CONTRIBUTING ZONE PLAN

LEANDER MUNICIPAL ATHLETIC COMPLEX

2401 US HWY 183
LEANDER, TX 78641

JUNE 2024

BY: Casey Hadsall
PARKHILL JOB NO. 11876.22

Parkhill

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Texas Commission on Environmental Quality

Edwards Aquifer Application Cover Page

Our Review of Your Application

The Edwards Aquifer Program staff conducts an administrative and technical review of all applications. The turnaround time for administrative review can be up to 30 days as outlined in 30 TAC 213.4(e). Generally administrative completeness is determined during the intake meeting or within a few days of receipt. The turnaround time for technical review of an administratively complete Edwards Aquifer application is 90 days as outlined in 30 TAC 213.4(e). Please know that the review and approval time is directly impacted by the quality and completeness of the initial application that is received. In order to conduct a timely review, it is imperative that the information provided in an Edwards Aquifer application include final plans, be accurate, complete, and in compliance with 30 TAC 213.

Administrative Review

1. Edwards Aquifer applications must be deemed administratively complete before a technical review can begin. To be considered administratively complete, the application must contain completed forms and attachments, provide the requested information, and meet all the site plan requirements. The submitted application and plan sheets should be final plans. Please submit one full-size set of plan sheets with the original application, and half-size sets with the additional copies.

   To ensure that all applicable documents are included in the application, the program has developed tools to guide you and web pages to provide all forms, checklists, and guidance. Please visit the below website for assistance: http://www.tceq.texas.gov/field/eapp.

2. This Edwards Aquifer Application Cover Page form (certified by the applicant or agent) must be included in the application and brought to the administrative review meeting.

3. Administrative reviews are scheduled with program staff who will conduct the review. Applicants or their authorized agent should call the appropriate regional office, according to the county in which the project is located, to schedule a review. The average meeting time is one hour.

4. In the meeting, the application is examined for administrative completeness. Deficiencies will be noted by staff and emailed or faxed to the applicant and authorized agent at the end of the meeting, or shortly after. Administrative deficiencies will cause the application to be deemed incomplete and returned.

   An appointment should be made to resubmit the application. The application is re-examined to ensure all deficiencies are resolved. The application will only be deemed administratively complete when all administrative deficiencies are addressed.

5. If an application is received by mail, courier service, or otherwise submitted without a review meeting, the administrative review will be conducted within 30 days. The applicant and agent will be contacted with the results of the administrative review. If the application is found to be administratively incomplete, it can be retrieved from the regional office or returned by regular mail. If returned by mail, the regional office may require arrangements for return shipping.

6. If the geologic assessment was completed before October 1, 2004 and the site contains "possibly sensitive" features, the assessment must be updated in accordance with the *Instructions to Geologists* (TCEQ-0585 Instructions).

Technical Review

1. When an application is deemed administratively complete, the technical review period begins. The regional office will distribute copies of the application to the identified affected city, county, and groundwater conservation district whose jurisdiction includes the subject site. These entities and the public have 30 days to provide comments on the application to the regional office. All comments received are reviewed by TCEQ.

2. A site assessment is usually conducted as part of the technical review, to evaluate the geologic assessment and observe existing site conditions. The site must be accessible to our staff. The site boundaries should be

clearly marked, features identified in the geologic assessment should be flagged, roadways marked and the alignment of the Sewage Collection System and manholes should be staked at the time the application is submitted. If the site is not marked the application may be returned.

3. We evaluate the application for technical completeness and contact the applicant and agent via Notice of Deficiency (NOD) to request additional information and identify technical deficiencies. There are two deficiency response periods available to the applicant. There are 14 days to resolve deficiencies noted in the first NOD. If a second NOD is issued, there is an additional 14 days to resolve deficiencies. If the response to the second notice is not received, is incomplete or inadequate, or provides new information that is incomplete or inadequate, the application must be withdrawn or will be denied. Please note that because the technical review is underway, whether the application is withdrawn or denied **the application fee will be forfeited**.
4. The program has 90 calendar days to complete the technical review of the application. If the application is technically adequate, such that it complies with the Edwards Aquifer rules, and is protective of the Edwards Aquifer during and after construction, an approval letter will be issued. Construction or other regulated activity may not begin until an approval is issued.

