

CLIENT: City of Austin
PROJECT NAME: Oak Knoll Storm Drain Improvements Project
PROJECT NO.: COA DO: 16060214043B
 LAN: 120-11884-003

PLANNING
 ENGINEERING
 PROGRAM MANAGEMENT
 Est. 1935
 AUSTIN, TX

TM001: Mitigation Alternatives Evaluation

TO:	Dario Octaviano (via email: Dario.Octaviano@austintexas.gov)
ISSUED BY:	Laura Casset, PE, CFM; William C Chandler, PE
REVIEWED BY:	Tom Mountz, PE
DATE:	9/17/2019
ATTACHMENTS:	<ol style="list-style-type: none"> 1. Overall Site Layout 2. Option 1 – Risk Considerations Memo (Baer Engineering) 3. Option 2 – Proposed Layout 4. Site-visit Photos 5. Elevation Area Relationships 6. HEC-HMS Results 7. Option 2 – Alternative Outfall Alignment 8. Cost Estimate Detail

Introduction/Summary

The Oak Knoll Storm Drain Improvements (OKSDI) project scope comprises expanding the storm drain system to relieve flooding in the Oak Knoll neighborhood. Refer to Attachment 1 for an overview of the site and the proposed work. The Preliminary Engineering Report (PER) proposed installing a detention pond on the U.S. Postal Service (USPS) property at 11900 Jollyville Road to mitigate increases in downstream discharges from the system (per Drainage Criteria Manual Section 8.3.0; DCM). During the 60% design phase, the project team identified a Voluntary Cleanup Program (VCP) site (VCP945) registered with the Texas Commission on Environmental Quality (TCEQ) on an adjacent parcel to the USPS site. The VCP is associated with a historical groundwater contamination and establishes the boundary of the existing plume for legal purposes. The proximity of the plume to the USPS site would pose risks to the City of Austin (City; COA) if the pond were constructed as proposed in the PER.

As such, the purpose of this Technical Memorandum is to document the evaluation of alternative flow mitigation designs that provide equal function and reduced risks as compared to that proposed in the PER. The following two alternatives were evaluated for these purposes (see following sections for detail):

- **Option 1: Pond at the USPS site.** The concept of this option is that the risks of construction/ownership of a pond at the USPS site could be reduced by modifying the previous pond design to limit potential disturbances to the plume (e.g., increasing offset from the plume, installing a pond liner, etc.).
Conclusion summary: Due to the revised plume extents, it is likely that any construction activities on the USPS site will impact the contamination plume. Consequences of impacting the plume are substantial. LAN recommends that no work take place on the USPS site.
- **Option 2: Alternative Location/Design.** The concept of this option is that risks of construction/ownership associated with the previous pond design at the USPS site could be reduced by installing a pond at a different location and avoiding the USPS site entirely.
Conclusion summary: Downstream flows can be effectively mitigated by improving the capacity of the Chelsea Moor Pond as well as installing an underground detention system in the Columbia Oaks Drive right-of-way (ROW). **LAN recommends pursuing construction of this design.**

Mitigation Alternatives Evaluation

Option 1: Pond at USPS Site

Refer to Attachment 2 for a detailed evaluation of risks associated with pursuing construction on the USPS site. Note that the VCP945 Response Action Plan (RAP) was recently updated to include a revised plume management zone that is larger than previously delineated. In discussions with TCEQ, we understand that the plume extents shown in this update are final and are to be imminently recorded.

The RAP presents substantial legal risks to any independent party that disturbs the area adjacent to the contamination plume. As groundwater is very shallow on the USPS site, any construction activities risk impacting the plume – thereby introducing liability to assume responsibility to remediate if impacts are confirmed. Due to the revised extents of the contamination plume, there is now insufficient space within the USPS parcel to accommodate the required pond dimensions without extending into the plume limits

For these reasons, LAN recommends that no construction activities be proposed on the USPS site.

Option 2: Alternative Location/Design

In revisiting potential locations for installation of stormwater detention infrastructure, LAN and the City collaboratively identified a potential mitigation alternative as a combination of:

- Improvements to the existing Chelsea Moor Pond (CM Pond; east of Broad Oaks Drive on Chelsea Moor/Woodcrest Drive); and/or
- Installation of an Underground Detention System (UDS) in the Columbia Oaks Drive ROW.

Refer to Attachment 3 for an overview of the proposed layout. The hydrologic and hydraulic analyses concluded that both improvements to the existing CM Pond and installation of an UDS in the Columbia Oaks ROW are needed to prohibit increases in downstream discharge from the storm drain system.

Hydrologic and Hydraulic Analyses

The hydrologic analysis was computed using U.S. Army Corps of Engineers Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS; version 4.3). The model used for the current analysis was based on the model produced for the OKSDI 60% design to evaluate the downstream impacts of the proposed system and design the detention pond at the USPS site. During the previous phase, the model was calibrated to better reflect the watershed conditions found in the InfoWorks-ICM model developed for preliminary engineering. The existing Chelsea Moor Pond and the Atlas 14 storm events (2-, 10-, 25-, and 100-year) were added to the model. The peak flow, time to peak, and volume at the outfall across Jollyville Road were evaluated for the Atlas 14 storm events to identify impacts downstream. Atlas 14 depths were obtained from the National Weather Service at the project centroid. Table 1 presents the 24-hour Atlas 14 rainfall depths used for this analysis.

Table 1: Atlas 14 24-Hour Rainfall Depths

Depth of Precipitation (inches)			
2-year	10-year	25-year	100-year
4.03	6.58	8.50	12.1

The CM Pond in the existing conditions is a one-acre pond that is maintained by the COA (within drainage easements) and detains overflow runoff from the Shadow Oaks apartment complex. Flows from the CM Pond are discharged into the Chelsea Moor ROW (in the Oak Knoll watershed). The Shadow Oaks apartment complex maintains a private pond (the Shadow Oaks pond; SOP) that is upstream of the CM Pond. The SOP discharges flows via an overflow weir to the CM Pond but otherwise discharges flow to an

adjacent watershed. This analysis assumes that the SOP is functioning as designed (see note in recommendations). The ponds were modeled using record drawings, survey data collected in July 2019, and TNRI 2017 LiDAR data. The project team visited the site in August 2019 to evaluate existing conditions and confirm critical measurements. Photos from this site visits can be found in Attachment 4.

Since the SOP is privately owned and any modifications would require ROW acquisition, pond improvements were focused on the CM Pond. The site constraints (i.e., existing ROW, heritage trees, homeowner assets, etc.) at the CM Pond do not allow the pond to be expanded to attenuate the total required volume. Proposed improvements include increasing the capacity of the pond, connecting the outfall directly to the proposed storm sewer system, and modifying the existing rock wall to better protect adjacent homes (Note: homeowners at 11708 Broad Oaks Drive told the project team that the east wall of the CM POND has overtopped into their backyard three times in the last seven years. They also noted a dip in the wall where the pond usually overtops first - shown as Figure 4 in Attachment 4). Approximately 0.4 acre-ft of soil is proposed to be excavated from the existing pond, thereby lowering the outlet flowline by 5.5-ft. The proposed outlet structure is a 24-in reinforced concrete pipe (RCP) with a 20-in collar and a 10-ft wide spillway.

Since the CM POND alone is insufficient to mitigate increases in downstream flows, other detention options were considered. There is little opportunity to acquire ROW of proportions necessary to install a new surface water detention pond due to the development density in the Oak Knoll neighborhood. As such, underground detention within existing ROW was evaluated to provide the remaining required detention volume. The Columbia Oaks Drive ROW is ideal for such installation because: it is relatively free of utilities; not on a main collector street; and, located in-line with the proposed storm drain network. In order to detain the required 0.5 acre-ft of volume, a 25-ft wide by 5-ft high by 250-ft long Forterra Crown Span is proposed with an 18-in RCP discharge that re-connects with the existing system. A splitter box is proposed at the upstream junction of the UDS with the proposed storm sewer system to regulate the flow split. The 60% design StormCAD model (updated to include the proposed UDS) confirms that proposed headlosses will not substantially influence the upstream pipe network.

Table 2: Reduction of Atlas 14 Peak Flows at the Jollyville Road Outlet

Storm Frequency	Existing Conditions Q (cfs)	Proposed Conditions Q (cfs)	Δ Q (cfs)
2-yr	152	152	-1
10-yr	256	255	-1
25-yr	339	338	-1
100-yr	502	492	-10

The elevation-area relationships for the CM Pond and UDS are included in Attachment 5. Detailed HEC-HMS results are presented in Attachment 6. The construction cost for the CM Pond modifications and UDS is estimated to be \$294,300 and \$1,583,100 respectively (Total: \$1,877,400). The design proposed in Option 2 is compliant with COA DCM 8.3.0 criteria considering the evaluated Atlas 14 storm events (2-, 10-, 25-, and 100-year).

Other considerations

As shown in Attachment 3, the recommended layout uses the existing storm drain network from Columbia Oaks Drive downstream to the existing network outfall with no proposed modifications. Stormwater discharged from the existing outfall over-land and accumulate on the USPS site prior to crossing Jollyville Road via two 6x3-ft box culverts. The USPS site is a natural topographical depression and is

partially inundated under existing conditions. As the recommended mitigation arrangement does not propose any modification to the USPS site, inundation will be unchanged by the OKSDI scope.

Easement dedication

The Land Development Code (25.7.152) mandates that the 100-year floodplain be dedicated by easement when such area exists in property proposed for development. The City of Austin otherwise attempts to dedicate known or planned inundation by drainage easement when such extents are in the project limits. As the recommended arrangement avoids any construction on the USPS site, this inundation is not within the proposed project limits and so the City is not obligated by regulation or precedent to pursue dedicating a drainage easement for the inundated area.

Alternative outfall

The groundwater contamination plume extends within approximately 50-ft of the Jollyville Road box culverts. No work is proposed on the USPS site with Option 2. It is important to note that any future construction activities at the Jollyville Road box culverts would risk the same consequences described above regarding construction of Option 1. As the plume is stable and active remediation is not feasible, this restriction on construction at the culverts should be considered permanent.

For informational purposes, we reviewed the project survey data and record information to evaluate conceptual-level feasibility of abandoning the existing culverts and constructing new culverts to avoid future conflicts with the plume. Attachment 7 illustrates conceptual alternative outfall alignments and summarizes anticipated conflicts. In summary, two alternative outfall alignments appear to be feasible but would require substantial engineering efforts to confirm impacts to downstream infrastructure. For planning purposes, we approximate the cost to construct either of these alternatives as \$1,500,000 (including professional services). This scope and associated cost are not included in the recommended design.

Recommendation and Conclusions

For the reasons described above, LAN recommends that no work be conducted at the USPS site and that the design presented as Option 2 be pursued in place of the detention pond proposed in the PER. The total estimated construction cost of the proposed arrangement is \$1,877,400. Refer to Attachment 8 for a detailed cost estimate.

Pursuing construction of the Option 2 design does not require any changes to the prior permitting requirements (refer to the PER Section 5 for greater detail). A City of Austin Site Plan Permit will be required for construction of the OKSDI scope including the Option 2 arrangement.

Design Impacts of Atlas 14

The City had not adopted design criteria associated with Atlas 14 criteria at the onset of this project. Due to the delays in project schedule associated with VCP945, the project has now extended well past the City's adoption of interim design standards to account for Atlas 14 latest precipitation data. For that reason, LAN has evaluated what impacts the increased Atlas 14 precipitation will have on the project design.

The design proposed in Option 2 is capable of mitigating increases in downstream flows considering the Atlas 14 storm events. The storm drain improvements proposed in the PER are inadequate to convey Atlas 14 storm events and would require adding inlets and upsizing the proposed trunkline. In total, these changes would result in an approximately \$500,000 increase to the PER cost estimate.

Note Regarding Shadow Oaks Pond

During a site-visit after a storm event, LAN observed a debris-line on the downstream side of the southeast corner of the Shadow Oaks berm – potentially indicative of a sag in the berm profile (Attachment 3, Figure 8). If this is the case, water that overtops the berm would flow towards the CM Pond and enter the Oak Knoll system instead of being conveyed to a separate watershed as designed. As noted above, the Option 2 design considers the Shadow Oaks pond berm to be of condition shown in the record drawings – which would not allow said unintentional flows into the Oak Knoll system. Because the Oak Knoll system was not designed to convey these flows, such an occurrence could contribute substantially to the flooding currently experienced in the Oak Knoll project area. Consequently, we recommended that the City request the Shadow Oaks management to verify that the berm condition and Shadows Oaks pond outfalls are functioning as designed. This would require the Shadow Oaks development provide as-built drawings or survey documentation illustrating that the current pond structures match the design plans.

Please do not hesitate to contact me with any questions or comments using the information provided below.

