Cypress Ditch Improvements Project

Project Background

Cypress Ditch (HCFCD Unit No. D115-00-00) serves as the primary outfall for the majority of the City's storm drainage systems, including major storm drainage trunklines on S. Rive Avenue, IH-610, and Newcastle Drive, as well as storm drainage systems belonging to the City of Houston. The ditch is approximately 9,500 linear feet, running from Chimney Rock Road to Brays Bayou. The portion of the channel between Chimney Rock Road and S. Rice Avenue, approximately 2,500 linear feet, is natural and unlined, while the remainder is concrete lined. The width of the channel right-of-way (ROW) ranges from 80 feet at the west end to 100 feet between IH-610 and Newcastle Drive.

Due to the level of development in both the City of Bellaire and the City of Houston and the change in drainage standards and criteria to accommodate for increased rainfall, the capacity in Cypress Ditch is not adequate to support flows from the City's storm drainage systems. Since the performance of the City's storm drainage systems is dependent on the capacity in the ditch, the limited capacity in the ditch negatively impacts the ability of those systems to minimize flood risk to Bellaire residents.

Engineering & Disaster Management

Project Scope

The Cypress Ditch Improvement project will increase the overall capacity in Cypress Ditch by reconstructing the lined portion of the channel between S. Rice Avenue and Brays Bayou and improving the natural channel section between Chimney Rock Road and S. Rice Avenue. The lined project will change the channel sides from a 2H:1V slope to a 1.5H:1V slope and deepen the channel bottom, where feasible, which will increase the channel's cross section volume, thereby increasing the maximum potential flow in the channel and lowering the water surface elevation during storms up to the 100-year (1% Annual Exceedance Probability [AEP]) storm event. Improvements to culverts where the channel crosses beneath roadways, specifically IH-610, will also be included to ensure these crossings do not create bottlenecks in the conveyance of the channel.

The project will also include the construction of surface detention to provide mitigation for the channel improvements. These ponds will be located on parcels currently owned by the City of Houston that are adjacent to Cypress Ditch, south of Beechnut Street and west of Newcastle Drive.

The projects are described in more detail in the attached Technical Memoranda.

Project Schedule

The anticipated schedule for the project is 9 months for final design and 24 months for construction, with construction anticipated to start in the fall of 2025.

Project Cost

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The total cost for the project, inclusive of the construction of the channel improvements and detention basins and associated costs for engineering design and land acquisition, is approximately $110 million.

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TECHNICAL MEMORANDUM 05

TITLE	**REGIONAL DRAINAGE IMPROVEMENT PLAN – REGIONAL DETENTION**		
PROJECT NO.	23001-00	PREPARED BY:	ADAM EATON, PE
TASK NO.	WORK ORDER 1, TASK E	APPROVED BY:	CHRIS CANONICO, PE
DATE	DECEMBER 27, 2023	REVISION	2

1. PROJECT BACKGROUND

The City of Bellaire (the City) commissioned the Master Drainage Concept Plan (MDCP) to provide a detailed analysis of the City's major north-south drainage systems and recommend improvements to those systems to reduce flooding potential within the City limits. The MDCP recommended conveyance and capacity improvements to Cypress Ditch (HCFCD Unit D115-00-00) and Kilmarnoch Ditch (HCFCD Unit D113-00-00), new storm sewer trunk lines along S. Rice Ave. and IH-610, and surface detention facilities to mitigate the proposed improvements. As part of the Regional Drainage Improvement Program (RDIP), the City requested that Ardurra evaluate the recommendations of the MDCP and refine the proposed improvements or recommend alternative improvements accordingly.

Mitigation is required for storm drainage and flood reduction infrastructure improvement projects to ensure that no adverse impacts are created on downstream systems. For such infrastructure improvements in the City, mitigation is required to ensure there are no adverse impacts created in Cypress Ditch or Brays Bayou (HCFCD Unit D100-00-00). Mitigation volume can be provided through surface detention (detention ponds), linear detention (closed conduit systems including oversized storm sewers or box culverts), subsurface detention basins, or stormwater tunnels. In most instances, surface detention is the more cost-effective alternative in terms of dollars per acre-foot of volume achieved.