Mid-Review Modifications

It is important to have final site plans prior to beginning the permitting process with TCEQ to avoid delays.

Occasionally, circumstances arise where you may have significant design and/or site plan changes after your Edwards Aquifer application has been deemed administratively complete by TCEQ. This is considered a "Mid-Review Modification". Mid-Review Modifications may require redistribution of an application that includes the proposed modifications for public comment.

If you are proposing a Mid-Review Modification, two options are available:

- If the technical review has begun your application can be denied/withdrawn, your fees will be forfeited, and the plan will have to be resubmitted.
- TCEQ can continue the technical review of the application as it was submitted, and a modification application can be submitted at a later time.

If the application is denied/withdrawn, the resubmitted application will be subject to the administrative and technical review processes and will be treated as a new application. The application will be redistributed to the affected jurisdictions.

Please contact the regional office if you have questions. If your project is located in Williamson, Travis, or Hays County, contact TCEQ's Austin Regional Office at 512-339-2929. If your project is in Comal, Bexar, Medina, Uvalde, or Kinney County, contact TCEQ's San Antonio Regional Office at 210-490-3096

Please fill out all required fields below and submit with your application.

1. Regulated Entity Name: Leander Municipal Athletic Complex						**2. Regulated Entity No.:**			
3. Customer Name: City of Leander						**4. Customer No.: 600646012**			
5. Project Type: **(Please circle/check one)**	(New)		Modification			Extension		Exception	
6. Plan Type: **(Please circle/check one)**	WPAP	(CZP)	SCS	UST	AST	EXP	EXT	Technical Clarification	Optional Enhanced Measures
7. Land Use: **(Please circle/check one)**	Residential		(Non-residential)			**8. Site (acres):**			77.1
9. Application Fee:	$8,000		**10. Permanent BMP(s):**					Bioretention, Engineered Vegetative Filter Strip, Pervious Synthetic Turf	
11. SCS (Linear Ft.):	0		**12. AST/UST (No. Tanks):**					0	
13. County:	Williamson		**14. Watershed:**					South Fork San Gabriel River	

Application Distribution

Instructions: Use the table below to determine the number of applications required. One original and one copy of the application, plus additional copies (as needed) for each affected incorporated city, county, and groundwater conservation district are required. Linear projects or large projects, which cross into multiple jurisdictions, can require additional copies. Refer to the "Texas Groundwater Conservation Districts within the EAPP Boundaries" map found at:

http://www.tceq.texas.gov/assets/public/compliance/field_ops/eapp/EAPP%20GWCD%20map.pdf

For more detailed boundaries, please contact the conservation district directly.

Austin Region			
County:	**Hays**	**Travis**	**Williamson**
Original (1 req.)	___	___	_X_
Region (1 req.)	___	___	_X_
County(ies)	___	___	_X_
Groundwater Conservation District(s)	___Edwards Aquifer Authority ___Barton Springs/ Edwards Aquifer ___Hays Trinity ___Plum Creek	___Barton Springs/ Edwards Aquifer	NA
City(ies) Jurisdiction	___Austin ___Buda ___Dripping Springs ___Kyle ___Mountain City ___San Marcos ___Wimberley ___Woodcreek	___Austin ___Bee Cave ___Pflugerville ___Rollingwood ___Round Rock ___Sunset Valley ___West Lake Hills	___Austin ___Cedar Park ___Florence ___Georgetown ___Jerrell _X_Leander ___Liberty Hill ___Pflugerville ___Round Rock