Sincerely,



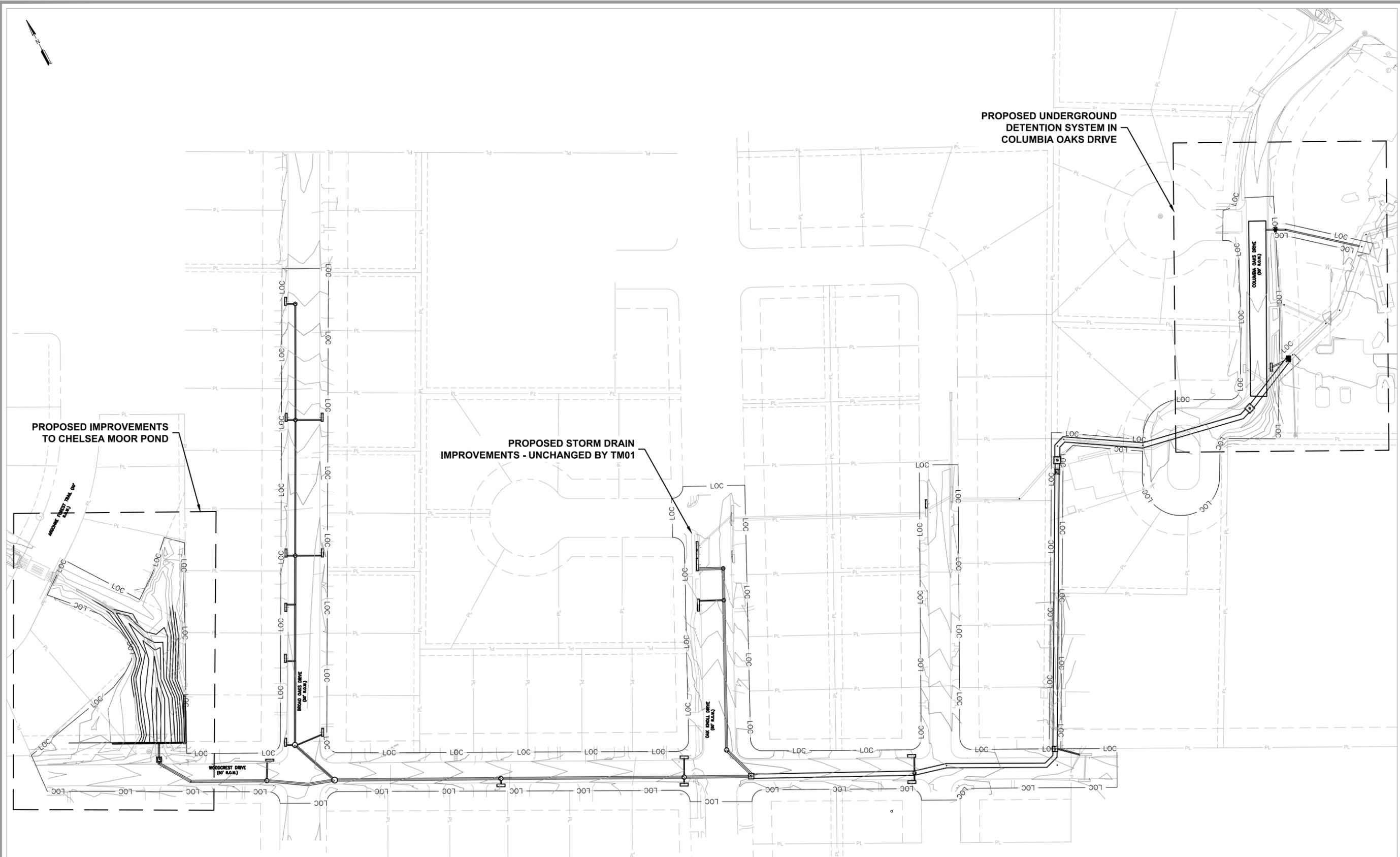
Laura Casset, PE, CFM
Lockwood, Andrews, & Newnam, Inc.
Project Manager
E: LMCasset@LAN-inc.com
T: 512 338 4212



Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614
William C Chandler, PE
Lockwood, Andrews, & Newnam, Inc.
Project Engineer
E: WCChandler@LAN-inc.com
T: 512 338 2729

cc. Reem Zoun, PE (Reem.Zoun@austintexas.gov)
Rupali Sabnis, PE (Rupali.Sabnis@austintexas.gov)
Tom Mountz, PE (TWMountz@LAN-inc.com)
Ollie Trager, EIT (OEMTrager@LAN-inc.com)

ATTACHMENT: 1. Overall Site Layout



1 OVERALL PROJECT SCOPE INCLUDING TM01 RECOMENDATION
SCALE: 1"=60'

REV. NO.	BY	DATE	REVISION DESCRIPTION

INTERIM REVIEW ONLY
Not to be used for construction, bidding, permit or regulatory approval purposes. This document is released for the purpose of interim review under the authority of:
LAURA M CASSETT
99387
SEPTEMBER 17, 2019

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

WATERSHED PROTECTION DEPARTMENT
OAK KNOLL STORM DRAIN IMPROVEMENTS PROJECT
OVERALL LAYOUT
TM01 - MTGN ALT. EVAL.



NOTES	NAME	DATE
DRAWN BY	SEM	
CHECKED BY	LMC	
DESIGNED BY	OET	
REVIEWED BY	TWM	

LAN Lockwood, Andrews & Newnam, Inc.
A LEAF A DAILY COMPANY
8911 N. CAPITAL OF TEXAS HWY
BUILDING 2, SUITE 2300
AUSTIN, TX 78759
PERMIT NUMBER

ATTACHMENT: 2. Option 1 – Risk Considerations Memo (Baer Engineering)



September 5, 2019

Lockwood, Andrews & Newnam, Inc.
8911 N. Capital of Texas Hwy, Building 2, Suite 2300
Austin, TX 78759

Delivered via e-mail to WCCChandler@lan-inc.com

Attention: Mr. William C. Chandler, P.E.

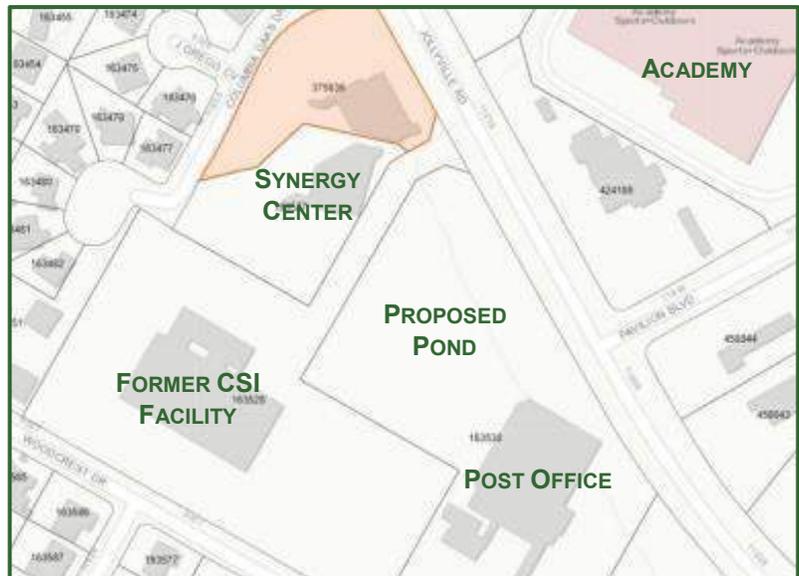
**Reference: Environmental Risk Considerations for Stormwater Pond
Installation into an Active Plume Management Zone**
Walnut Creek Watershed Drainage Improvements
Oak Knoll Drive and Surrounding Streets in Austin, Texas
City of Austin 2015 Watershed Engineering Flood Hazard Mitigation Rotation List
Baer Engineering Document No. 162014-8b.021

Dear Mr. Chandler:

Baer Engineering and Environmental Consulting, Inc. (Baer Engineering), is pleased to provide this Technical Memorandum discussing the environmental factors involved with installing a stormwater pond into an active Plume Management Zone (PMZ).

PROJECT INFORMATION

Lockwood, Andrews, & Newman (LAN) is in the process of designing drainage improvements for Oak Knoll Drive. Upon review of existing conditions and siting constraints for a stormwater management pond, the design team found there is potential for exposure to an existing groundwater contamination plume. One of the location options for the proposed pond is an area of undeveloped land adjacent to the U.S. Postal Service (USPS) Balcones Post Office at 11900 Jollyville Road. Much of this parcel is also included in the PMZ of a remediation project. (See location diagram, at right.)



SITE HISTORY

The former Columbia Scientific Industries (CSI) facility is located to the west and slightly south of the proposed pond location. The former CSI facility was constructed in 1973 and operated from 1973 until approximately 1993. During that time, CSI manufactured air monitoring instruments and other scientific equipment. Operations involved solvent degreasing of parts, acid neutralization and sand trap filtration in on-site concrete tanks, and use of various hazardous chemicals for instrument manufacture/maintenance. Small quantities of chlorinated

Baer Engineering and Environmental Consulting, Inc.

7756 Northcross Drive, Suite 211  Austin, Texas, U.S.A. 78757

Telephone: (512) 453-3733  www.BaerEng.com  Fax: (512) 453-3316

solvents (reportedly 10 to 70 gallons per year) were used at the property in a vapor degreaser. Solvent use ceased in 1993, and the property is currently used for office space only.

A volatile organic compound (VOC) groundwater plume was identified at the facility. The chemicals of concern (COCs) are:

- Trichloroethylene
- 1,1,2-Trichloroethane
- 1,1-Dichloroethylene (1,1-DCE)

Based on groundwater samples collected in May 2014, the plume is approximately 620 feet long, and currently extends off the former CSI property and onto the USPS property. The affected area occupies approximately 1.4 acres. The figure on the following page shows the location of the Plume Management Zone (PMZ).

That facility is currently undergoing remediation by monitored natural attenuation (MNA) in the Voluntary Cleanup Program (VCP). In May of 2017, ERM (on behalf of CSI), turned in a Response Action Plan (RAP) to the TCEQ. This plan proposed a Restrictive Covenant on the area of the contaminant plume, which includes the location of the proposed detention pond. These covenants were finalized in August of 2019 and have been (or will be) recorded at the Travis County offices. A copy of the covenant is presented as **ATTACHMENT 1**. The main points in the covenant are:

- *Defining a plume management zone (PMZ) as an area of groundwater containing concentrations of chemicals of concern exceeding the TCEQ-approved protective concentration levels in accordance with 30 TAC §350.33(f(4)).*
- *Establishing the PMZ on the property.*
- *Stating the reason for the PMZ, which is so that the chemicals of concern in the groundwater are managed such that human exposure is prevented and other groundwater resources are protected.*
- *Describing the maintenance and monitoring required to be conducted at the PMZ. This maintenance and monitoring must be implemented unless and until TCEQ approves some modification of those requirements.*
- *Identifying the record owner of fee title to the Property as the United States Postal Service (the "Owner") with an address of 475 L'Enfant Plaza, SW, Washington, D.C. 20260.*
- *Restricting property use by stating: "Exposure to the groundwater underlying the Affected Property for any purpose is prohibited until such time when all of the chemicals of concern no longer exceed their respective protective concentration levels. The maintenance and monitoring described in Exhibit B is required to be conducted by the Responder or its successors. Any modification of this restrictive covenant is prohibited without prior approval of TCEQ."*
- *Noting that these restrictions shall be a covenant running with the land.*

MAINTENANCE AND MONITORING

There are several monitoring wells on the property that are tested on a semi-annual basis:

- PO-1 ○ PO-3 ○ PO-7 ○ PO-9 ○ PO-11*
- PO-2 ○ PO-4 ○ PO-8 ○ PO-10*

*Proposed future well – if required by TCEQ.

Groundwater samples are analyzed for volatile organic compounds (VOCs) by SW846 8260B.

GEOLOGY/HYDROLOGY

- The Former CSI site used chlorinated solvents. Chlorinated volatile organic compounds (CVOCs), primarily 1,1-DCE, have been detected in the groundwater since the late 1990s.
- The site geology comprises a clayey to sandy soil or fill over limestone bedrock.
- Bedrock is located within three feet of the ground surface.
- The monitoring wells are 30 to 35 feet in total depth, and groundwater is shallow.
- Groundwater flow direction is generally to the east and northeast.
- The physical characteristics of the uppermost groundwater bearing unit (GWBU) are dominated by dual-porosity, both fracture and pore-driven. This architecture, combined with the dense (i.e., heavier than water) nature of the contaminant, sets up matrix diffusion that limits the mobility of the contaminant, and limits the treatability of the groundwater plume by injection or other remedial options.
- The extent of the groundwater plume has remained constant over seven years, and the 1,1-DCE concentrations continue to decrease over time.
- Monitoring will continue until the concentrations along the plume axis are below the attenuation action level, and PMZ monitoring wells show concentrations below the protective concentration levels (PCLS) for three consecutive years.
- If the area of PCL exceedance begins to migrate, the TCEQ will require additional wells on the USPS property.
- The remedy selected for the Site is a PMZ with MNA. Ongoing Site data show that this approach will continue to reduce the mass of contaminants and extent of the plume.

RISK ANALYSIS – POND INSTALLATION ON USPS PROPERTY

There are two primary risks the City of Austin (COA) would incur by placing a pond on this property:

- Altering and/or enhancing the plume flow and being named a Responsible Party (RP) by the TCEQ; and
- Additional expenses from monitoring, waste disposal, and design.

I have tabulated some of the considerations below:

Consideration	Discussion
The covenant says excavation into the PMZ will require approval from the TCEQ and from the property owners.	Joe Bell, TCEQ Project Manager, said the TCEQ is unlikely to turn down such a request. However, the responsible party (RP) for the contamination is not required to approve. Excavation in the PMZ will likely affect the plume, perhaps causing it to migrate. The RP has been working to stabilize this plume for close to two decades. I would not expect them to approve something that invalidates part of their progress.
If COA digs into the plume, excavates contaminated soils, or causes changes in the PMZ, COA will become an RP for the site.	Right now, the site is controlled through the PMZ, the restrictive covenants, and the ongoing monitoring. Affecting this stability and/or generating waste with contamination from the CSI site would add COA to the list of RPs. At the least, COA would be responsible for mitigating the consequences of the disturbance.
If the pond is installed it will become a preferred pathway	The area of lower pressure could short-circuit natural groundwater flow and provide a pathway to uncontaminated

Consideration	Discussion
for contaminant migration.	soils.
Impacts to the PMZ could be minimized by moving or reshaping the pond footprint to avoid the PMZ.	Soil and/or groundwater disturbance downgradient of the plume would still be hydrologically connected to the contamination. Creating a preferred pathway could cause the plume to migrate.
Consider installation of a cutoff wall between the PMZ and the pond location.	This would take the form of sheet piling or a slurry wall. Installation could be difficult because of shallow bedrock. Disturbing the bedrock is likely to disturb the product lodged inside.
Consider lining and contouring the pond to limit groundwater interaction in the PMZ.	After the initial disturbance, infiltration to the pond could be mitigated by adding a lining. The preferred lining is clay. It may be possible to use an impermeable membrane, but that would be dependent upon the materials characteristics. It is essential that the liner material be compatible with the COCs.
Consider establishing a hydraulic barrier between the pond and the PMZ.	Pumping water out of the plume area will maintain the groundwater gradient towards the contaminant source. All wastewater generated becomes waste belonging to COA. Another consideration is that, by pumping out the groundwater, additional product will be mobilized out of the bedrock. Once pumping ceases it is possible that rebound will cause the COC concentrations to go up.
Consider installing a plume monitoring system at the same time as the pond is installed.	This would allow COA to gather data on plume encroachment. These data would allow COA to demonstrate compliance with the PMZ. The monitoring system could be as simple as placing sentinel wells around the pond. Initial, and then semi-annual monitoring, would be adequate to show plume stability with respect to COA property.

ADDITIONAL EXPENSES

If COA chooses to install a stormwater pond into the PMZ, the following estimated expenses may be incurred:

ITEM	BREAKDOWN	COST
Procure TCEQ and RP permission to disturb plume.	16 hours @ \$150/hr	\$2,400
Prepare plume monitoring plan.	4 hours @ \$150/hr	\$600
Install three monitoring wells to 20 feet in depth.	3 wells @ \$4,000/ea	\$12,000
Semi-annual sampling three wells.	20 hours @ \$150/hr	\$3,000
Semi-annual samples, three wells, VOCs.	6 samples @ \$225/ea	\$1,350
Waste disposal.	1 drum @ \$500/ea	\$500
Sampling pond water, two samples, monthly, VOCs	24 samples @ \$225/ea	\$5,400
Reporting to COA, RP, and TCEQ	32 hours @ \$150/hr	\$4,800
Additional pond design.	Engineering	Unknown
Installation of pond liner.	\$10,000 to \$30,000	Varies
Installation of cutoff wall.	\$10,000 to \$30,000	Varies
Installation of hydraulic control.	2 wells @ \$4,000/ea	\$8,000
Weekly dewatering samples.	52 samples @ \$225/ea	\$11,700
Waste disposal for hydraulic control.	20 gpm, 360 days 10,368,000 gallons	Varies

These costs were used to estimate initial and annual fees, as shown in the following table.

