Stormwater Detention: How It Works*. Retrieved from Harris County Flood Control District: https://www.hcfcd.org/Additional-Resources/Flooding-and-Floodplains/Stormwater-Detention-How-it-Works

NCTCOG. (2014, September). *integrated Stormwater Management Technical Manual; Site Development Controls*. Retrieved from North Central Texas Council of Governments: http://iswm.nctcog.org/technical-manual.html

State of Texas. (1989, August 28). *Title 12, Subtitle C, Chapter 395, Subchapter B. Authorization of Impact Fee*. Retrieved from Local Government Code:

https://statutes.capitol.texas.gov/Docs/LG/htm/LG.395.htm

State of Texas. (2009, April 1). *Title 13, Subtitle A, Chapter 552, Subchapter C. Municipal Drainage Utility Systems*. Retrieved from Local Government Code:

https://statutes.capitol.texas.gov/Docs/LG/htm/LG.552.htm#C

State of Texas. (2009, January 1). *Title 30 Part 1 Chapter 299 Dams and Reservoirs*. Retrieved from Texas Administrative Code:

https://texreg.sos.state.tx.us/public/readtac\$ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=299&sch =A&rl=Y

State of Texas. (2014, March 6). *Title 30 Part 1 Chapter 307 Texas Surface Water Quality Standards*. Retrieved from Texas Administrative Code:

https://texreg.sos.state.tx.us/public/readtac%24ext.ViewTAC?tac_view=4&ti=30&pt=1&ch=307&rl=Y

- TCEQ. (December 2019, December). *Guidelines for Developing Emergency Action Plans in Texas*. Dam Satefy Program, Critical Infrastructure Division. Austin, TX: Texas Commission on Environmental Quality. Retrieved from Texas Commission on Environmental Quality:
 - https://www.tceq.texas.gov/assets/public/comm_exec/pubs/gi/gi-394.pdf
- Texas Secretary of State. (2020). *Home or Property Owners' Association FAQs*. Retrieved December 4, 2020, from Texas Secretary of State Ruth R. Hughs: https://www.sos.state.tx.us/corp/hpoafaqs.shtml
- U.S. EPA Region 3. (2015). Community Based Public-Private Partnerships (CBP3s) and Alternative Market-Based Tools for Integrated Green Stormwater Infrastructure; A Guide for Local Governments. Water Protection Division. Washington, D.C.: U.S. EPA Region 3. Retrieved from https://www.epa.gov/sites/production/files/2015-12/documents/gi_cb_p3_guide_epa_r3_final_042115_508.pdf





APPENDIX A

NOTICE OF CONFIDENTIALITY RIGHTS: IF YOU ARE A NATURAL PERSON, YOU MAY REMOVE OR STRIKE ANY OR ALL OF THE FOLLOWING INFORMATION FROM ANY INSTRUMENT THAT TRANSFERS AN INTEREST IN REAL PROPERTY BEFORE IT IS FILED FOR RECORD IN THE PUBLIC RECORDS: YOUR SOCIAL SECURITY NUMBER OR YOUR DRIVER'S LICENSE NUMBER.

Landowner/Developer Inspection and Maintenance Agreement

STATE OF TEXAS

KNOW ALL PERSONS BY THESE PRESENTS

COUNTY OF _____

 THIS AGREEMENT, made and entered into this ______ day of ______, 20_____, by and between ______, hereinafter called the "Landowner," whose address is ______, and the City (or County) of ______, Texas, whose address is ______, hereinafter called the "City" (or "County").

WITNESSETH, that:

WHEREAS, the Landowner is the owner of certain real property described as an approximately ______ acre tract located in the ______ Survey, Abstract No. ______ as recorded by deed recorded in Volume ______, Page _____, dated ______ in the Public Official Records of ______ County, Texas, Instrument Number ______, hereinafter the "Property"; and

WHEREAS, the Landowner is proceeding to build on and develop the Property; and

WHEREAS, the Site Plan/Subdivision Plan known as ______, City (or County) File No. ______ hereinafter called the "Plan", which is incorporated herein by reference, as approved or to be approved by the City (or County), provides for stormwater management facilities within the confines of the Property; and

WHEREAS, the City (or County) and the Landowner, its successors, assigns and heirs in interest, including any Homeowners Association (HOAs) or Planned Improvement District (PID) agree that the health, safety, and welfare of the residents of ______, Texas require that on-site stormwater management facilities be constructed and maintained on or under the Property; and

WHEREAS, the City requires that on-site stormwater management facilities as shown on the Plan be constructed and adequately maintained by the Landowner, its successors and assigns, the location and dimensions of which is shown and more particularly described by metes and bounds in the attached Exhibit "A" ("Facility Property"), and