San Antonio Region					
County:	**Bexar**	**Comal**	**Kinney**	**Medina**	**Uvalde**
Original (1 req.)	___	___	___	___	___
Region (1 req.)	___	___	___	___	___
County(ies)	___	___	___	___	___
Groundwater Conservation District(s)	___ Edwards Aquifer Authority ___Trinity-Glen Rose	_Edwards Aquifer Authority	___Kinney	___EAA ___Medina	___EAA ___Uvalde
City(ies) Jurisdiction	___Castle Hills ___Fair Oaks Ranch ___Helotes ___Hill Country Village ___Hollywood Park ___San Antonio (SAWS) ___Shavano Park	___Bulverde ___Fair Oaks Ranch ___Garden Ridge ___New Braunfels ___Schertz	NA	___San Antonio ETJ (SAWS)	NA

I certify that to the best of my knowledge, that the application is complete and accurate. This application is hereby submitted to TCEQ for administrative review and technical review. Casey Hadsall, PE
Print Name of Customer/Authorized Agent Casey Hadsall 02/23/2024 Signature of Customer/Authorized Agent Date

FOR TCEQ INTERNAL USE ONLY				
Date(s)Reviewed:		Date Administratively Complete:		
Received From:		Correct Number of Copies:		
Received By:		Distribution Date:		
EAPP File Number:		Complex:		
Admin. Review(s) (No.):		No. AR Rounds:		
Delinquent Fees (Y/N):		Review Time Spent:		
Lat./Long. Verified:		SOS Customer Verification:		
Agent Authorization Complete/Notarized (Y/N):		Fee Check:	Payable to TCEQ (Y/N):	
Core Data Form Complete (Y/N):			Signed (Y/N):	
Core Data Form Incomplete Nos.:			Less than 90 days old (Y/N):	

SECTION 1

CONTRIBUTING ZONE PLAN

Contributing Zone Plan Application

Texas Commission on Environmental Quality

for Regulated Activities on the Contributing Zone to the Edwards Aquifer and Relating to 30 TAC §213.24(1), Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

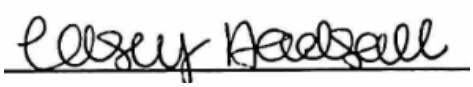
Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **Contributing Zone Plan Application** is hereby submitted for TCEQ review and Executive Director approval. The application was prepared by:

Print Name of Customer/Agent: Casey Hadsall

Date: 05/31/2023

Signature of Customer/Agent:



Regulated Entity Name: Leander Municipal Athletic Complex

Project Information

1. County: Williamson
2. Stream Basin: South Fork San Gabriel River
3. Groundwater Conservation District (if applicable): NA
4. Customer (Applicant):

   Contact Person: Russell Alabastro
   Entity: City of Leander
   Mailing Address: 201 N. Brushy Street
   City, State: Leander, TX Zip: 78641
   Telephone: 512-528-2750 Fax: 512-259-1425
   Email Address: ralabastro@leandertx.gov

5. Agent/Representative (If any):

Contact Person: Casey Hadsall, PE
Entity: Parkhill, Inc
Mailing Address: 255 N. Center Street, Suite 200
City, State: Arlington, Texas Zip: 76011
Telephone: 903-521-2730 Fax: 817-649-7645
Email Address: chadsall@parkhill.com

6. Project Location:

☒ The project site is located inside the city limits of Leander, Texas.
☒ The project site is located outside the city limits but inside the ETJ (extra-territorial jurisdiction) of Leander, Texas.
☐ The project site is not located within any city's limits or ETJ.

7. ☒ The location of the project site is described below. Sufficient detail and clarity has been provided so that the TCEQ's Regional staff can easily locate the project and site boundaries for a field investigation.

The project is located to the East of US Highway 183, and to the north of the South Fork San Gabriel River. Larkspur Park Boulevard is north of the project site and Walkup Lane is east of the project site. The regional trail that is included in the project runs from the project site to the south east along the north edge of the South Fork San Gabriel River.

8. ☒ **Attachment A - Road Map**. A road map showing directions to and the location of the project site is attached. The map clearly shows the boundary of the project site.

9. ☒ **Attachment B - USGS Quadrangle Map**. A copy of the official 7 ½ minute USGS Quadrangle Map (Scale: 1" = 2000') is attached. The map(s) clearly show:

☒ Project site boundaries.
☒ USGS Quadrangle Name(s).