The MDCP estimated that all of the improvements proposed therein would require approximately 1,850 acre-feet (ac-ft) of mitigation volume. The MDCP identified seven properties that would provide approximately 394 ac-ft of mitigation volume, through the construction of surface detention ponds, at a projected construction cost of $35 million. These properties include the City of Houston's Southwest Wastewater Treatment Plant (SW WWTP) and a CenterPoint Energy easement located on the west side of Kilmarnoch Ditch.

As part of the Regional Drainage Improvement Program (RDIP), the City requested that Ardurra evaluate the recommendations of the MDCP and refine the proposed improvements or recommend alternative improvements accordingly, which included determining the mitigation volume required for the refined or alternative improvements and evaluating potential locations for surface detention, including properties that were identified in the MDCP. The RDIP recommended improvements to Cypress Ditch and the IH-610 storm sewer system be completed first (the First Phase projects), as

these systems serve as the outfalls to all other City storm drainage systems and need to be improved to facilitate other potential storm drainage infrastructure improvements throughout the City.

2. Project Location and Description

While the entirety of the City was considered for potential locations for surface detention ponds, ponds located at the southern, or downstream, end of the city, specifically along Cypress Ditch, Brays Bayou, or the major north/south drainage, are preferrable as they provide more efficient use of the volume by the system(s) they are being used to mitigate. Ponds at the southern end of the city right along Cypress Ditch or Brays Bayou, with discharges directly to either of those channels, can be excavated deeper than ponds further upstream or those that discharge into a storm sewer.

Another alternative for surface detention in the City is pocket detention, which comprises utilizing a larger number of smaller parcels for surface detention ponds to achieve the required mitigation volume from the cumulative volume of all the parcels. However, the volume available from each parcel is minimal, given the area of each parcel and the depth to which they can be excavated, accounting for sloped sides and berms, and thus the need to acquire a large number of smaller parcels to provide mitigation benefits for the larger First Phase projects, pocket detention was not explored in detail for this project.

3. Previous Drainage Studies

The City commissioned the MDCP, dated April 2022, to provide a detailed analysis of the flooding conditions resulting from the performance of the major drainage systems within the City limits. The City also authorized a Drainage Study in 2016 to investigate possible alternatives to reduce the occurrence of structural flooding within the city limits. The MDCP was used as the starting point for the current analysis included in the RDIP.

The Harris County Flood Control District (HCFCD) is in the process of updating the Brays Bayou hydraulic models to incorporate both the Project Brays improvements and ATLAS 14 rainfall data for the MAAPnext program. HCFCD provided an interim model for the Regional Drainage Improvement Program.

4. Purpose and Scope of Work

The purpose of this technical memorandum (TM) is to summarize further analysis of potential locations for large surface detention basins to provide mitigation volume for the recommended improvements identified through the RDIP tasks and as analyzed and presented in TMs 03 (Cypress Ditch Improvements) and 04 (IH-610 Storm Sewer System Improvements). The current estimated total mitigation volume required for the proposed improvements is approximately 380 acre-feet; this total volume may change as these projects are further refined and mitigation volume re-calculated through preliminary and final design. And because these projects represent only the First Phase of the RDIP, additional mitigation volume will be required as future projects are identified and developed.

This analysis includes identifying potential properties or parcels, calculating the potential volumes for those parcels individually as well as the total cumulative volume available, and providing rough cost estimates for construction and property acquisition. The viability of all sites presented in the MDCP was not verified through the first phase of the RDIP. As the RDIP progresses and projects are further developed, additional properties will need to be investigated to determine if they can provide detention volume.

For the purpose of this TM, the term "regional detention" is used to indicate detention facilities that would provide mitigation volume for the regional impacts of the RDIP, including First Phase projects and future projects to be developed. Such facilities could also potentially provide additional mitigation volume that could be utilized by the City of Houston (COH), HCFCD, or both, presenting an opportunity for sharing costs for acquisition and/or construction. The potential for sharing costs and mitigation volume with either entity will be further evaluated in the next phase of the RDIP.

While this analysis identified opportunities to construct detention ponds with the volume necessary to mitigate the First Phase projects, the ponds must also contemplate providing volume to facilitate other potential future City drainage infrastructure projects.

5. METHODOLOGY

The analysis was conducted using Google Maps and Google Earth to identify potential parcels to serve as surface detention ponds, and parcel information (including ownership, parcel size, and current value) was obtained from the Harris County Appraisal District (HCAD). In instances where parcel size was not provided in the HCAD data, surface area was estimated using the Google Earth measuring tool.