ITEM	INITIAL COST	ANNUAL COST
Procure TCEQ and RP permission to disturb plume.	\$2,400	\$300
Prepare plume monitoring plan.	\$600	\$200
Install three monitoring wells to 20 feet in depth.	\$12,000	\$1,000
Semi-annual sampling three wells, labor	\$3,000	\$3,000
Semi-annual samples, three wells, VOCs.	\$1,350	\$1,350
Waste disposal.	\$500	\$500
Sampling pond water, two samples, monthly, VOCs	\$5,400	\$5,400
Reporting to COA, RP, and TCEQ	\$4,800	\$4,800
Additional pond design.	Unknown	Unknown
Installation of pond liner.	Varies	Varies
Installation of cutoff wall.	Varies	Varies
Installation of hydraulic control.	\$8,000	\$1,000
Weekly dewatering samples.	\$11,700	\$2,700
Waste disposal for hydraulic control. This task can be very costly. Unless we can get permission to discharge to the sanitary sewer, disposal costs could be more than \$1,000,000.	Varies	Varies
TOTALS	\$49,750.00	\$20,250.00

ASSUMPTIONS:

- I used one general labor rate of \$150/hr.
- Wells will require installation by auger.
- Wells will be sampled twice per year.
- Pond will be sampled monthly for first year.
- No attorney’s fees have been included.
- Costs for mitigation items (hydraulic control, slurry wall, etc.) are estimates based on minimal data and do not reflect quotes from contractors. They are not included in the overall totals.

OVERALL COSTS

If COA chooses to install a stormwater pond at this location, there will be a minimum initial cost of \$50,000, plus the cost of the additional engineering and controls on the pond. There will be a minimum annual cost of \$20,000 for sampling and maintenance.

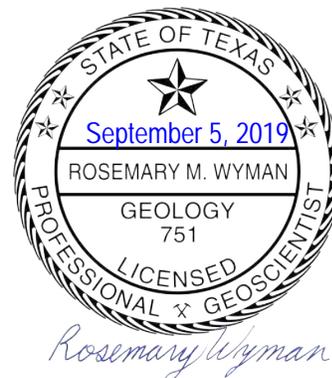
Please let me know if you have questions about this letter report. I can be reached by email at rwyman@baereng.com, or by telephone at 512.585.0176.

Respectfully submitted,
BAER ENGINEERING AND ENVIRONMENTAL CONSULTING, INC.

Rosemary Wyman

Rosemary Wyman, P.G. (TX751), CHMM, CPESC
 Principal Geologist
 Environmental, Health, and Safety Manager

Attachment: Restrictive Covenants





0000-0000-0036-0818

Document Control Sheet

Sheet Title:	VCP - OLS
Box ID:	10521
Control Sheet ID:	0000-0000-0036-0818
Record Series Name:	WST / Voluntary Cleanup Program
Record Series:	VCP
Primary ID:	945
Secondary ID:	
Doc Type:	Documents Incoming
Security:	Public
Date:	8/2/2019 12:00AM
Title:	RAP REV
Tertiary ID	

United Technologies Corporation
 9 Farm Springs Road
 Farmington, CT 06032

VCP 945
 IN DATE: 8/2/2019
 DOC. TYPE: RAP REV
 COMM #: 24404975
 PROJ. MGR.: J BELL

August 2, 2019

Mr. Joe Bell
 Texas Commission on Environmental Quality
 Voluntary Cleanup Program
 Corrective Action Section
 12100 Park 35 Circle, Building D
 Austin, TX 78753

RECEIVED

AUG 13 2019

TCEQ
 CENTRAL FILE ROOM

ORIGINAL

**Re: Former CSI Facility, 11950 Jollyville Road
 Austin, Travis County, TX
 Voluntary Cleanup Program (VCP) No. 945
 Customer No. CN601409949, Regulated Entity No. RN100604065**

Dear Mr. Bell:

Enclosed are the Restrictive Covenants to be recorded as part of the Response Action Plan for the above referenced facility. The Restrictive Covenant for 11950 Jollyville Road presents the language agreed upon with you to accommodate the property owner's concern with potential future construction activity.

Further to ERM's letter to you dated March 15, 2019 and to provide clarification consistent with the enclosed Restrictive Covenants, for the long-term monitoring of the institutional control, PO-4 and PO-9 will be monitored semi-annually as conservative points of exposure. In the event that concentrations at either monitoring well PO-4 or PO-9 exceed the attenuation action level (AAL) for the chemicals of concern, additional downgradient monitoring well(s) will be installed to monitor compliance of the PMZ within the institutional control boundary. The proposed future wells, if needed, are identified as PO-10/PO-11; the Restrictive Covenant for 11882 Jollyville Road now presents this on Exhibit B-2. The table below supersedes that presented in ERM's March 15, 2019 correspondence with the change in Exhibit number underlined.

Description of the Potential Problem	Impact	Will this cause a response action failure?		Corrective Response
		Y	N	
Monitoring well damage/collapse	Potentially unable to monitor MNA		X	Repair or replace the monitoring well as necessary to monitor MNA.
Statistical increase in COC concentration above historical maximum concentrations in one or multiple attenuation monitoring points.	Plume movement may be present or MNA is not effective.		X	Perform data usability evaluation to check the integrity of the data results. If necessary, resample monitoring well(s) to confirm concentration. If exceedance is confirmed, resample the monitoring well within 3 months to evaluate if the concentration is a one-time occurrence or a statistical trend. If exceedance trend is confirmed, evaluate additional options to establish plume stability. If exceedance trend is confirmed at PO-6, evaluate if an additional monitoring well is required east of the PMW.

RECEIVED
 AUG 05 2019
 VCP-CA Section

<p>Detection of COCs above AAL at PO-4 and PO-9 as POE wells.</p>		X	<p>Perform data usability evaluation to check the integrity of the data results.</p> <p>If necessary, resample monitoring well to confirm concentration.</p> <p>If exceedance is confirmed at PO-4/PO-9 POE wells, install a new groundwater monitoring well, PO-10/PO-11 <u>as noted on Exhibit B-2</u> of the Restrictive Covenant for 11882 Jollyville Road.</p>
<p>Detection of COCs above /AAL at POE or PMZ Monitoring Well (for all wells except PO-4 or PO-9 as POE wells).</p>			X

Please provide your approval to proceed with the filing of the Restrictive Covenants. If you have any questions, you may contact me at (248) 538-0190.

Very truly yours,



Paul M. Di Nardo
Associate Director, Remediation

Enclosures

cc: Diane Bellantoni, UTC
Alicia Fogg, ERM

**TEXAS RISK REDUCTION PROGRAM
RESTRICTIVE COVENANT**

STATE OF TEXAS §
 §
COUNTY OF TRAVIS §

This Restrictive Covenant is filed to provide information concerning certain environmental conditions and use limitations pursuant to the Texas Commission on Environmental Quality (the "TCEQ") Texas Risk Reduction Program (the "TRRP") Rules found at 30 Texas Administrative Code ("TAC"), Chapter 350, and affects the real property (the "Property") described as follows:

LOTS THREE (3) AND FOUR (4), BLOCK B, COLUMBIA OAKS, A SUBDIVISION
IN THE CITY OF AUSTIN, TRAVIS COUNTY, TEXAS, ACCORDING TO THE MAP
OR PLAT OF RECORD IN VOLUME 81, PAGE 41, PLAT RECORDS OF TRAVIS
COUNTY, TEXAS.

Portions of the groundwater of the Property contain certain identified chemicals of concern causing those portions of the Property to be considered an Affected Property as that term is defined in the TRRP. The portion considered to be Affected Property is described as follows:

Refer to Exhibit A, attached hereto and incorporated herein by reference for the metes and
bounds description of the Affected Property, a plat map and a list of chemicals of concern
by medium.

This Restrictive Covenant is required for the following reasons:

The Affected Property is subject to the TRRP requirements for properties with an area overlying a TCEQ-approved plume management zone. A plume management zone is defined as an area of groundwater containing concentrations of chemicals of concern exceeding the TCEQ-approved protective concentration levels, plus any additional area allowed by the TCEQ in accordance with 30 TAC §350.33(f)(4). A plume management zone was established so that the chemicals of concern in the groundwater are managed such that human exposure is prevented and other groundwater resources are protected. The attached Exhibit B provides the location and extent of the plume management zone and describes the maintenance and monitoring required to be conducted by Responder or its successors. This maintenance and monitoring must be implemented unless and until TCEQ approves some modification of those requirements.

As of the date of this Restrictive Covenant, the record owner of fee title to the Property is United States Postal Service (the "Owner") with an address of 475 L'Enfant Plaza, SW, Washington, D.C. 20260. In consideration of the Response Actions by Kidde Fire Protection Inc. on behalf of Forney Corporation (the "Responder"), approval of the Response Action Plan, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Owner has agreed to place the following restrictions on the Property in favor of the TCEQ and the State of Texas, to-wit:

1. Plume Management Zone: Exposure to the groundwater underlying the Affected Property for any purpose is prohibited until such time when all of the chemicals of concern no longer exceed their respective protective concentration levels. The maintenance and monitoring described in Exhibit B is required to be conducted by the Responder or its successors. Any modification of this restrictive covenant is prohibited without prior approval of TCEQ.
2. These restrictions shall be a covenant running with the land.

For additional information, contact:

TCEQ Central Records
12100 Park 35 Circle
Building E
Austin, Texas 78753

Mail: TCEQ - MC 199
P.O. Box 13087
Austin, TX 78711-3087

TCEQ Program and Identifier No.: VCP No. 945

This Restrictive Covenant may be rendered of no further force or effect only by a release executed by the TCEQ or its successor agencies and filed in the same Real Property Records as those in which this Restrictive Covenant is filed.

[Signature pages follow.]

Executed this ____ day of _____, 2019.

OWNER:

UNITED STATES POSTAL SERVICE

By: _____

Name: _____

Title: _____

STATE OF NORTH CAROLINA §

§

COUNTY OF GUILFORD §

§

BEFORE ME, on this the ____ day of _____, 2019, personally appeared _____, _____ of United States Postal Service, known to me to be the person whose name is subscribed to the foregoing instrument, and he acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE,
this the ____ day of _____, 2019.

Notary Public in and for the
State of North Carolina
County of Guilford
My Commission Expires: _____

Accepted as Third-Party Beneficiary this ____ day of _____, 2019.

**TEXAS COMMISSION ON
ENVIRONMENTAL QUALITY,**

By: _____
Name: _____
Title: _____

STATE OF TEXAS §
 §
COUNTY OF TRAVIS §

BEFORE ME, on this the ____ day of _____, 2019, personally appeared _____, _____ of the Texas Commission on Environmental Quality, known to me to be the person whose name is subscribed to the foregoing instrument, and he acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE,
this the ____ day of _____, 2019.

Notary Public in and for the State of Texas
County of _____
My Commission Expires: _____

EXHIBIT A

Exhibit A-1: Legal Description of the Affected Property

Exhibit A-2: Plat Map of the Affected Property

Exhibit A-3: Chemicals of Concern

Exhibit A-1

Legal Description of the Affected Property

[see attached]

PERIMETER DESCRIPTION

DESCRIPTION OF A 4.55 ACRE TRACT OF LAND LOCATED IN THE JAMES D. GOODE SURVEY, SECTION 30, ABSTRACT NO. 307, TRAVIS COUNTY, TEXAS, BEING SITUATED IN LOT 1, LOT 3 AND LOT 4, BLOCK B, OF COLUMBIA OAK, SUBDIVISION OF RECORD IN VOLUME 81, PAGE 41, OF THE PLAT RECORDS TRAVIS COUNTY, TEXAS, SAID 4.55 ACRE TRACT, AS DEPICTED ON THE ACCOMPANYING EXHIBIT WHICH IS A PART HEREOF, BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

COMMENCING at a 1/2-inch iron rod found for the southeast corner of Lot 1, of said Columbia Oaks, Block B, also being the southwest corner of Lot 4, Block B of said Columbia Oaks and in the north margin of Woodcrest Drive (50' R.O.W.) of Woodcrest recorded in Volume 81, Page 55 ; Plat Records of Travis County, Texas

THENCE North 60°38'12"04" West, over and across said Lot 1, for a distance of 259.68 feet to a calculated point at the **POINT OF BEGINNING** of the herein described tract, said point being on the arc of a non-tangent curve to the right;

THENCE over and across said Lots 1 and 3 the following thirty-three (33) courses and distances:

1. Along said curve to the right an arc distance of 190.59 feet, said curve having a central angle of 02°07'32", a radius of 5,137.21 feet and whose chord bears North 61°56'40" West, a distance of 190.58 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
2. Continuing along the curve to the right an arc distance of 188.43 feet, said curve having a central angle of 02°47'13", a radius of 3,873.80 feet and whose chord bears North 60°39'25" West, a distance of 188.41 feet to a calculated point for point of curvature of a non-tangent curve to the right;
3. Continuing along the curve to the right an arc distance of 9.67 feet, said curve having a central angle of 74°40'52", a radius of 7.42 feet and whose chord bears North 23°11'03" West, a distance of 9.00 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
4. Continuing along the curve to the right an arc distance of 24.94 feet, said curve having a central angle of 17°55'29", a radius of 79.71 feet and whose chord bears North 26°04'12" East, a distance of 24.84 feet to a calculated point for the curve herein described;
5. North 31°41'45" East, a distance of 11.65 feet to an existing monitor well and the point of curvature of a non-tangent curve to the right;
6. Continuing along the curve to the right an arc distance of 120.75 feet, said curve having a central angle of 07°36'23", a radius of 909.53 feet and whose chord bears North 47°44'18" East, a distance of 120.66 feet to a calculated point for the point of curvature of a non-tangent curve to the right;