10. ☒ **Attachment C - Project Narrative**. A detailed narrative description of the proposed project is attached. The project description is consistent throughout the application and contains, at a minimum, the following details:

☒ Area of the site
☒ Offsite areas
☒ Impervious cover
☒ Permanent BMP(s)
☒ Proposed site use
☒ Site history
☒ Previous development
☒ Area(s) to be demolished

11. Existing project site conditions are noted below:

- ☐ Existing commercial site
- ☐ Existing industrial site
- ☐ Existing residential site
- ☐ Existing paved and/or unpaved roads
- ☐ Undeveloped (Cleared)
- ☒ Undeveloped (Undisturbed/Not cleared)
- ☐ Other: _____

12. The type of project is:

- ☐ Residential: # of Lots: _____
- ☐ Residential: # of Living Unit Equivalents: _____
- ☐ Commercial
- ☐ Industrial
- ☒ Other: Park

13. Total project area (size of site): 77.1 Acres

    Total disturbed area: 48.9 Acres

14. Estimated projected population: N/A

15. The amount and type of impervious cover expected after construction is complete is shown below:

Table 1 - Impervious Cover

Impervious Cover of Proposed Project	*Sq. Ft.*	*Sq. Ft./Acre*	*Acres*
Structures/Rooftops	2614	÷ 43,560 =	0.06
Parking	131552	÷ 43,560 =	3.02
Other paved surfaces	157392	÷ 43,560 =	3.61
Total Impervious Cover	291558	÷ 43,560 =	6.69

Total Impervious Cover 6.69 **÷ Total Acreage** 77.1 **X 100 =** 8.7**% Impervious Cover**

16. ☒ **Attachment D - Factors Affecting Surface Water Quality**. A detailed description of all factors that could affect surface water quality is attached. If applicable, this includes the location and description of any discharge associated with industrial activity other than construction.

17. ☒ Only inert materials as defined by 30 TAC 330.2 will be used as fill material.

For Road Projects Only

Complete questions 18 - 23 if this application is exclusively for a road project.

☒ N/A

18. Type of project:

    ☐ TXDOT road project.
    ☐ County road or roads built to county specifications.
    ☐ City thoroughfare or roads to be dedicated to a municipality.
    ☐ Street or road providing access to private driveways.

19. Type of pavement or road surface to be used:

    ☐ Concrete
    ☐ Asphaltic concrete pavement
    ☐ Other: _____

20. Right of Way (R.O.W.):

    Length of R.O.W.: _____ feet.
    Width of R.O.W.: _____ feet.
    L x W = _____Ft^2 ÷ 43,560 Ft^2/Acre = _____ acres.

21. Pavement Area:

    Length of pavement area: _____ feet.
    Width of pavement area: _____ feet.
    L x W = _____Ft^2 ÷ 43,560 Ft^2/Acre = _____ acres.
    Pavement area _____ acres ÷ R.O.W. area _____ acres x 100 = _____% impervious cover.

22. ☐ A rest stop will be included in this project.

    ☐ A rest stop will not be included in this project.

23. ☐ Maintenance and repair of existing roadways that do not require approval from the TCEQ Executive Director. Modifications to existing roadways such as widening roads/adding shoulders totaling more than one-half (1/2) the width of one (1) existing lane require prior approval from the TCEQ.

Stormwater to be generated by the Proposed Project

24. ☒ **Attachment E - Volume and Character of Stormwater**. A detailed description of the volume (quantity) and character (quality) of the stormwater runoff which is expected to occur from the proposed project is attached. The estimates of stormwater runoff quality and quantity are based on area and type of impervious cover. Include the runoff coefficient of the site for both pre-construction and post-construction conditions.

Wastewater to be generated by the Proposed Project

25. ☒ Wastewater is to be discharged in the contributing zone. Requirements under 30 TAC §213.6(c) relating to Wastewater Treatment and Disposal Systems have been satisfied.