Potential parcels considered for this analysis were subject to the following criteria:

- Larger parcels along Cypress Ditch or Brays Bayou, optimizing the hydraulic efficiency of the potential pond, yielding more potential volume
- Vacant parcels, with minimal development (e.g., parking lots) or those where existing structures are known to be unused
- Parcels immediately adjacent to the City and within a two-mile reach, both upstream and downstream of the City, along Brays Bayou
- Publicly and privately owned parcels

The depth and total volume achievable for each potential detention pond depended on the location and the system to which they discharged. Parcels that were immediately adjacent to either Cypress Ditch or Brays Bayou that discharge to those channels were assumed to have a potential depth of excavation of 20 feet, as this is roughly the depth of each channel near their confluence. Potential

volumes for parcels not adjacent to these channels that discharge to storm sewer systems were calculated using excavated depths of 8 feet. The volume for each parcel was calculated at 50-percent and 75-percent of the total maximum volume (total area multiplied by total depth) to account for the required sloped sides, maintenance berms, and potential volume reductions necessary to incorporate mixed-use design considerations, including stepped or shelfed bottoms, varying depth detention cells, etc. Ponds were assumed to have flat bottoms.

The volumes presented in this TM represent conceptual level volumes; the total achievable volume for each parcel will be further refined in the next phase of the RDIP. The total achievable volume for each parcel will depend on whether the ponds are maximized for volume or to accommodate recreational or other amenities, whether the ponds are designed to meet HCFCD standards, maintenance requirements and considerations, and other hydraulic and hydrologic design considerations.

Construction costs, including excavation and demolition unit costs, were obtained from recent Harris County bid documents and are also presented as a range. Costs for demolition were assumed to range between $3 and $10 per square yard and costs for excavation were assumed to range between $15 and $25 per cubic yard. Construction costs are presented as low and high costs for one-half and three-quarters of the total achievable excavation depth.

Acquisition costs were obtained from HCAD, where available.

6. CenterPoint Energy Easement

At the time of this analysis, COH was engaging in discussions with CenterPoint Energy regarding utilizing available space in CenterPoint easements for detention in other areas across Houston. Those discussions have not advanced to the point where CenterPoint has either agreed or disagreed to that potential arrangement, so for the purposes of this analysis the CenterPoint easement on the east side of the City of Bellaire, near Kilmarnoch Ditch, was not considered for detention ponds. The City should continue to coordinate with COH and consider engaging in these discussions to find a mutually beneficial path forward for all three parties.

7. Ruffino Hills Regional Detention Facility

The City and the City of West University Place co-owned the Ruffino Hills landfill, located near the interchange of US-59/I-69 and Beltway 8 in southwest Houston. COH has been seeking to acquire the property with the intent to construct a regional detention facility to provide mitigation volume for projects throughout the Keegans Bayou and Brays Bayou watersheds. COH previously purchased the City of West University Place's rights to the property and has been seeking to purchase the City's rights as well. Detention on the Ruffino Hills property would not be a viable option for mitigating City projects or improvements.

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Under the RDIP, the City has been advancing conversations with COH to establish a mutually beneficial agreement whereby COH would acquire the City's rights to the Ruffino Hills property, and in return the City would receive cash with which to construct detention or property that could provide usable detention volume for the City. This agreement will continue to be pursued through the next phase of the RDIP.

8. RESULTS

Using the criteria provided in **Section 5**, twelve (12) parcels were ultimately identified as potential locations for regional detention facilities, as shown in **Figure 1** and summarized in **Table 1**.

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Figure 1: Regional Detention Parcels

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Table 1: Regional Detention Analysis Results