7. Continuing along the curve to the right an arc distance of 49.94 feet, said curve having a central angle of $11^{\circ}48'57''$, a radius of 242.14 feet and whose chord bears North $59^{\circ}07'27''$ East, a distance of 49.85 feet to an existing monitor well and the point of curvature of a non-tangent curve to the right;
8. Continuing along the curve to the right an arc distance of 178.40 feet, said curve having a central angle of $17^{\circ}04'34''$, a radius of 598.60 feet and whose chord bears North $78^{\circ}22'55''$ East, a distance of 177.74 feet to an existing monitor well and the point of curvature of a non-tangent curve to the right;
9. Continuing along the curve to the right an arc distance of 82.62 feet, said curve having a central angle of $08^{\circ}17'57''$, a radius of 570.36 feet and whose chord bears South $88^{\circ}07'16''$ East, a distance of 82.54 feet to a calculated point for the end of the curve herein described;
10. South $87^{\circ}01'53''$ East, a distance of 22.69 feet to the point of curvature of a non-tangent curve to the left, also from which a 1/2" iron rod found for an interior angle point of said Lot 1, also being the southeast corner of Lot 2, Block B of said Columbia Oaks bears North $14^{\circ}25'17''$ East, a distance of 34.65 feet;
11. Continuing along the curve to the left, an arc distance of 78.25 feet, said curve having a central angle of $21^{\circ}23'14''$, a radius of 209.62 feet and whose chord bears North $79^{\circ}10'22''$ East, for a distance of 77.80 feet to end of the curve herein described and from which an existing monitor well bears South $71^{\circ}21'50''$ East, a distance of 37.98 feet;
12. North $69^{\circ}16'24''$ East, a distance of 108.23 feet to a calculated point for the point of curvature of a non-tangent curve to the left;
13. Continuing along a curve to the left, an arc distance of 36.49 feet, said curve having a central angle of $16^{\circ}04'53''$, a radius of 130.00 feet and whose chord bears North $60^{\circ}43'01''$ E, for a distance of 36.37 feet to a calculated point for the end of the curve herein described;
14. North $52^{\circ}43'24''$ East, a distance of 37.04 feet to a calculated point for the point of curvature of a non-tangent curve to the left;
15. Continuing along a curve to the left, an arc distance of 38.51 feet, said curve having a central angle of $12^{\circ}36'52''$, a radius of 174.92 feet and whose chord bears North $59^{\circ}34'37''$ East, a distance of 38.43 feet to a calculated point for the end of the curve herein described;
16. Continuing along a curve to the right, an arc distance of 66.81 feet, said curve having a central angle of $32^{\circ}56'55''$, a radius of 116.18 feet and whose chord bears North $83^{\circ}54'03''$ East, a distance of 65.89 feet to a calculated point for the point of curvature of a non-tangent curve to the right;

17. Continuing along a curve to the right, an arc distance of 24.28 feet, said curve having a central angle of $34^{\circ}00'21''$, a radius of 40.91 feet and whose chord bears South $62^{\circ}46'45''$ East, a distance of 23.92 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
18. Continuing along a curve to the right, an arc distance of 59.83 feet, said curve having a central angle of $15^{\circ}49'59''$, a radius of 216.50 feet and whose chord bears South $32^{\circ}55'41''$ East, a distance of 59.64 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
19. Continuing along a curve to the right, an arc distance of 48.65 feet, said curve having a central angle of $18^{\circ}31'20''$, a radius of 150.50 feet and whose chord bears South $19^{\circ}16'49''$ East, a distance of 48.44 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
20. Continuing along a curve to the right, an arc distance of 46.58 feet, said curve having a central angle of $24^{\circ}07'04''$, a radius of 110.65 feet and whose chord bears South $01^{\circ}04'12''$ West, a distance of 46.23 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
21. Continuing along a curve to the right, an arc distance of 47.59 feet, said curve having a central angle of $38^{\circ}00'21''$, a radius of 71.74 feet and whose chord bears South $34^{\circ}22'00''$ West, a distance of 46.72 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
22. Continuing along a curve to the right, an arc distance of 20.14 feet, said curve having a central angle of $12^{\circ}39'55''$, a radius of 91.12 feet and whose chord bears South $61^{\circ}00'51''$ West, a distance of 20.10 feet to a calculated point for the end of the curve herein described;
23. South $66^{\circ}45'50''$ W, a distance of 56.52 feet to a calculated point for the point of curvature of a non-tangent curve to the right from which an existing monitor well bears North $04^{\circ}27'47''$ East, a distance 102.85 feet;
24. Continuing along a curve to the right, an arc distance of 103.23 feet, said curve having a central angle of $000^{\circ}21'24''$, a radius of 16,582.03 feet and whose chord bears South $67^{\circ}34'49''$ West, a distance of 103.22 feet to a calculated point for the end of the curve herein described;
25. South $69^{\circ}47'11''$ West, a distance of 18.30 feet to a calculated point;
26. South $67^{\circ}31'37''$ West, a distance of 41.72 feet to a calculated point for the point of curvature of a non-tangent curve to the left;
27. Continuing along a curve to the left, an arc distance of 48.43 feet, said curve having a central angle of $17^{\circ}04'16''$, a radius of 162.55 feet and whose chord bears South $56^{\circ}19'40''$ West, a distance of 48.25 feet to a calculated point for the of the curve herein described;
28. South $47^{\circ}02'53''$ West, a distance of 83.70 feet to a calculated point;

29. South 47°59'29" West, a distance of 81.83 feet to a calculated point;
30. South 47°12'59" West, a distance of 43.28 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
31. Continuing along of a curve to the right, an arc distance of 30.71 feet, said curve having a central angle of 10°59'53", a radius of 160.00 feet and whose chord bears South 50°55'21" West, a distance of 30.67 feet to the end of the curve herein described and an existing monitor well;
32. South 50°08'28" W, a distance of 7.98 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
33. Continuing along a curve to the right, an arc distance of 29.41 feet, said curve having a central angle of 63°09'40", a radius of 26.68 feet and whose chord bears South 83°37'17" West, a distance of 27.94 feet to . **POINT OF BEGINNING**, and containing 4.55 acres of land, more or less;

All bearings are based on the Texas State Plane Coordinate System, Central Zone, NAD 83.

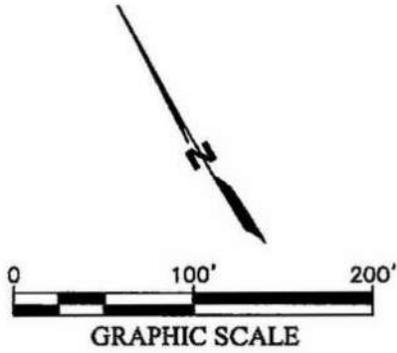
This property description is accompanied by a separate Exhibit of even date.



SURVEYING AND MAPPING, LLC
4801 Southwest Parkway, Building Two, Suite 208
Austin, Texas 78735
TX Firm Registration No. 10064300

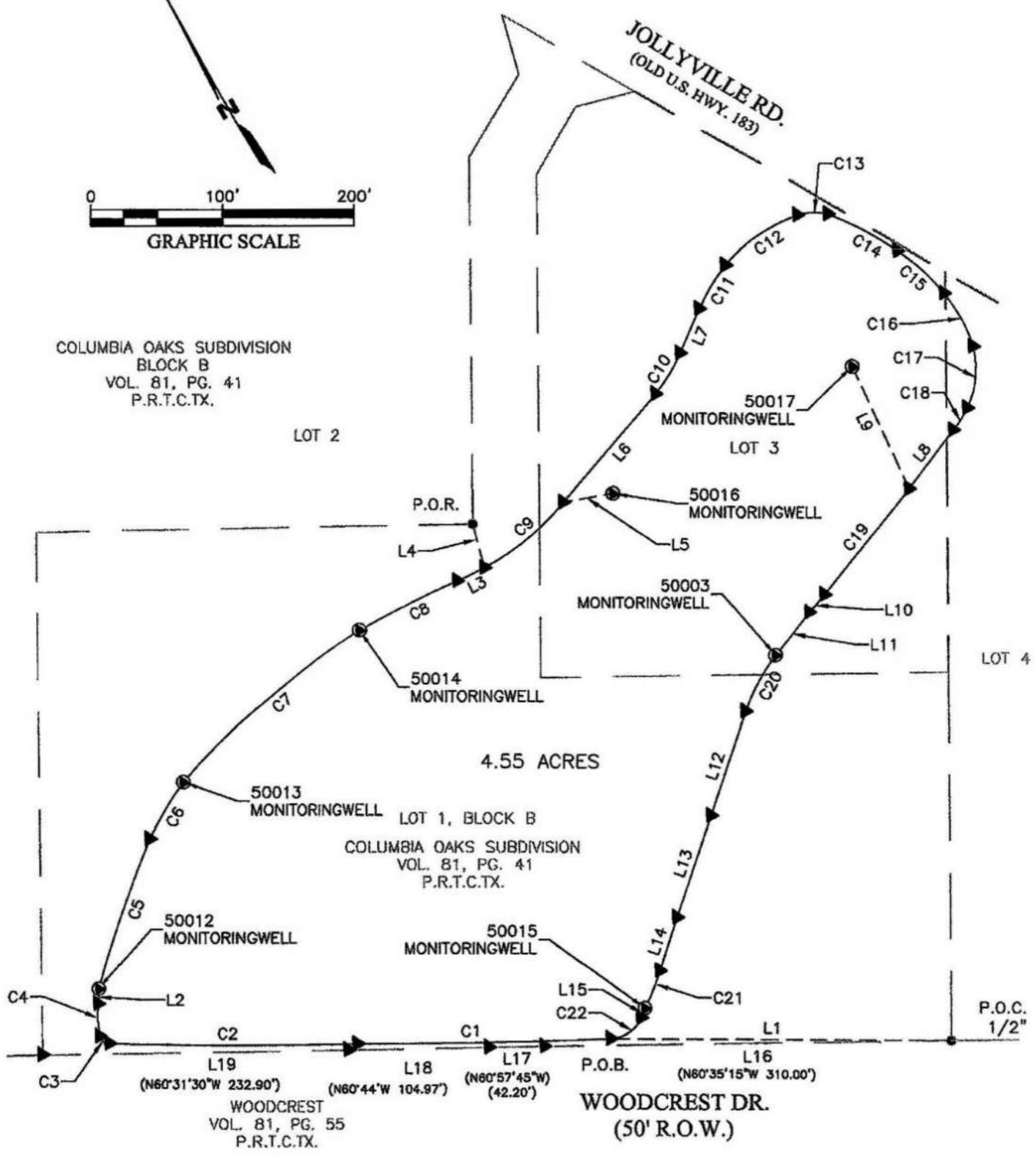
Neil Hines 29 April 2019
Neil Hines Date
Registered Professional Land Surveyor
No. 5642 – State of Texas

4.55 ACRE TRACT
 JAMES D. GOODE SURVEY,
 SECTION 30, ABSTRACT NO. 307
 TRAVIS COUNTY, TEXAS



COLUMBIA OAKS SUBDIVISION
 BLOCK B
 VOL. 81, PG. 41
 P.R.T.C.TX.

LOT 2



4.55 ACRES

LOT 1, BLOCK B
 COLUMBIA OAKS SUBDIVISION
 VOL. 81, PG. 41
 P.R.T.C.TX.

WOODCREST
 VOL. 81, PG. 55
 P.R.T.C.TX.

WOODCREST DR.
 (50' R.O.W.)

JOB NUMBER: 48938
 DATE: 04/2019
 SCALE: 1"=100'
 SURVEYOR: N.Hines
 TECHNICIAN: Nelson
 DRAWING: SK 32231
 TRACT: IDN/A
 PARTY CHIEF: G. Dean
 FIELD BOOKS: 24702



4801 Southwest Parkway
 Building Two, Suite 100
 Austin Texas, 78735
 Ofc: 512.447.0575
 Fax: 512.326.3029
 email: info@sam.biz

PROJECT: ERM, Inc.
 Jollyville Rd. Monitoring Wells

SHEET 5
 OF 6

Texas Firm Registration No. 10064300

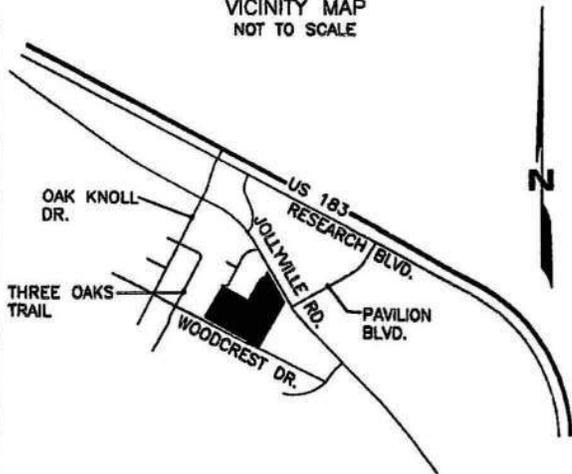
4.55 ACRE TRACT
 JAMES D. GOODE SURVEY,
 SECTION 30, ABSTRACT NO. 307
 TRAVIS COUNTY, TEXAS

LINE TABLE		
NUMBER	DIRECTION	LENGTH
L1	N60°38'24"W	259.64'
L2	N31°41'45"E	11.65'
L3	N87°01'53"W	22.69'
L4	N14°25'17"E	34.65'
L5	S71°21'50"E	37.98'
L6	N69°16'24"E	108.23'
L7	N52°43'24"E	37.04'
L8	S66°45'50"W	56.52'
L9	N04°27'47"E	102.85'
L10	S89°47'11"W	18.30'
L11	S67°31'37"W	41.72'
L12	S47°02'53"W	83.70'
L13	S47°59'29"W	81.83'
L14	S47°12'59"W	43.28'
L15	S50°08'28"W	7.98'
L16	N81°43'18"W	308.83'
L17	N62°05'48"W	42.18'
L18	N61°52'03"W	104.91'
L19	N61°39'33"W	232.77'

Point Table				
Point #	Northing	Easting	Elevation	Raw Description
50003	10127266.16	3108200.28	906.30	MONITORINGWELL
50012	10127293.14	3107629.76	916.49	MONITORINGWELL
50013	10127399.85	3107762.05	914.85	MONITORINGWELL
50014	10127435.63	3107935.97	911.41	MONITORINGWELL
50015	10127078.71	3107982.61	910.77	MONITORINGWELL
50016	10127434.06	3108153.53	904.65	MONITORINGWELL
50017	10127430.17	3108359.56	901.20	MONITORINGWELL

CURVE TABLE					
CURVE NO.	DELTA	RADIUS	LENGTH	CHORD BEARING	CHORD LENGTH
C1	002°07'32"	6137.18'	190.58'	N81°56'40"W	180.57'
C2	002°47'13"	3873.81'	188.43'	N60°39'25"W	188.41'
C3	074°40'52"	7.42'	9.67'	N23°11'03"W	9.00'
C4	017°55'29"	79.71'	24.94'	N26°04'12"E	24.84'
C5	007°36'23"	909.53'	120.75'	N47°44'18"E	120.66'
C6	011°48'57"	242.14'	49.94'	N58°07'27"E	49.85'
C7	017°04'34"	598.60'	178.40'	N78°22'58"E	177.74'
C8	008°17'57"	570.36'	82.62'	S88°07'18"E	82.54'
C9	021°23'14"	209.62'	78.25'	N79°10'22"E	77.80'
C10	016°04'53"	130.00'	36.49'	N60°43'01"E	36.37'
C11	012°36'52"	174.92'	38.51'	N59°34'37"E	38.43'
C12	032°56'55"	116.18'	66.81'	N83°54'03"E	65.89'
C13	034°00'21"	40.91'	24.28'	S82°46'45"E	23.92'
C14	015°49'59"	216.50'	59.83'	S32°55'41"E	59.84'
C15	018°31'20"	150.50'	48.65'	S19°16'46"E	48.44'
C16	024°07'04"	110.65'	46.58'	S01°04'12"W	46.23'
C17	038°00'21"	71.74'	47.59'	S34°22'00"W	46.72'
C18	012°39'55"	91.12'	20.14'	S81°00'51"W	20.10'
C19	000°21'24"	16582.03'	103.23'	S87°34'49"W	103.23'
C20	017°04'16"	182.55'	48.43'	S58°18'40"W	48.25'
C21	010°59'53"	160.00'	30.71'	S50°55'21"W	30.67'
C22	063°09'40"	26.68'	29.41'	S83°37'17"W	27.94'

VICINITY MAP
 NOT TO SCALE



BEARING BASIS:

BEARINGS ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NAD 83/93 (VRS). DISTANCES SHOWN HEREON ARE GRID VALUES.