☐ N/A

26. Wastewater will be disposed of by:

☐ On-Site Sewage Facility (OSSF/Septic Tank):

☐ **Attachment F - Suitability Letter from Authorized Agent**. An on-site sewage facility will be used to treat and dispose of the wastewater from this site. The appropriate licensing authority's (authorized agent) written approval is attached. It states that the land is suitable for the use of private sewage facilities and will meet or exceed the requirements for on-site sewage facilities as specified under 30 TAC Chapter 285 relating to On-site Sewage Facilities.

☐ Each lot in this project/development is at least one (1) acre (43,560 square feet) in size. The system will be designed by a licensed professional engineer or registered sanitarian and installed by a licensed installer in compliance with 30 TAC Chapter 285.

☒ Sewage Collection System (Sewer Lines):

The sewage collection system will convey the wastewater to the Liberty Hill Wastewater (name) Treatment Plant. The treatment facility is:

☒ Existing.
☐ Proposed.

☐ N/A

Permanent Aboveground Storage Tanks(ASTs) ≥ 500 Gallons

Complete questions 27 - 33 if this project includes the installation of AST(s) with volume(s) greater than or equal to 500 gallons.

☒N/A

27. Tanks and substance stored:

Table 2 - Tanks and Substance Storage

AST Number	*Size (Gallons)*	*Substance to be Stored*	*Tank Material*
1			
2			
3			

AST Number	*Size (Gallons)*	*Substance to be Stored*	*Tank Material*
4			
5			

Total x 1.5 = _____ Gallons

28. ☐ The AST will be placed within a containment structure that is sized to capture one and one-half (1 1/2) times the storage capacity of the system. For facilities with more than one tank system, the containment structure is sized to capture one and one-half (1 1/2) times the cumulative storage capacity of all systems.

    ☐ **Attachment G - Alternative Secondary Containment Methods**. Alternative methods for providing secondary containment are proposed. Specifications showing equivalent protection for the Edwards Aquifer are attached.

29. Inside dimensions and capacity of containment structure(s):

Table 3 - Secondary Containment

Length (L)(Ft.)	*Width(W)(Ft.)*	*Height (H)(Ft.)*	*L x W x H = (Ft3)*	*Gallons*

Total: _____ Gallons

30. Piping:

☐ All piping, hoses, and dispensers will be located inside the containment structure.
☐ Some of the piping to dispensers or equipment will extend outside the containment structure.
☐ The piping will be aboveground
☐ The piping will be underground

31. ☐ The containment area must be constructed of and in a material impervious to the substance(s) being stored. The proposed containment structure will be constructed of: _____.

32. ☐ **Attachment H - AST Containment Structure Drawings**. A scaled drawing of the containment structure is attached that shows the following:

☐ Interior dimensions (length, width, depth and wall and floor thickness).
☐ Internal drainage to a point convenient for the collection of any spillage.
☐ Tanks clearly labeled
☐ Piping clearly labeled

☐ Dispenser clearly labeled

33. ☐ Any spills must be directed to a point convenient for collection and recovery. Spills from storage tank facilities must be removed from the controlled drainage area for disposal within 24 hours of the spill.

    ☐ In the event of a spill, any spillage will be removed from the containment structure within 24 hours of the spill and disposed of properly.

    ☐ In the event of a spill, any spillage will be drained from the containment structure through a drain and valve within 24 hours of the spill and disposed of properly. The drain and valve system are shown in detail on the scaled drawing.

Site Plan Requirements

Items 34 - 46 must be included on the Site Plan.

34. ☒ The Site Plan must have a minimum scale of 1" = 400'.

    Site Plan Scale: 1" = 150'.

35. 100-year floodplain boundaries:

    ☒ Some part(s) of the project site is located within the 100-year floodplain. The floodplain is shown and labeled.

    ☐ No part of the project site is located within the 100-year floodplain.

    The 100-year floodplain boundaries are based on the following specific (including date of material) sources(s): _____.

36. ☒ The layout of the development is shown with existing and finished contours at appropriate, but not greater than ten-foot contour intervals. Lots, recreation centers, buildings, roads, etc. are shown on the site plan.