Parcel Number	Address	Owner	HCAD Number	Area (ac)	Depth (ft)	Volume (ac-ft)	Construction Cost	Acquisition Cost
1	SW WWTP	COH	0440360000061 0440860000221	37	20	450 – 675	$10.9M - $27.2M[1]	[2]
2	HPW Service Center	COH	0440360000064	6	20	61 – 92	$1.6M - $4.0M	[2]
3	SW Police Substation	COH	0440360000065	5	20	48 – 72	$1.7M - $3.4M[3]	[2]
4	Bellaire WWTP	COB	0591280410001 0591280410004 0440360000059	7	20	66 – 99	$1.6M - $4.0M[1]	N/A
5	4545 Beechnut	FKM Partnership, LTD	1157220020001	5	8	18 – 28	$445,000 - $1.1M	$2.2M
6	0 W Loop S 8801 W Loop S	Meyerland Crossing LLC	0992420000003 0992420000001	7	8	30 – 45	$829,000 - $2.2M	$8.4M
7	0 Meyer Park Dr	TREP WLS Owner LLC	0992430000001	3	8	11 – 17	$320,000 - $834,000	$2.6M
8	4010 S Braeswood Blvd	BG17 - South Braeswood Property Owner LLC	0440860000259	3	20	30 – 45	$733,000 - $1.8M	$5.3M
9	4035 S Braeswood Blvd	BG12 Braeswood and Stella LLC	1463520010001	6	20	61 – 91	$1.9M - $4.1M[3]	$14.1M
10	8700 Stella Link Rd	Stella Link Holdings LLC	1463520010003	4	20	37 – 56	$951,000 - $2.4M	$7.1M
11	5417 S Braeswood Blvd 9602 Chimney Rock Rd 5401 S Braeswood Blvd	Current Owner	0923470000030 0923470000032 0923470000033	4	20	40 – 59	$1.5M - $2.9M[3]	$11.2M
12	5435 S Braeswood Blvd	Cosmos Foundation Inc dba Harmony Science Academy	0923470000001	1	20	13 – 19	$811,000 - $1.3M[3]	$3.5M
			Total	**95**	**-**	**967 - 1,451**	**$23.2M - $55.3M**	**$54.4M**

[1] Construction Costs account for excavation only. Costs for demolition costs requires investigation due to wastewater treatment equipment, buildings that could potentially require asbestos abatement, etc.

[2] Acquisition Cost to be negotiated with COH depending on potential cost-share or parcel swap agreement

[3] Construction Cost assumes $500,000 for demolition of existing structures

Although it could provide significant mitigation volume, Parcel 1 (the SW WWTP) should not be considered as a potential site for detention is COH currently does not intend to abandon the facility. Should that change at any point, the City should engage COH in discussion to convert the site into a detention facility, at which point costs for acquisition, demolition, and excavation would be further refined.

Parcels 2 and 3 are both owned by COH: Parcel 2 serves as storage for HPW maintenance equipment and material, and Parcel 3, the SW Police Substation, is currently abandoned. These parcels could be acquired from COH, through either a land swap or volume-share agreement, and converted to detention. The City could offer to provide space for the HPW maintenance equipment and material as part of the agreement.

Parcel 4 is the City's WWTP. Demolishing the WWTP to construct a detention facility on the site would require diverting wastewater flows to the SW WWTP, for which the City would incur an annual cost, that would need approval from COH. The wastewater diversion and treatment agreement could be pursued in order to allow the City to convert the WWTP to a detention facility.

Parcel 5 is a vacant, undeveloped lot with a direct connection to the storm sewer on Beechnut St. Since it is undeveloped, construction costs would be minimized, but since it is privately owned the City would be required to purchase the property, which currently has an HCAD value of $2.2 million.

Parcels 6 and 7 are parking lots that could facilitate direct connections to the City's storm sewer system as well as the TxDOT system along IH-610. These two parcels are privately owned and are currently being redeveloped, making them unusable for surface detention.

Parcel 8 is an undeveloped property immediately adjacent to Brays Bayou. Most of the property lies in the Brays Bayou floodway, with the rest in the 100-year floodplain, so it is unlikely that the property would be redeveloped. The parcel is less than one mile downstream of the City, making it potentially hydraulically feasible to provide mitigation for the City.

Parcels 9 and 10 are a former shopping center along Stella Link Rd. There are a few businesses still in operation, which are all located on Parcel 9. The City could investigate whether there are any plans to redevelop either parcel. Their location near Brays Bayou and proximity to the City (less than one mile downstream) make them potentially hydraulically feasible to provide mitigation for the City.

Parcel 11 is a shopping center with businesses still in operation, however the owner has indicated they are interested in selling. The parcel is located immediately outside the City limits along Brays Bayou, making it potentially hydraulically feasible to provide mitigation for the City.

Parcel 12 is a shopping center with businesses still in operation, but the property is for sale. The parcel is located immediately outside the City limits along Brays Bayou, making it potentially hydraulically feasible to provide mitigation for the City.

The parcels recommended for further analysis to support the development of regional detention are summarized in **Table 2**.