LEGEND

- - IRON ROD FOUND (SIZE NOTED)
- ▲ - CALCULATED POINT
- - MONITORING WELL (AS NOTED)
- - CONCRETE MONUMENT FOUND
- P.O.B. - POINT OF BEGINNING
- P.O.C. - POINT OF COMMENCEMENT
- P.O.R. - POINT OF REFERENCE
- P.R.T.C.TX. - PLAT RECORDS TRAVIS COUNTY, TEXAS
- () - RECORD INFORMATION

Neil Hines 24 April 2019
 NEIL HINES DATE
 REGISTERED PROFESSIONAL LAND SURVEYOR
 NO. 5642 - STATE OF TEXAS

JOB NUMBER: 48938
 DATE: 04-2019
 SCALE: 1"=100'
 SURVEYOR: N.Hines
 TECHNICIAN: T.Nelson
 DRAWING: SK-2231
 TRACT: DN/A
 PARTICIPANT: J. G. Dean
 FIELD BOOKS: 24702



4801 Southwest Parkway
 Building Two, Suite 100
 Austin Texas, 78735
 Ofc: 512.447.0575
 Fax: 512.326.3029
 email: info@sam.biz

PROJECT: ERM, Inc.
 Jollyville Rd. Monitoring Wells

SHEET 6
 OF 6

Texas Firm Registration No. 10064300

Exhibit A-3

Chemicals of Concern

Trichloroethylene

1,1-Dichloroethylene

1,1,2-Trichloroethane

EXHIBIT B

Exhibit B-1: Location and Extent of Plume Management Zone

Exhibit B-2: Required Maintenance and Monitoring

Exhibit B-1

Location and Extent of Plume Management Zone

[see attached]

Exhibit B-2

Required Maintenance and Monitoring

Monitor Well ID	Monitoring Frequency	Laboratory Parameters
PO-1	Semi-annual	VOCs by SW846 8260B
PO-2	Semi-annual	VOCs by SW846 8260B
PO-3	Semi-annual	VOCs by SW846 8260B
PO-4	Semi-annual	VOCs by SW846 8260B
PO-7	Semi-annual	VOCs by SW846 8260B
PO-8	Semi-annual	VOCs by SW846 8260B
PO-9	Semi-annual	VOCs by SW846 8260B
PO-10*	Semi-annual	VOCs by SW846 8260B
PO-11*	Semi-annual	VOCs by SW846 8260B

NOTES:

VOC = Volatile Organic Compound

* = Proposed future well, if required by TCEQ

**TEXAS RISK REDUCTION PROGRAM
RESTRICTIVE COVENANT**

STATE OF TEXAS §
 §
COUNTY OF TRAVIS §

This Restrictive Covenant is filed to provide information concerning certain environmental conditions and use limitations pursuant to the Texas Commission on Environmental Quality (the "TCEQ") Texas Risk Reduction Program (the "TRRP") Rules found at 30 Texas Administrative Code ("TAC"), Chapter 350, and affects the real property (the "Property") described as follows:

LOT 1, BLOCK B, COLUMBIA OAKS, A SUBDIVISION IN TRAVIS COUNTY,
TEXAS, ACCORDING TO THE MAP OR PLAT THEREOF RECORDED IN
VOLUME 81 PAGE 41 OF THE PLAT RECORDS OF TRAVIS COUNTY, TEXAS.

Portions of the groundwater of the Property contain certain identified chemicals of concern causing those portions of the Property to be considered an Affected Property as that term is defined in the TRRP. The portion considered to be Affected Property is described as follows:

Refer to Exhibit A, attached hereto and incorporated herein by reference for the metes and bounds description of the Affected Property, a plat map and a list of chemicals of concern by medium.

This Restrictive Covenant is required for the following reasons:

The Affected Property is subject to the TRRP requirements for properties with an area overlying a TCEQ-approved plume management zone. A plume management zone is defined as an area of groundwater containing concentrations of chemicals of concern exceeding the TCEQ approved protective concentration levels, plus any additional area allowed by the TCEQ in accordance with 30 TAC §350.33(f)(4). A plume management zone was established so that the chemicals of concern in the groundwater are managed such that human exposure is prevented and other groundwater resources are protected. The attached Exhibit B provides the location and extent of the plume management zone and describes the maintenance and monitoring required to be conducted by Responder or its successors. This maintenance and monitoring must be implemented unless and until TCEQ approves some modification of those requirements.

As of the date of this Restrictive Covenant, the record owner of fee title to the Property is Harris Dabney, Ltd., a Texas limited partnership (the "Owner"), with an address of 8150 North Central Expressway, Suite 750, Dallas, Texas, 75206-1826. In consideration of the Response Actions by Kidde Fire Protection Inc. on behalf of Forney Corporation (the "Responder"), approval of the Response Action Plan, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Owner has agreed to place the following restrictions on the Property in favor of the TCEQ and the State of Texas, to-wit:

1. Plume Management Zone: Exposure to the groundwater underlying the Affected Property for any purpose is prohibited, except for exposure to the groundwater from construction conducted in accordance with an acceptable soil and groundwater management plan, or until such time when all the chemicals of concern no longer exceed their respective protective concentration levels. The soil and groundwater management plan must receive prior written approval from TCEQ before any construction may begin. Groundwater encountered during activities approved by the TCEQ must be managed in accordance with local, State, and Federal

regulations. The maintenance and monitoring described in Exhibit B is required to be conducted by the Responder or its successors. Any modification of this restrictive covenant is prohibited without prior approval of TCEQ.

2. These restrictions shall be a covenant running with the land.

For additional information, contact:

TCEQ Central Records
12100 Park 35 Circle
Building E
Austin, Texas 78753

Mail: TCEQ - MC 199
P.O. Box 13087
Austin, TX 78711-3087

TCEQ Program and Identifier No.: VCP No. 945

This Restrictive Covenant may be rendered of no further force or effect only by a release executed by the TCEQ or its successor agencies and filed in the same Real Property Records as those in which this Restrictive Covenant is filed.

[Signature pages follow.]

Executed this ____ day of _____, 2019.

OWNER:

HARRIS DABNEY, LTD.,
a Texas limited partnership

By: Harris, Dabney, Brinker, L.L.C.,
a Texas limited liability company,
its general partner

Scott Dabney, President

STATE OF TEXAS §
 §
COUNTY OF DALLAS §

BEFORE ME, on this the ____ day of _____, 2019, personally appeared Scott Dabney, President of Harris, Dabney, Brinker, L.L.C., a Texas limited liability company, the general partner of Harris Dabney, Ltd., a Texas limited partnership, known to me to be the person whose name is subscribed to the foregoing instrument, and he acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE,
this the ____ day of _____, 2019.

Notary Public in and for the State of Texas
County of Dallas
My Commission Expires: _____

Executed this ____ day of _____, 2019.

RESPONDER:

FORNEY CORPORATION,
a Delaware corporation

By: Kidde Fire Protection Inc.,
a Delaware corporation,
its agent

By: _____
Name: _____
Title: _____

STATE OF _____ §

COUNTY OF _____ §

BEFORE ME, on this the ____ day of _____, 2019, personally appeared _____, _____ of Kidde Fire Protection Inc., a Delaware corporation, as agent of Forney Corporation, a Delaware corporation, known to me to be the person whose name is subscribed to the foregoing instrument, and he acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE,
this the ____ day of _____, 2019.

Notary Public in and for the State of _____
County of _____
My Commission Expires: _____

Accepted as Third-Party Beneficiary this ____ day of _____, 2019.

**TEXAS COMMISSION ON
ENVIRONMENTAL QUALITY,**

By: _____
Name: _____
Title: _____

STATE OF TEXAS §
 §
COUNTY OF TRAVIS §

BEFORE ME, on this the ____ day of _____, 2019, personally appeared _____, _____ of the Texas Commission on Environmental Quality, known to me to be the person whose name is subscribed to the foregoing instrument, and he acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE,
this the ____ day of _____, 2019.

Notary Public in and for the State of Texas
County of _____
My Commission Expires: _____

EXHIBIT A

Exhibit A-1: Legal Description of the Affected Property

Exhibit A-2: Plat Map of the Affected Property

Exhibit A-3: Chemicals of Concern

Exhibit A-1

Legal Description of the Affected Property

[see attached]

PERIMETER DESCRIPTION

DESCRIPTION OF A 4.55 ACRE TRACT OF LAND LOCATED IN THE JAMES D. GOODE SURVEY, SECTION 30, ABSTRACT NO. 307, TRAVIS COUNTY, TEXAS, BEING SITUATED IN LOT 1, LOT 3 AND LOT 4, BLOCK B, OF COLUMBIA OAK, SUBDIVISION OF RECORD IN VOLUME 81, PAGE 41, OF THE PLAT RECORDS TRAVIS COUNTY, TEXAS, SAID 4.55 ACRE TRACT, AS DEPICTED ON THE ACCOMPANYING EXHIBIT WHICH IS A PART HEREOF, BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

COMMENCING at a 1/2-inch iron rod found for the southeast corner of Lot 1, of said Columbia Oaks, Block B, also being the southwest corner of Lot 4, Block B of said Columbia Oaks and in the north margin of Woodcrest Drive (50' R.O.W.) of Woodcrest recorded in Volume 81, Page 55 ; Plat Records of Travis County, Texas

THENCE North 60°38'12"04" West, over and across said Lot 1, for a distance of 259.68 feet to a calculated point at the **POINT OF BEGINNING** of the herein described tract, said point being on the arc of a non-tangent curve to the right;

THENCE over and across said Lots 1 and 3 the following thirty-three (33) courses and distances:

1. Along said curve to the right an arc distance of 190.59 feet, said curve having a central angle of 02°07'32", a radius of 5,137.21 feet and whose chord bears North 61°56'40" West, a distance of 190.58 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
2. Continuing along the curve to the right an arc distance of 188.43 feet, said curve having a central angle of 02°47'13", a radius of 3,873.80 feet and whose chord bears North 60°39'25" West, a distance of 188.41 feet to a calculated point for point of curvature of a non-tangent curve to the right;
3. Continuing along the curve to the right an arc distance of 9.67 feet, said curve having a central angle of 74°40'52", a radius of 7.42 feet and whose chord bears North 23°11'03" West, a distance of 9.00 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
4. Continuing along the curve to the right an arc distance of 24.94 feet, said curve having a central angle of 17°55'29", a radius of 79.71 feet and whose chord bears North 26°04'12" East, a distance of 24.84 feet to a calculated point for the curve herein described;
5. North 31°41'45" East, a distance of 11.65 feet to an existing monitor well and the point of curvature of a non-tangent curve to the right;
6. Continuing along the curve to the right an arc distance of 120.75 feet, said curve having a central angle of 07°36'23", a radius of 909.53 feet and whose chord bears North 47°44'18" East, a distance of 120.66 feet to a calculated point for the point of curvature of a non-tangent curve to the right;

7. Continuing along the curve to the right an arc distance of 49.94 feet, said curve having a central angle of $11^{\circ}48'57''$, a radius of 242.14 feet and whose chord bears North $59^{\circ}07'27''$ East, a distance of 49.85 feet to an existing monitor well and the point of curvature of a non-tangent curve to the right;
8. Continuing along the curve to the right an arc distance of 178.40 feet, said curve having a central angle of $17^{\circ}04'34''$, a radius of 598.60 feet and whose chord bears North $78^{\circ}22'55''$ East, a distance of 177.74 feet to an existing monitor well and the point of curvature of a non-tangent curve to the right;
9. Continuing along the curve to the right an arc distance of 82.62 feet, said curve having a central angle of $08^{\circ}17'57''$, a radius of 570.36 feet and whose chord bears South $88^{\circ}07'16''$ East, a distance of 82.54 feet to a calculated point for the end of the curve herein described;
10. South $87^{\circ}01'53''$ East, a distance of 22.69 feet to the point of curvature of a non-tangent curve to the left, also from which a 1/2" iron rod found for an interior angle point of said Lot 1, also being the southeast corner of Lot 2, Block B of said Columbia Oaks bears North $14^{\circ}25'17''$ East, a distance of 34.65 feet;
11. Continuing along the curve to the left, an arc distance of 78.25 feet, said curve having a central angle of $21^{\circ}23'14''$, a radius of 209.62 feet and whose chord bears North $79^{\circ}10'22''$ East, for a distance of 77.80 feet to end of the curve herein described and from which an existing monitor well bears South $71^{\circ}21'50''$ East, a distance of 37.98 feet;
12. North $69^{\circ}16'24''$ East, a distance of 108.23 feet to a calculated point for the point of curvature of a non-tangent curve to the left;
13. Continuing along a curve to the left, an arc distance of 36.49 feet, said curve having a central angle of $16^{\circ}04'53''$, a radius of 130.00 feet and whose chord bears North $60^{\circ}43'01''$ E, for a distance of 36.37 feet to a calculated point for the end of the curve herein described;
14. North $52^{\circ}43'24''$ East, a distance of 37.04 feet to a calculated point for the point of curvature of a non-tangent curve to the left;
15. Continuing along a curve to the left, an arc distance of 38.51 feet, said curve having a central angle of $12^{\circ}36'52''$, a radius of 174.92 feet and whose chord bears North $59^{\circ}34'37''$ East, a distance of 38.43 feet to a calculated point for the end of the curve herein described;
16. Continuing along a curve to the right, an arc distance of 66.81 feet, said curve having a central angle of $32^{\circ}56'55''$, a radius of 116.18 feet and whose chord bears North $83^{\circ}54'03''$ East, a distance of 65.89 feet to a calculated point for the point of curvature of a non-tangent curve to the right;