    ☐ The layout of the development is shown with existing contours at appropriate, but not greater than ten-foot contour intervals. Finished topographic contours will not differ from the existing topographic configuration and are not shown. Lots, recreation centers, buildings, roads, etc. are shown on the site plan.

37. ☒ A drainage plan showing all paths of drainage from the site to surface streams.

38. ☒ The drainage patterns and approximate slopes anticipated after major grading activities.

39. ☒ Areas of soil disturbance and areas which will not be disturbed.

40. ☒ Locations of major structural and nonstructural controls. These are the temporary and permanent best management practices.

41. ☒ Locations where soil stabilization practices are expected to occur.

42. ☒ Surface waters (including wetlands).

    ☐ N/A

43. ☒ Locations where stormwater discharges to surface water.

    ☐ There will be no discharges to surface water.

44. ☐ Temporary aboveground storage tank facilities.

    ☒ Temporary aboveground storage tank facilities will not be located on this site.

45. ☐ Permanent aboveground storage tank facilities.

    ☒ Permanent aboveground storage tank facilities will not be located on this site.

46. ☒ Legal boundaries of the site are shown.

Permanent Best Management Practices (BMPs)

Practices and measures that will be used during and after construction is completed.

47. ☒ Permanent BMPs and measures must be implemented to control the discharge of pollution from regulated activities after the completion of construction.

    ☐ N/A

48. ☒ These practices and measures have been designed, and will be constructed, operated, and maintained to insure that 80% of the incremental increase in the annual mass loading of total suspended solids (TSS) from the site caused by the regulated activity is removed. These quantities have been calculated in accordance with technical guidance prepared or accepted by the executive director.

    ☒ The TCEQ Technical Guidance Manual (TGM) was used to design permanent BMPs and measures for this site.

    ☐ A technical guidance other than the TCEQ TGM was used to design permanent BMPs and measures for this site. The complete citation for the technical guidance that was used is: _____.

    ☐ N/A

49. ☒ Owners must insure that permanent BMPs and measures are constructed and function as designed. A Texas Licensed Professional Engineer must certify in writing that the permanent BMPs or measures were constructed as designed. The certification letter must be submitted to the appropriate regional office within 30 days of site completion.

    ☐ N/A

50. Where a site is used for low density single-family residential development and has 20 % or less impervious cover, other permanent BMPs are not required. This exemption from permanent BMPs must be recorded in the county deed records, with a notice that if the percent impervious cover increases above 20% or land use changes, the exemption for the whole site as described in the property boundaries required by 30 TAC §213.4(g) (relating to Application Processing and Approval), may no longer apply and the property owner must notify the appropriate regional office of these changes.

☐ The site will be used for low density single-family residential development and has 20% or less impervious cover.
☐ The site will be used for low density single-family residential development but has more than 20% impervious cover.
☒ The site will not be used for low density single-family residential development.

51. The executive director may waive the requirement for other permanent BMPs for multi-family residential developments, schools, or small business sites where 20% or less impervious cover is used at the site. This exemption from permanent BMPs must be recorded in the county deed records, with a notice that if the percent impervious cover increases above 20% or land use changes, the exemption for the whole site as described in the property boundaries required by 30 TAC §213.4(g) (relating to Application Processing and Approval), may no longer apply and the property owner must notify the appropriate regional office of these changes.

☐ **Attachment I - 20% or Less Impervious Cover Waiver**. The site will be used for multi-family residential developments, schools, or small business sites and has 20% or less impervious cover. A request to waive the requirements for other permanent BMPs and measures is attached.
☐ The site will be used for multi-family residential developments, schools, or small business sites but has more than 20% impervious cover.
☒ The site will not be used for multi-family residential developments, schools, or small business sites.

52. ☒ **Attachment J - BMPs for Upgradient Stormwater**.

☐ A description of the BMPs and measures that will be used to prevent pollution of surface water, groundwater, or stormwater that originates upgradient from the site and flows across the site is attached.
☐ No surface water, groundwater or stormwater originates upgradient from the site and flows across the site, and an explanation is attached.
☒ Permanent BMPs or measures are not required to prevent pollution of surface water, groundwater, or stormwater that originates upgradient from the site and flows across the site, and an explanation is attached.