Table 2: Regional Detention Parcel Recommendations

Parcel Number	Volume (ac-ft)	Construction Cost	Acquisition Cost
2	61 – 92	$1.6M - $4.0M	(2)
3	48 – 72	$1.7M - $3.4M(3)	(2)
4	66 – 99	$1.6M - $4.0M(1)	N/A
5	18 – 28	$445,000 - $1.1M	$2.2M
8	30 – 45	$733,000 - $1.8M	$5.3M
9	61 – 91	$1.9M - $4.1M(3)	$14.1M
10	37 – 56	$951,000 - $2.4M	$7.1M
11	40 – 59	$1.5M - $2.9M(3)	$11.2M
12	13 – 19	$811,000 - $1.3M(3)	$3.5M
TOTAL	**373 - 560**	**$11.2M - $25.1M**	**$43.4M**

(1) Construction Costs account for excavation only. Costs for demolition costs requires investigation due to wastewater treatment equipment, buildings that could potentially require asbestos abatement, etc.

(2) Acquisition Cost to be negotiated with COH depending on potential cost-share or parcel swap agreement

(3) Construction Cost assumes $500,000 for demolition of existing structures

All of the recommended parcels could potentially yield between 373 and 560 acre-feet of volume for mitigation. The three publicly owned parcels (Parcels 2, 3, and 4) could potentially yield between 175 and 263 acre-feet of volume at a cost for construction between $4.8 million and $11.4 million for construction, but with no cost for acquisition as these would ideally be included in the land swap with COH. The remaining parcels, all privately owned, could potentially yield 198 and 297 acre-feet of volume at a cost for construction between $6.3 million and $13.7 million, but with a total cost of $43.4 million to acquire the properties.

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9. RECOMMENDATIONS

The current estimated mitigation volume required to construct the improvements to Cypress Ditch and the IH-610 storm sewer system, as documented in TMs 03 and 04 (the First Phase projects), is approximately 380 acre-feet. Based on this analysis, the City must utilize a combination of the identified parcels shown in **Table 2** as surface detention ponds to achieve this volume. Additionally, the City will need volume beyond this estimated amount in order to support full implementation of the RDIP and facilitate other future storm drainage infrastructure improvement projects to identified under future phases.

The City's strategy for implementing regional detention solutions should include the following. All costs and volumes presented below are conceptual-level and will need to be further refined through additional analyses and design.

- **Pursue a land swap agreement with COH:** The City and COH should continue to pursue an agreement whereby COH receives the Ruffino Hills property (see **Section 7**), and the City receives Parcels 2 and 3, either through direct ownership or long-term lease from COH, on which detention ponds could be constructed. This would allow both entities to fulfill their mitigation needs and facilitate flood risk reduction across a significant portion of the region. The agreement would ideally not require any cash, so the only costs the City would incur would be for the construction of the detention ponds on Parcels 2 and 3. These parcels could yield between 100 and 170 acre-feet of detention volume at a cost of construction ranging from approximately $3.2 million to $7.4 million.

- **Convert the City's WWTP to detention:** The location of the City's WWTP (Parcel 4) along Cypress Ditch makes it an attractive site for detention. The City has previously investigated opportunities to abandon the WWTP; such an investigation should be re-initiated concurrent with the next phase of the RDIP. The City should coordinate with COH to determine the feasibility and conditions of transferring City wastewater to the SW WWTP, which would require constructing a lift station and force main from the existing City WWTP site south to the SW WWTP and paying COH an annual fee for treatment. This transfer could be included as part of the land swap agreement described above. Once the wastewater transfer infrastructure is in place, the City could demolish the WWTP and construct surface detention on the site. The cost to construct detention on the WWTP site includes approximately $6 million to $10 million to construct the wastewater transfer infrastructure, $1.6 million to $4.0 million for excavation, and $1.0 million to $2.0 million for demolition. The site could potentially yield between 60 and 100 acre-feet of volume.

- **Acquire private properties for detention:** Since the availability of publicly owned properties to serve as detention facilities to provide mitigation volumes necessary to support implementation of the RDIP is limited, the City should consider acquiring private properties to achieve the required mitigation volumes. Parcels 5, 8, 9, 10, 11, and 12 are potentially hydraulically feasible to provide mitigation. Since Parcel 8 is located mostly in the floodway, it is unlikely that it can be redeveloped; the other parcels, however, could be redeveloped. The City should investigate which parcels are planned for redevelopment and determine if those not already being redeveloped could be purchased. The six privately owned parcels identified could potentially yield 200 to 300 acre-feet of detention volume at an estimated cost to demolish and excavate the parcels ranging from $6.3 million to $$13.7 million. The costs to acquire all six parcels is $43.4 million.