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

- 1. That the on-site stormwater management facilities shall be constructed by the Landowner in accordance with the plans and specifications contained in City (Or County) File No. ______ of the Plan.
- 2. That Landowner shall adequately maintain the stormwater management facilities. This includes all pipes and channels on or under the Property built to convey stormwater to the facility, as well as all structures, improvements, and vegetation on or under the Property provided to control the quantity and quality of the stormwater. Adequate maintenance is herein defined as good working condition so that these facilities are performing their design functions.
- 3. That Landowner shall inspect the stormwater management facility and submit an inspection report annually. The purpose of the inspection is to assure safe and proper functioning of the facilities. The inspection shall cover the entire facilities, and deficiencies shall be noted in the inspection report.
- 4. That Landowner hereby grants permission to the City (or County), its authorized agents and employees, to enter upon the Property and to inspect the stormwater management facilities whenever the City (or County) deems necessary. The purpose of inspection is to follow-up on reported deficiencies and/or to respond to citizen complaints. Except in the case of emergency, and to the extent Landowner has provided the City (or County) with its contact information (email or telephone number), the City (or County) may, but is not required to, provide prior notice to the Landowner of an inspection. The City (or County) shall provide the Landowner copies of the inspection findings and a directive to commence with the repairs if necessary.
- 5. That in the event the Landowner fails to maintain the stormwater management facilities in good working condition acceptable to the City (or County), and fails to correct such condition(s) within the time designated by the City (or County), the City (or County) may enter upon the Property and take whatever steps necessary to correct deficiencies identified in the inspection report and to charge the costs of such repairs to the Landowner. This provision shall not be construed to allow the City (or County) to erect any structure of permanent nature on the land of the Landowner that is different from or in addition to the facilities described in the Plan or outside of the easement for the stormwater management facilities. It is expressly understood and agreed that the City (or County) is under no obligation to routinely maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the City (or County).
- 6. That Landowner shall perform the work necessary to keep these facilities in good working order as appropriate. In the event a maintenance schedule for the stormwater management facilities (including sediment removal) is outlined on the approved plans, the schedule shall be followed.
- 7. That in the event the City (or County) pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the City (or County) within ten (10) days after demand for all costs reasonably incurred.
- 8. That this Agreement imposes no liability of any kind whatsoever on the City (or County) and the Landowner agrees to hold the City (or County) harmless for the design, construction, operation, maintenance or use of any stormwater management facility to be developed, constructed or used

by the Landowner or its successor, assigns or heirs. The Landowners shall indemnify and hold harmless the City, its officers, employees, and agents from any direct or indirect loss, damage, liability, or expense and attorney's fees for any negligence of the Landowner, his contractors, engineers, agents, or representatives, arising out of the design, construction, or condition of the stormwater management facility or the Landowner's operation, maintenance, or use of the stormwater management facility including any non-performance of the foregoing. Any successor landowner of the Property shall have full responsibility and liability for the stormwater management facility as herein described. All the above shall be covenants running with the land.

- 9. Landowner covenants and agrees that no habitable building shall be erected within the drainage easement outlined on Exhibit "A" but this paragraph shall not preclude construction of other improvements within the drainage easement, which do not impede drainage. Landowner covenants and agrees that no habitable building shall be erected on the above property abutting such easement which shall have a finished floor at an elevation less than two feet above the maximum depth of water in the detention pond which would occur during a 100 year frequency flood.
- 10. This Agreement shall be recorded among the land records of ______ County, Texas, shall constitute a covenant running with the land, and shall be binding on the Landowner, its administrators, executors, assigns, heirs and any other successors in interests, including any property owner's association.

WITNESS the following signatures and seals:

Executed this _____ day of _____ 20____.

LANDOWNER:

CITY (or COUNTY OF _____, TEXAS

ВҮ:_____

By: _____ City (or County) Official

CONTACT INFORMATION FOR LANDOWNER:

Email Address: _____

Phone Number: _____

ATTEST:

City Secretary

APPROVED AS TO FORM:

City (or County) Attorney

STATE OF TEXAS

COUNTY OF			
This instrument was acknowledged before me on	the day of	_, 20, by	
, on behalf of C	ity (or County) of	in	
the capacity herein noted and for the purposes sta			
	Notary Public in and for the St	ate of Texas	
STATE OF TEXAS			
COUNTY OF			
Before me, the undersigned authority on this	day of	, 20 ,	
personally appeared			
		nown to me to be the	
person whose name is subscribed to the foregoing	g instrument and acknowledged t	to me that the same is	
the act of	, and that he executed the same as its		
and as the act of such	and for the purposes a	and consideration	
expressed in the foregoing instrument.			

Notary Public in and for the State of Texas

EXHIBIT "A"

INSERT LEGAL DESCRIPTION