17. Continuing along a curve to the right, an arc distance of 24.28 feet, said curve having a central angle of $34^{\circ}00'21''$, a radius of 40.91 feet and whose chord bears South $62^{\circ}46'45''$ East, a distance of 23.92 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
18. Continuing along a curve to the right, an arc distance of 59.83 feet, said curve having a central angle of $15^{\circ}49'59''$, a radius of 216.50 feet and whose chord bears South $32^{\circ}55'41''$ East, a distance of 59.64 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
19. Continuing along a curve to the right, an arc distance of 48.65 feet, said curve having a central angle of $18^{\circ}31'20''$, a radius of 150.50 feet and whose chord bears South $19^{\circ}16'49''$ East, a distance of 48.44 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
20. Continuing along a curve to the right, an arc distance of 46.58 feet, said curve having a central angle of $24^{\circ}07'04''$, a radius of 110.65 feet and whose chord bears South $01^{\circ}04'12''$ West, a distance of 46.23 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
21. Continuing along a curve to the right, an arc distance of 47.59 feet, said curve having a central angle of $38^{\circ}00'21''$, a radius of 71.74 feet and whose chord bears South $34^{\circ}22'00''$ West, a distance of 46.72 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
22. Continuing along a curve to the right, an arc distance of 20.14 feet, said curve having a central angle of $12^{\circ}39'55''$, a radius of 91.12 feet and whose chord bears South $61^{\circ}00'51''$ West, a distance of 20.10 feet to a calculated point for the end of the curve herein described;
23. South $66^{\circ}45'50''$ W, a distance of 56.52 feet to a calculated point for the point of curvature of a non-tangent curve to the right from which an existing monitor well bears North $04^{\circ}27'47''$ East, a distance 102.85 feet;
24. Continuing along a curve to the right, an arc distance of 103.23 feet, said curve having a central angle of $000^{\circ}21'24''$, a radius of 16,582.03 feet and whose chord bears South $67^{\circ}34'49''$ West, a distance of 103.22 feet to a calculated point for the end of the curve herein described;
25. South $69^{\circ}47'11''$ West, a distance of 18.30 feet to a calculated point;
26. South $67^{\circ}31'37''$ West, a distance of 41.72 feet to a calculated point for the point of curvature of a non-tangent curve to the left;
27. Continuing along a curve to the left, an arc distance of 48.43 feet, said curve having a central angle of $17^{\circ}04'16''$, a radius of 162.55 feet and whose chord bears South $56^{\circ}19'40''$ West, a distance of 48.25 feet to a calculated point for the of the curve herein described;
28. South $47^{\circ}02'53''$ West, a distance of 83.70 feet to a calculated point;

29. South 47°59'29" West, a distance of 81.83 feet to a calculated point;
30. South 47°12'59" West, a distance of 43.28 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
31. Continuing along of a curve to the right, an arc distance of 30.71 feet, said curve having a central angle of 10°59'53", a radius of 160.00 feet and whose chord bears South 50°55'21" West, a distance of 30.67 feet to the end of the curve herein described and an existing monitor well;
32. South 50°08'28" W, a distance of 7.98 feet to a calculated point for the point of curvature of a non-tangent curve to the right;
33. Continuing along a curve to the right, an arc distance of 29.41 feet, said curve having a central angle of 63°09'40", a radius of 26.68 feet and whose chord bears South 83°37'17" West, a distance of 27.94 feet to . **POINT OF BEGINNING**, and containing 4.55 acres of land, more or less;

All bearings are based on the Texas State Plane Coordinate System, Central Zone, NAD 83.

This property description is accompanied by a separate Exhibit of even date.



SURVEYING AND MAPPING, LLC
4801 Southwest Parkway, Building Two, Suite 208
Austin, Texas 78735
TX Firm Registration No. 10064300

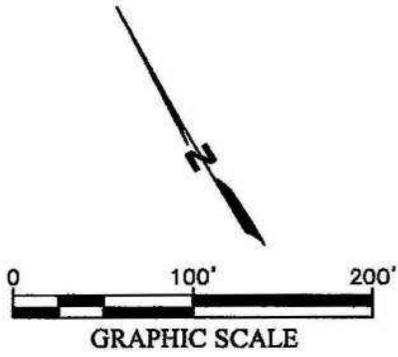
Neil Hines 24 April 2019
Neil Hines Date
Registered Professional Land Surveyor
No. 5642 - State of Texas

Exhibit A-2

Plat Map of the Affected Property

[see attached]

4.55 ACRE TRACT
 JAMES D. GOODE SURVEY,
 SECTION 30, ABSTRACT NO. 307
 TRAVIS COUNTY, TEXAS



COLUMBIA OAKS SUBDIVISION
 BLOCK B
 VOL. 81, PG. 41
 P.R.T.C.TX.

LOT 2

P.O.R.
 L4
 L3
 C8

50017 MONITORINGWELL
 LOT 3
 L9
 C19
 L10
 L11

LOT 4

4.55 ACRES

LOT 1, BLOCK B
 COLUMBIA OAKS SUBDIVISION
 VOL. 81, PG. 41
 P.R.T.C.TX.

50012 MONITORINGWELL
 C6
 C5
 L2
 C4
 C3

50015 MONITORINGWELL
 L15
 C22
 L14
 L13
 L12
 C21

P.O.C.
 1/2"

L19 (N60°31'30"W 232.90')
 L18 (N60°44'W 104.97')
 L17 (N60°57'45"W 42.20')
 L16 (N60°35'15"W 310.00')

WOODCREST DR.
 VOL. 81, PG. 55
 P.R.T.C.TX.

WOODCREST DR.
 (50' R.O.W.)

JOB NUMBER: 48938
 DATE: 04/2019
 SCALE: 1" = 100'
 SURVEYOR: N. Hines
 TECHNICIAN: N. Hines
 DRAWING: SK 12231
 TRACT: JDNZA
 PARTY CHIEF: G. Dean
 FIELD BOOKS: 24702



4801 Southwest Parkway
 Building Two, Suite 100
 Austin Texas, 78735
 Ofc: 512.447.0575
 Fax: 512.326.3029
 email: info@sam.biz

PROJECT: ERM, Inc.
 Jollyville Rd. Monitoring Wells
 SHEET 5
 OF 6

Texas Firm Registration No. 10064300

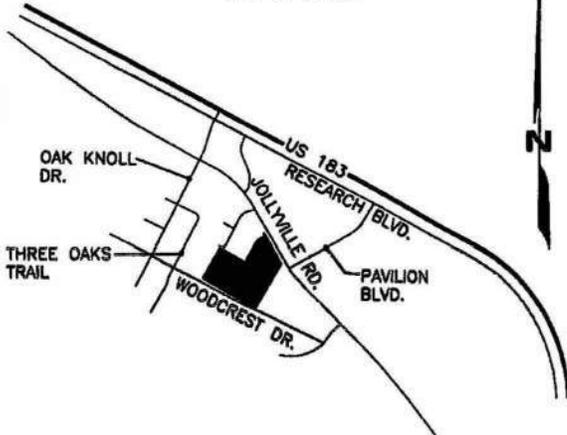
4.55 ACRE TRACT
 JAMES D. GOODE SURVEY,
 SECTION 30, ABSTRACT NO. 307
 TRAVIS COUNTY, TEXAS

LINE TABLE		
NUMBER	DIRECTION	LENGTH
L1	N60°38'24"W	259.84'
L2	N31°41'45"E	11.65'
L3	N87°01'53"W	22.69'
L4	N14°25'17"E	34.85'
L5	S71°21'50"E	37.98'
L6	N69°16'24"E	108.23'
L7	N52°43'24"E	37.04'
L8	S66°45'50"W	56.52'
L9	N04°27'47"E	102.85'
L10	S69°47'11"W	18.30'
L11	S67°31'37"W	41.72'
L12	S47°02'53"W	83.70'
L13	S47°59'29"W	81.83'
L14	S47°12'59"W	43.28'
L15	S50°08'28"W	7.98'
L16	N61°43'18"W	309.83'
L17	N62°05'48"W	42.18'
L18	N61°52'03"W	104.91'
L19	N61°39'33"W	232.77'

Point Table				
Point #	Northing	Easting	Elevation	Raw Description
50003	10127266.16	3108200.28	906.30	MONITORINGWELL
50012	10127293.14	3107629.76	916.49	MONITORINGWELL
50013	10127399.85	3107762.05	914.85	MONITORINGWELL
50014	10127435.63	3107935.97	911.41	MONITORINGWELL
50015	10127078.71	3107982.61	910.77	MONITORINGWELL
50016	10127434.06	3108153.53	904.65	MONITORINGWELL
50017	10127430.17	3108359.56	901.20	MONITORINGWELL

CURVE TABLE					
CURVE NO.	DELTA	RADIUS	LENGTH	CHORD BEARING	CHORD LENGTH
C1	002°07'32"	5137.18'	190.58'	N61°56'40"W	190.57'
C2	002°47'13"	3873.81'	188.43'	N80°39'25"W	188.41'
C3	074°40'52"	7.42'	8.67'	N23°11'03"W	9.00'
C4	017°55'29"	79.71'	24.94'	N26°04'12"E	24.84'
C5	007°36'23"	909.53'	120.75'	N47°44'18"E	120.66'
C6	011°48'57"	242.14'	49.94'	N59°07'27"E	49.85'
C7	017°04'34"	598.60'	178.40'	N78°22'55"E	177.74'
C8	008°17'57"	570.36'	82.62'	S88°07'16"E	82.54'
C9	021°23'14"	209.62'	78.25'	N78°10'22"E	77.80'
C10	016°04'53"	130.00'	38.49'	N60°43'01"E	38.37'
C11	012°36'52"	174.92'	38.51'	N59°34'37"E	38.43'
C12	032°56'55"	116.18'	66.81'	N83°54'03"E	65.89'
C13	034°00'21"	40.91'	24.28'	S62°46'45"E	23.92'
C14	015°49'59"	216.50'	59.83'	S32°55'41"E	59.84'
C15	018°31'20"	150.50'	48.65'	S18°16'46"E	48.44'
C16	024°07'04"	110.65'	48.58'	S01°04'12"W	46.23'
C17	038°00'21"	71.74'	47.59'	S34°22'00"W	46.72'
C18	012°39'55"	91.12'	20.14'	S61°00'51"W	20.10'
C19	000°21'24"	16582.03'	103.23'	S67°34'49"W	103.23'
C20	017°04'16"	162.55'	48.43'	S56°18'40"W	48.25'
C21	010°59'53"	160.00'	30.71'	S50°55'21"W	30.67'
C22	063°09'40"	26.68'	29.41'	S83°37'17"W	27.94'

VICINITY MAP
 NOT TO SCALE



BEARING BASIS:

BEARINGS ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NAD 83/93 (VRS). DISTANCES SHOWN HEREON ARE GRID VALUES.

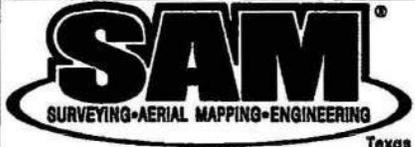


LEGEND

- - IRON ROD FOUND (SIZE NOTED)
- ▲ - CALCULATED POINT
- - MONITORING WELL (AS NOTED)
- - CONCRETE MONUMENT FOUND
- - POINT OF BEGINNING
- - POINT OF COMMENCEMENT
- - POINT OF REFERENCE
- () - PLAT RECORDS TRAVIS COUNTY, TEXAS
- () - RECORD INFORMATION

Neil Hines 24 April 2019
 NEIL HINES DATE
 REGISTERED PROFESSIONAL LAND SURVEYOR
 NO. 5642 - STATE OF TEXAS

JOB NUMBER: 48938
DATE: 04.2019
SCALE: 1" = 100'
SURVEYOR: NHines
TECHNICIAN: TNelson
DRAWING: SK 32231
TRACT ID: N/A
PARTY CHIEF: GDean
FIELD BOOKS: 24702



4801 Southwest Parkway
 Building Two, Suite 100
 Austin Texas, 78735
 Ofc: 512.447.0575
 Fax: 512.326.3029
 email: info@sam.biz
 Texas Firm Registration No. 10064300

PROJECT: ERM, Inc.
 Jollyville Rd. Monitoring Wells
 SHEET 6
 OF 6

Exhibit A-3

Chemicals of Concern

Trichloroethylene

1,1-Dichloroethylene

1,1,1-Trichloroethane

1,1,2-Trichloroethane

EXHIBIT B

Exhibit B-1: Location and Extent of Plume Management Zone

Exhibit B-2: Required Maintenance and Monitoring

Exhibit B-1

Location and Extent of Plume Management Zone

[see attached]

Exhibit B-2

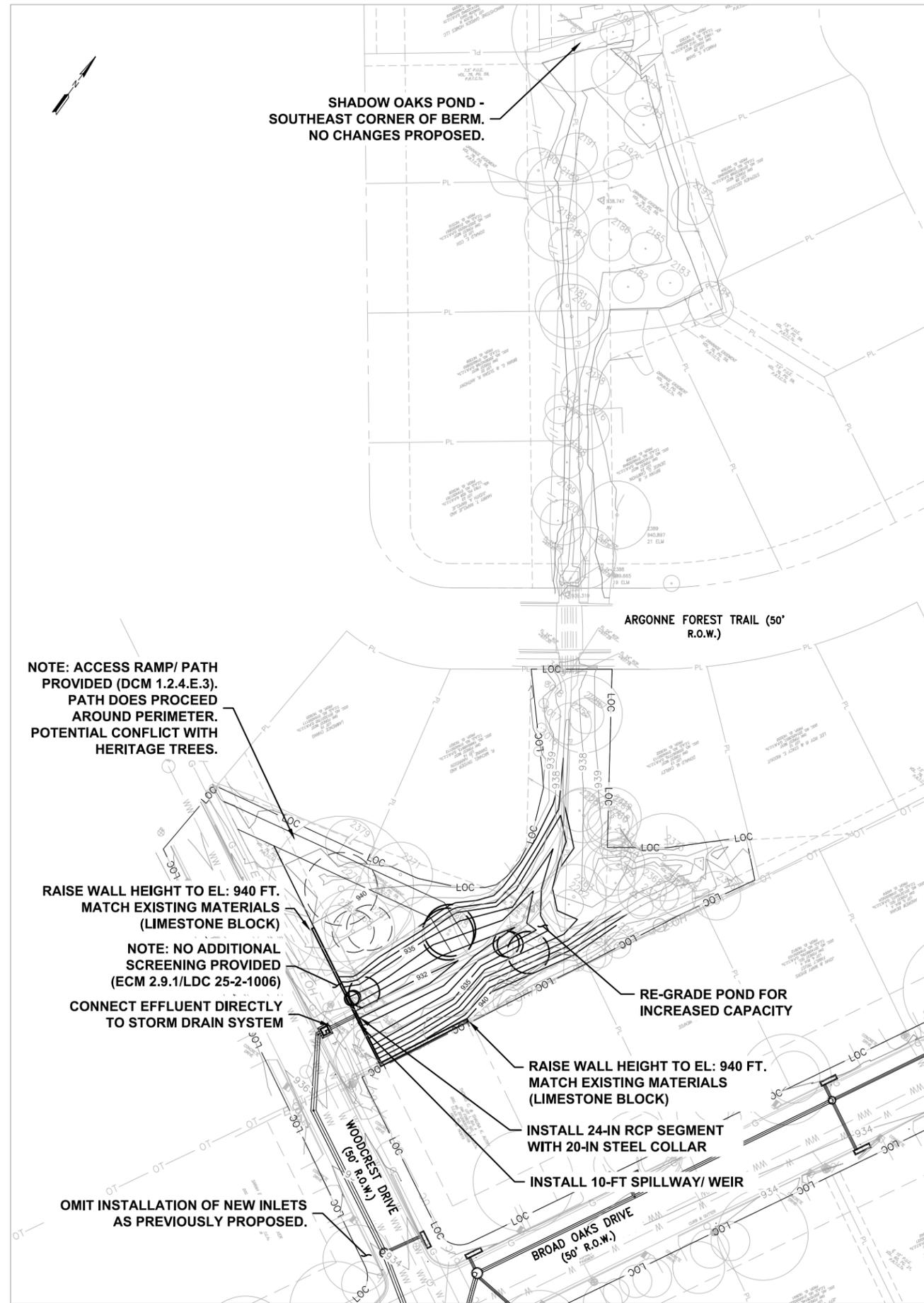
Required Maintenance and Monitoring

Monitor Well ID	Monitoring Frequency	Laboratory Parameters
MW-1	Semi-annual	VOCs by SW846 8260B
MW-5	Semi-annual	VOCs by SW846 8260B
MW-7	Semi-annual	VOCs by SW846 8260B
MW-8	Semi-annual	VOCs by SW846 8260B
MW-14	Semi-annual	VOCs by SW846 8260B
MW-15	Semi-annual	VOCs by SW846 8260B
MW-16	Semi-annual	VOCs by SW846 8260B