- **Advance regional detention to preliminary design:** The next phase of the RDIP should include preliminary design for regional detention. Preliminary design should be completed for Parcels 2, 3, and 4 and should consider Parcels 5, 8, 9, 10, 11, and 12 per the City's direction.

Given the high costs to acquire private properties, especially larger parcels to facilitate more volume, surface detention may not be able to provide the total volume necessary to mitigate all storm drainage infrastructure improvements developed under the RDIP. The City would then need to consider other options for mitigation, including the following. These options could include the following, which would be implemented on a case-by-case basis to support specific projects.

- **Pumped detention:** Traditional surface detention ponds discharge by gravity to a receiving system, either a storm sewer network or a channel, where the depth of the receiving system dictates the total depth of the pond. As an alternative, surface detention ponds can be discharged using a pump system, which would allow the pond to be dug deeper as it would not rely on gravity to fully empty the pond. This would require the City to both construct and maintain the pump systems, increasing the construction costs and creating a new operations and maintenance (O&M) cost.

- **Inline detention:** Because of the extent of existing development in and around the City, large, vacant or developed properties are not readily available, and any such parcels are likely privately owned and would need to be acquired, if not already planned for redevelopment, which constrains the ability of the City to construct surface detention ponds. As an alternative, inline detention, which creates detention within the limits of existing rights-of-way, can be implemented where surface detention ponds are not viable.

Inline detention can be achieved in one of two ways: oversizing the storm sewer or lowering the street to create additional volume. The viability of both options is dependent on the extents of the existing right-of-way, the location and depth of other utilities, and the ability to meet drainage design criteria for both street ponding and structural flood risk reduction. The volume achievable using inline detention not as substantial as surface detention, making it more applicable for local drainage improvement projects where the scope is limited to one or two local streets.

- **Underground detention:** Underground detention, comprising large concrete basins or vaults constructed below grade, is a potential alternative to surface detention in highly developed or urbanized areas like the City. Underground detention basins or vaults can be constructed beneath surface improvements, like parking lots or buildings. Because the detention is built below grade, the basins or vaults cannot discharge by gravity, requiring a pump system for discharge. Underground detention basins are much more costly than other mitigation alternatives on a unit cost (dollars per acre-foot of volume) basis, especially when structures are built on the surface directly above them which necessitates more concrete and structural support to carry the structure's weight.

- **Detention credits from other entities:** Some detention ponds are constructed with excess volume (credits) to provide mitigation for future projects. Both COH and HCFCD have constructed detention ponds along Brays Bayou that may be feasible to provide mitigation for RDIP projects. The City should engage with both COH and HCFCD to determine if either entity has credits available in existing surface detention ponds along Brays Bayou that the City could purchase or otherwise acquire.

- **Public private partnerships (PPPs) for detention:** Publicly owned properties, especially those large enough to support detention ponds with substantial volume and those in a location hydraulically feasible to mitigate City projects, are limited. Because all private development requires mitigation, the City could engage with private property owners and developers to identify where partnership opportunities may exist for the City and the property owner to jointly construct detention on the private property, as opposed to the City trying to acquire the property outright. Such partnerships could focus on either surface detention ponds or underground detention, and the costs for construction and the available volume could be shared between the City and property owner or developer. Such partnerships could be pursued for any of the private properties presented in **Tables 1** and **2**, specifically Parcels 6 and 7.

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Surface detention ponds provide the most technically feasible form of mitigation needed to support the First Phase projects of the RDIP, as well as subsequent projects to be developed. This requires that the City acquire properties, either through a land swap agreement with COH or by purchasing privately or other publicly owned properties. If the City does not acquire such properties, the volume that can be achieved through other mitigation alternatives limits the ability to implement the RDIP. We will continue to evaluate opportunities to implement mitigation alternatives as the RDIP progresses, but it is important that the City seek to acquire the properties identified in **Table 2** to support construction of surface detention ponds.

If you have any questions regarding our analyses or the results or recommendations, or if we can be of further service, please contact us.

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Adam Eaton, P.E., ENV SP, CFM
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