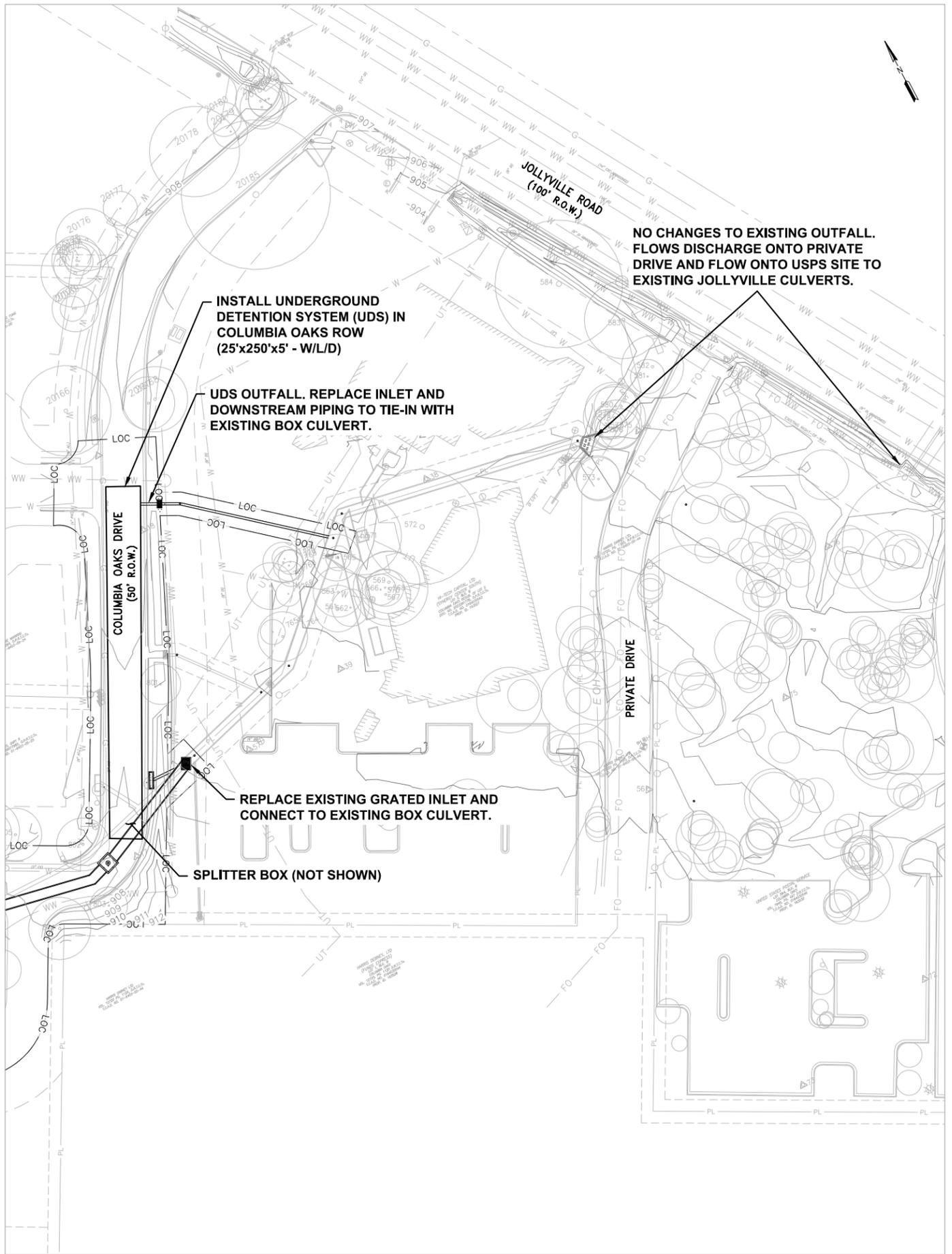
NOTES:

VOC = Volatile Organic Compound

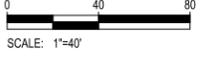
ATTACHMENT: 3. Option 2 - Proposed Layout



1 IMPROVEMENTS TO CHELSEA MOOR POND
SCALE: 1"=40'



2 UNDERGROUND STORAGE IN COLUMBIA OAKS DR.
SCALE: 1"=40'



REV. NO.	DATE	REVISION DESCRIPTION

INTERIM REVIEW ONLY
Not to be used for construction, bidding, permit or regulatory approval purposes. This document is released for the purpose of interim review under the authority of:
LAURA M CASSETT
99387
SEPTEMBER 17, 2019

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

WATERSHED PROTECTION DEPARTMENT
OAK KNOLL STORM DRAIN IMPROVEMENTS PROJECT

OPTION 2 - PROPOSED LAYOUT

TM01 - MTGN ALT. EVAL.



NOTES	NAME	DATE
DRAWN BY	SEM	
CHECKED BY	LMC	
DESIGNED BY	OET	
REVIEWED BY	TWM	

Lockwood, Andrews & Newnam, Inc.
A LEAF A DALEY COMPANY
8911 N. CAPITAL OF TEXAS HWY
BUILDING 2, SUITE 2300
AUSTIN, TX 78759
PERMIT NUMBER

ATTACHMENT: 4. Site Visit Photos



Figure 1: Existing Conditions Chelsea Moor Pond Outfall, August 2019



Figure 2: Existing Conditions Chelsea Moor Pond Looking Upstream from Pond Outfall, August 2019



Figure 3: Existing Conditions Chelsea Moor Pond Heritage Trees West of Outfall, August 2019



Figure 4: Existing Conditions Chelsea Moor Pond, Low Point in East Corner of Wall, August 2019



Figure 5: Existing Conditions Chelsea Moor Pond, Wall Near 11708 Briar Oaks Drive, August 2019



Figure 6: Existing Conditions Chelsea Moor Pond Berm on East Side, August 2019



Figure 7: Existing Conditions Shadow Oaks Pond Spillway, August 2019



Figure 8: Debris Line Seen Behind Outfall at Shadow Oaks Water Quality Pond, Storm Event August 2016



Figure 9: Depth of Water in Shadow Oaks Water Quality Pond, Storm Event August 2016



Figure 10: Depth of Water in Shadow Oaks Detention Pond (not full), Storm Event August 2016

ATTACHMENT: 5. Elevation Area Relationships

Chelsea Moor Pond Elevation-Area Relationship

Existing		Proposed	
Elevation (ft)	Area (ac)	Elevation (ft)	Area (ac)
		931	0.00
		932	0.00
		933	0.02
		934	0.04
		935	0.08
		936	0.11
936.5	0.01		
937	0.05	937	0.16
938	0.24	938	0.28
939	0.56	939	0.56
940	1.11	940	1.11
940.5	1.13	940.5	1.13

Proposed Underground Detention at Columbia Oaks Drive
 Elevation-Area Relationship

Elevation (ft)	Area (ac)
902	0.13
903	0.13
904	0.13
905	0.13
906	0.13

ATTACHMENT: 6. HEC-HMS Results

EXISTING ULTIMATE HEC-HMS					
HMS Node	AREA	Q ₂	Q ₁₀	Q ₂₅	Q ₁₀₀
	(sq mi)	(cfs)	(cfs)	(cfs)	(cfs)
A-1-01	0.03421	44.4	78	103.3	150.6
A-1-02a	0.02108	28.3	49.4	65.4	95.2
A-1-02b	0.00168	2.8	4.9	6.4	9.3
A-1-02c	0.00242	3.8	6.6	8.7	12.6
A-1-03	0.00352	5.7	9.7	12.7	18.4
A-1-04	0.01715	28.1	49.1	64.9	94.4
A-1-05	0.00725	15.6	26.1	34.1	49
A-1-06	0.00423	9.2	15.6	20.3	29.2
A-2	0.00731	9.6	16.8	22.2	32.2
A-3-01	0.01438	22	38.5	51	74.4
A-3-02	0.00080	1.9	3	3.9	5.6
A-4	0.00703	12.4	21.5	28.4	41.3
A-5	0.04140	58.8	100	131.1	189.3
A-6	0.00309	6.8	11.4	14.9	21.4
Briar Oak Outs	0.00000	7.7	15.6	23.8	58.4
Briar Oaks Div	0.03249	20.1	38.4	60.2	147.5
Chelsea Moor Pond	0.02108	16.9	34.3	55.3	167.3
D-A-04-1	0.05821	0	18.1	50.6	137.9
D-A-3	0.04767	6.6	36.6	62.5	156.4
D-A-4	0.05470	0	9.5	39.3	129.1
J-A-04-1	0.05821	54.5	93.1	125.6	212.9
J-A-04-2	0.07537	80.5	133.4	179.2	271.7
J-A-1-03	0.00352	5.7	9.7	12.7	18.4
J-A-1-06	0.08262	91.2	149.8	194.9	294.8
J-A-2-1	0.02518	19.6	39.7	63.9	178.9
J-A-2-2	0.03249	20.1	38.4	60.2	147.5
J-A-3	0.04767	40.6	70.6	96.5	190.4
J-A-4	0.05470	49	84.5	114.3	204.1
Jollyville Road Outlet	0.13134	152.2	255.5	339	502
R-1-03	0.03249	20.1	38.4	60.2	147.5
R-A-1-02-B	0.02518	19.6	39.6	63.9	178.7
R-A-1-04-1	0.00000	49	75	75	75
R-A-1-04-1B	0.05821	0	18.1	50.6	138.1
R-A-1-04-2	0.00000	54.5	75	75	75
R-A-1-05	0.07537	80.4	133.4	179.1	271.6
R-A-1-06	0.08262	91.1	149.7	194.9	294.7
R-A-3B	0.04767	6.5	36.5	62.5	155.9
R-A-4-01	0.00000	34	34	34	34
R-A-4-02	0.00352	5.7	9.7	12.7	18.4
R-A-4B	0.05470	0	9.4	39.2	128.5
Shadow Oaks Out	0.03421	20.2	32.5	38.2	40.4
Shadow Oaks Overflow	0.00000	0	0	6.3	96.3
Shadow Oaks Pond	0.03421	20.2	32.5	38.2	40.4

PROPOSED ULTIMATE HEC-HMS					
HMS Node	AREA	Q ₂	Q ₁₀	Q ₂₅	Q ₁₀₀
	(sq mi)	(cfs)	(cfs)	(cfs)	(cfs)
A-1-01	0.03421	44.4	78	103.3	150.6
A-1-02a	0.02108	28.3	49.4	65.4	95.2
A-1-02b	0.00168	2.8	4.9	6.4	9.3
A-1-02c	0.00242	3.8	6.6	8.7	12.6
A-1-03	0.00352	6.2	10.6	14	20.2
A-1-04	0.01715	28.1	49.1	64.9	94.4
A-1-05	0.00725	15.6	26.1	34.1	49
A-1-06	0.00423	9.2	15.6	20.3	29.2
A-2	0.00731	10.1	17.6	23.3	33.9
A-3-01	0.01438	22	38.5	51	74.4
A-3-02	0.00080	1.9	3	3.9	5.6
A-4	0.00703	12.4	21.5	28.4	41.3
A-5	0.04140	58.8	100	131.1	189.3
A-6	0.00309	6.8	11.4	14.9	21.4
Chelsea Moor Pond Prop	0.02108	23.5	30.7	33.3	35.5
Columbia Oaks Pond	0.07295	10.8	14.2	13.7	12
D-A-4	0.07295	26.2	41.2	43.6	42.2
J-A-04-1	0.05580	69.7	113.8	145.5	211.4
J-A-04-2	0.07295	80.8	134.2	178.7	262
J-A-1-03-1	0.04445	54.5	86.3	108.3	189.4
J-A-1-03-2	0.04797	59.5	95.1	120.2	196.7
J-A-1-05	0.08020	86.7	145.7	197.9	295
J-A-2-1	0.02276	25	32.8	36	35.5
J-A-2-2	0.03007	34.2	49.5	58.9	148.8
J-A-3	0.00080	1.9	3	3.9	5.6
J-A-3-01	0.01438	22	38.5	51	74.4
J-A-4	0.00783	13.8	23.9	31.5	45.8
Jollyville Road Outlet	0.12892	151.7	255	337.7	492.2
R-1-03-01	0.03007	34.2	49.5	58.9	148.5
R-1-03-02	0.04445	54.5	86.2	108.2	188.5
R-A-1-02-B	0.02276	25	32.8	36	35.5
R-A-1-04-1	0.00783	13.8	23.9	31.5	45.8
R-A-1-04-2	0.05580	69.6	113.7	145.5	211.2
R-A-1-05-A	0.00000	70	120	165	250
R-A-1-05-B	0.07295	80.8	134.2	178.7	262
R-A-1-06	0.08020	86.7	145.6	197.5	294.8
R-A-3-01	0.01438	21.9	38.4	50.9	74.1
R-A-4-01	0.00080	1.8	3	3.9	5.6
R-A-4-02	0.04797	59.4	95	120.1	196
Shadow Oaks Out	0.03421	20.2	32.5	38.2	40.4
Shadow Oaks Overflow	0.00000	0	0	6.3	96.3
Shadow Oaks Pond	0.03421	20.2	32.5	38.2	40.4
R-A-1-02-A	0.00000				123
Briar Oak Outs	0.01139				44.8
Briar Oaks Div	0.00000				113.2

EXISTING ULTIMATE

HYDROLOGIC RESULTS	PEAK FLOW (CFS)			
	2-YR	10-YR	25-YR	100-YR
A-1-01	44	78	103	151
A-1-02a	28	49	65	95
A-1-02b	3	5	6	9
A-1-02c	4	7	9	13
A-1-03	6	10	13	18
A-1-04	28	49	65	94
A-1-05	16	26	34	49
A-1-06	9	16	20	29
A-2	10	17	22	32
A-3-01	22	39	51	74
A-3-02	2	3	4	6
A-4	12	22	28	41
A-5	59	100	131	189
JOLLYVILLE ROAD OUTLET	152	256	339	502

PROPOSED ULTIMATE

HYDROLOGIC RESULTS	PEAK FLOW (CFS)			
	2-YR	10-YR	25-YR	100-YR
A-1-01	44	78	103	151
A-1-02a	28	49	65	95
A-1-02b	3	5	6	9
A-1-02c	4	7	9	13
A-1-03	6	11	14	20
A-1-04	28	49	65	94
A-1-05	16	26	34	49
A-1-06	9	16	20	29
A-2	10	18	23	34
A-3-01	22	39	51	74
A-3-02	2	3	4	6
A-4	12	22	28	41
A-5	59	100	131	189
JOLLYVILLE ROAD OUTLET	152	255	338	492

PEAK FLOW CHANGE: PROPOSED - EXISTING (CFS)

HYDROLOGIC RESULTS	PEAK FLOW (CFS)			
	2-YR	10-YR	25-YR	100-YR
JOLLYVILLE ROAD OUTLET	-1	-1	-1	-10

ATTACHMENT: 7. Option 2 – Alternative Outfall Alignment



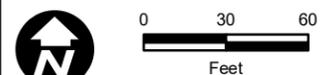
8911 N. Capital of Texas Hwy
Building 2, Suite 2300
Austin, TX 78759
Tel. 512.338.4212
www.lan-inc.com

AUSTIN, TEXAS
OAK KNOLL
STORM DRAIN IMPROVEMENT PROJECT
ALTERNATIVE OUTFALL ALIGNMENTS



LEGEND

- Drainage Pipe
- Private Ponds
- COA Ponds
- Alt. Outfall Algmt 1
- Alt. Outfall Algmt 2
- PMZ
- PCLE Zone
- Water lines
- Gas line
- Wastewater lines
- Underground Telephone
- Fibre Optics



Project No. 120-11884-003
Date: 9/10/2019

Multiple conflicts with existing utilities in Jollyville ROW:

- Wastewater (ukwn dia/mtrl)
- 2 in. CI Water (abnd)
- 6 in. DI Water (abnd)
- 6 in. AC Water
- 8 in. DI Water
- 24 in. DI Water (ukwn mtrl)
- 16 in. DI Water
- Gas (ukwn dia/mtrl)
- 14 in. CSC Water (abnd)
- Wastewater (ukwn dia/mtrl)

Connect to existing SD system. Tie-in elevation appears feasible based on anticipated elevations and minimum velocity criteria. Note that connection is ~100 ft from PMZ.

Possible conflicts with existing street culverts. If unavoidable, would require collecting combined flows via junction box due to anticipated shallow depth of cover.

FL elev: 903 ft

FL elev. 894 ft

FL elev: 899 ft

Easement required for alignment not in Jollyville.

Likely conflict with fiber optic

Proposed Underground Detention System (MAE Option 2)

Unknown City Asset. May pose conflict with tie-in.

Impacts on downstream infrastructure from direct connection of Oak Knoll SD system (as proposed by either alternative shown in this figure) has not been reviewed. Improvement to relative conveyance efficiency as well as reduction in infiltration could demand an increase in downstream system capacity.

N:\1201120-11884-003-0-Data-GIS-Modeling\9-01-GIS\2-ArcMapProjects\Working\OKSDI_OutfallOptions.mxd

100 ft from PMZ
50 ft from PMZ



8911 N. Capital of Texas Hwy
 Building 2, Suite 2300
 Austin, TX 78759
 Tel. 512.338.4212
 www.lan-inc.com

AUSTIN, TEXAS
 OAK KNOLL
 STORM DRAIN IMPROVEMENT PROJECT
 ALTERNATIVE OUTFALL ALIGNMENTS

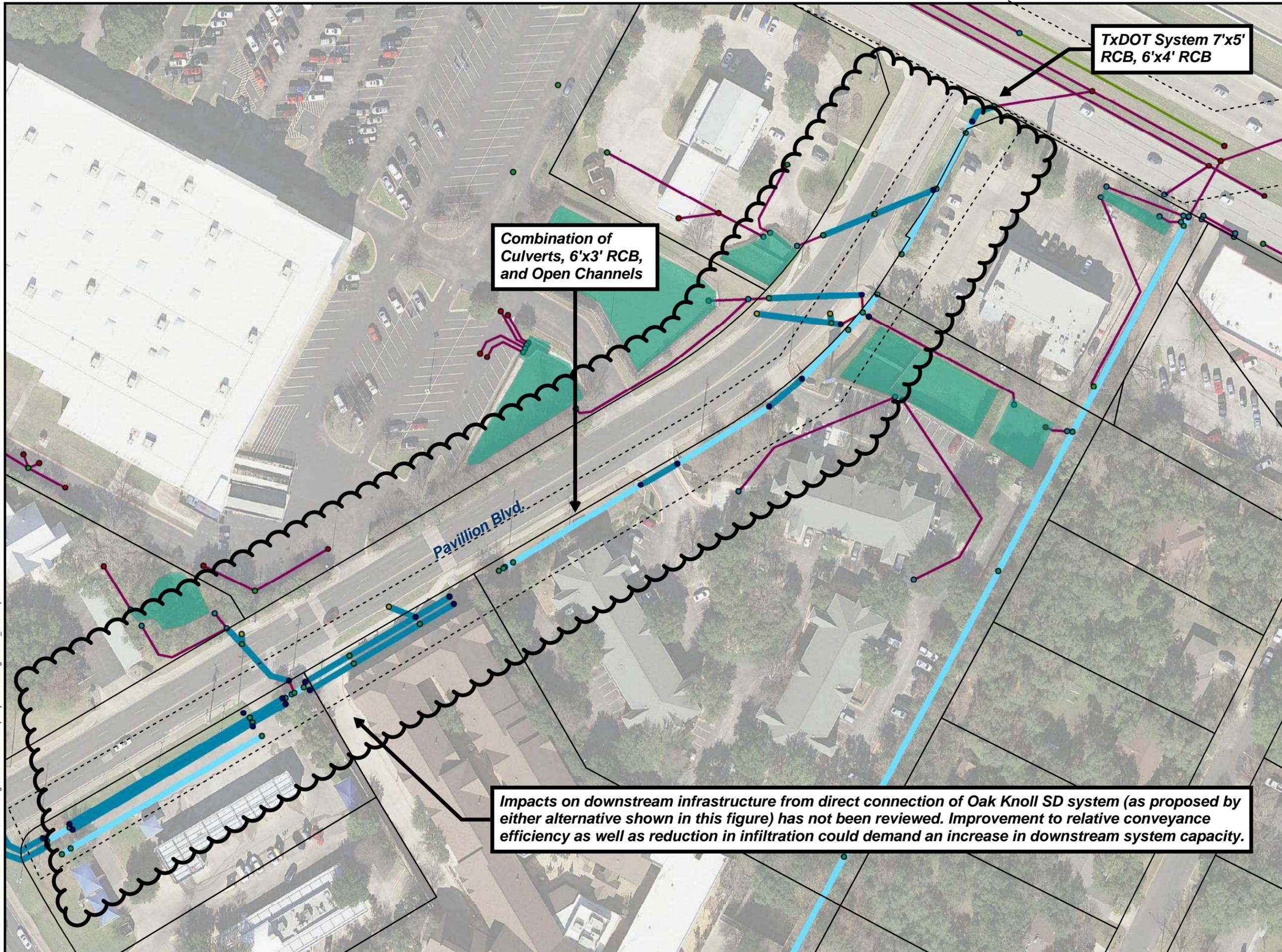


LEGEND

- Drainage Pipe
- Open Channel
- Private Drainage Pipe
- Private ponds
- COA Ponds



Project No. 120-11884-003
 Date: 9/10/2019
 Sheet #: 2



**Combination of
 Culverts, 6'x3' RCB,
 and Open Channels**

**TxDOT System 7'x5'
 RCB, 6'x4' RCB**

Impacts on downstream infrastructure from direct connection of Oak Knoll SD system (as proposed by either alternative shown in this figure) has not been reviewed. Improvement to relative conveyance efficiency as well as reduction in infiltration could demand an increase in downstream system capacity.

N:\1201\20-11884-003\9-0-Data-GIS-Modeling\9-01-GIS\2-ArcMapProjects\Working\OKSDI_OutfallOptions.mxd

© LEO A DALY Company 2019

ATTACHMENT: 8. Cost Estimate Detail

**OAK KNOLL STORM DRAIN IMPROVEMENTS PROJECT
 TM01 - MITIGATION ALTERNATIVES EVALUATION
 OPTION 2 - ALTERNATIVE LAYOUT/DESIGN
 OPINION OF PROBABLE CONSTRUCTION COST**



ROW	ITEM NO.	ITEM DESCRIPTION	UNIT	RATE	QTY	ITEM COST
1	CHELSEA MOOR POND IMPROVEMENTS					
2	102S-A	CLEARING AND GRUBBING	AC	\$5,000	1	\$4,000
3	120S-B	CHANNEL EXCAVATION, PLAN QUANTITY	CY	\$35	2,222	\$77,777
4	130S-T	CLASS C (TOPSOIL), PLAN QUANTITY, 6-IN. DEPTH	CY	\$48	222	\$10,666
5	SP401S-I	COFFERDAMS AND DEWATERING	LS	\$10,000	1	\$10,000
6	403S-LF	TRICKLE CHANNEL, REINFORCED CONCRETE	LF	\$25	300	\$7,500
7	508S-E3x3	ENERGY DISSIPATOR, 3 FT. X 3 FT. POND OUTFALL	EA	\$17,000	1	\$17,000
8	509S-1	TRENCH EXCAVATION SAFETY PROTECTIVE SYSTEMS (ALL DEPTHS)	LF	\$4	610	\$2,440
9	510-ASD 24" DIA.	PIPE, 24" DIA., RCP CL III (ALL DEPTHS), INCLUDING EXCAVATION & BACKFILL	LF	\$121	20	\$2,420
10	604S-A	NON-NATIVE SEEDING FOR EROSION CONTROL METHOD, _ MULCH	SY	\$3	1,333	\$4,000
11	605S-A	SOIL RETENTION BLANKET CLASS 2, TYPE D	SY	\$10	1,333	\$13,333
12	SP608S	EXTENDED PLANTINGS MAINTENANCE	MO	\$1,500	12	\$18,000
13	609S-F	WATERING	SY	\$3	1,333	\$4,000
14	610S-A	TREE PROTECTIVE FENCING TYPE A CHAIN LINK FENCE	LF	\$7	500	\$3,500
15	SP610S-E	TREE TRIMMING	EA	\$300	5	\$1,500
16	623S	DRY STACK ROCK WALL	SF	\$80	340	\$27,200
17	639S	ROCK BERM	LF	\$41	40	\$1,640
18	641S	STABILIZED CONSTRUCTION ENTRANCE	EA	\$1,800	1	\$1,800
19	642S	SILT FENCE	LF	\$3	1,000	\$3,100
20	610S-R - MTGN	TREE REMOVAL MITIGATION PAYMENT/COST	IN	\$200	8	\$1,600
21	610S-R	REMOVAL OF EXISTING TREES	EA	\$560	8	\$4,480
22	SUBTOTAL: CHELSEA MOOR POND IMPROVEMENTS (ROUNDED)					\$ 216,000
23	Contingency (30%)					\$ 64,800
24	COLUMBIA OAKS UNDERGROUND DETENTION SYSTEM					
25	104S-A	REMOVE P.C. CONCRETE CURB	LF	\$11	500	\$5,500
26	110S-B	STREET EXCAVATION, PLAN QUANTITY	CY	\$35	2,100	\$73,500
27	210S-A	FLEXIBLE BASE	CY	\$85	711	\$60,444
28	340S-B-C3	HOT MIX ASPHALTIC CONCRETE PAVEMENT, 3 INCHES, TYPE C	SY	\$40	356	\$14,224
29	430S-A	P.C. CONCRETE CURB AND GUTTER	LF	\$30	500	\$15,000
30	506S-CNSW	CONNECTION TO EXISTING 6 FT. X 3 FT. BOX CULVERT	EA	\$3,000	2	\$6,000
31	508S-IG5x4	INLET, GRATED, 5 FT. X 4 FT.	EA	\$3,000	3	\$9,000
32	509S-1	TRENCH EXCAVATION SAFETY PROTECTIVE SYSTEMS (ALL DEPTHS)	LF	\$4	610	\$2,440
33	510-ASD 18" DIA	PIPE, 18 INCH DIA. RCP (ALL DEPTHS), INCLUDING EXCAVATION & BACKFILL	LF	\$120	200	\$24,000
34	628S-B	SEDIMENT CONTAINMENT DIKES	LF	\$14	50	\$700
35	UTIL RLCS	RELOCATE EXISTING UTILITIES	EA	\$200,000	1	\$200,000
36	UDS	UNDERGROUND DETENTION UNIT (FORTERRA CROWN SPAN)	SF	\$120	6,250	\$750,000
37	UDS-SB	SPLITTER BOX FOR UNDERGROUND DETENTION UNIT	EA	\$75,000	1	\$75,000
38	SUBTOTAL: COLUMBIA OAKS UNDERGROUND DETENTION SYSTEM (ROUNDED)					\$ 1,235,800
39	Contingency (30%)					\$ 370,700
40	GRAND TOTAL (ROUNDED)					\$ 1,887,300

Notes:

1. Refer to TM01 for detail of design basis and assumptions.

Not to be used for construction, bidding, permitting or regulatory approval purposes. This document is released on 9/10/2019 for the purpose of interim review under the authority of Laura Casset, Texas PE NO. 99387, Lockwood, Andrews & Newnam, Inc., Texas Registered Engineering Firm - 2614