53. ☒ **Attachment K - BMPs for On-site Stormwater**.

☒ A description of the BMPs and measures that will be used to prevent pollution of surface water or groundwater that originates on-site or flows off the site, including pollution caused by contaminated stormwater runoff from the site is attached.
☐ Permanent BMPs or measures are not required to prevent pollution of surface water or groundwater that originates on-site or flows off the site, including pollution caused by contaminated stormwater runoff, and an explanation is attached.

54. ☒ **Attachment L - BMPs for Surface Streams**. A description of the BMPs and measures that prevent pollutants from entering surface streams is attached.

☐ N/A

55. ☒ **Attachment M - Construction Plans**. Construction plans and design calculations for the proposed permanent BMPs and measures have been prepared by or under the direct supervision of a Texas Licensed Professional Engineer, and are signed, sealed, and dated. Construction plans for the proposed permanent BMPs and measures are attached and include: Design calculations, TCEQ Construction Notes, all proposed structural plans and specifications, and appropriate details.

☐ N/A

56. ☒ **Attachment N - Inspection, Maintenance, Repair and Retrofit Plan**. A site and BMP specific plan for the inspection, maintenance, repair, and, if necessary, retrofit of the permanent BMPs and measures is attached. The plan fulfills all of the following:

☒ Prepared and certified by the engineer designing the permanent BMPs and measures
☒ Signed by the owner or responsible party
☒ Outlines specific procedures for documenting inspections, maintenance, repairs, and, if necessary, retrofit.
☒ Contains a discussion of record keeping procedures

☐ N/A

57. ☐ **Attachment O - Pilot-Scale Field Testing Plan**. Pilot studies for BMPs that are not recognized by the Executive Director require prior approval from the TCEQ. A plan for pilot-scale field testing is attached.

☒ N/A

58. ☒ **Attachment P - Measures for Minimizing Surface Stream Contamination**. A description of the measures that will be used to avoid or minimize surface stream contamination and changes in the way in which water enters a stream as a result of the construction and development is attached. The measures address increased stream flashing, the creation of stronger flows and in-stream velocities, and other in-stream effects caused by the regulated activity, which increase erosion that result in water quality degradation.

☐ N/A

Responsibility for Maintenance of Permanent BMPs and Measures after Construction is Complete.

59. ☒ The applicant is responsible for maintaining the permanent BMPs after construction until such time as the maintenance obligation is either assumed in writing by another entity having ownership or control of the property (such as without limitation, an owner's association, a new property owner or lessee, a district, or municipality) or the ownership of the property is transferred to the entity. Such entity shall then be

responsible for maintenance until another entity assumes such obligations in writing or ownership is transferred.

60. ☒ A copy of the transfer of responsibility must be filed with the executive director at the appropriate regional office within 30 days of the transfer if the site is for use as a multiple single-family residential development, a multi-family residential development, or a non-residential development such as commercial, industrial, institutional, schools, and other sites where regulated activities occur.

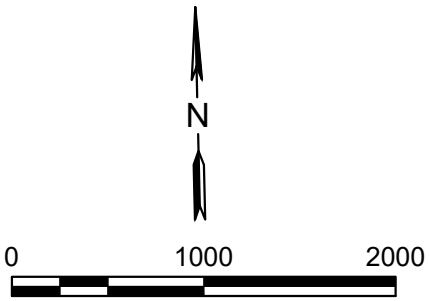
Administrative Information

61. ☒ Submit one (1) original and one (1) copy of the application, plus additional copies as needed for each affected incorporated city, groundwater conservation district, and county in which the project will be located. The TCEQ will distribute the additional copies to these jurisdictions.

62. ☒ Any modification of this Contributing Zone Plan may require TCEQ review and Executive Director approval prior to construction, and may require submission of a revised application, with appropriate fees.

63. ☒ The site description, controls, maintenance, and inspection requirements for the storm water pollution prevention plan (SWPPP) developed under the EPA NPDES general permits for stormwater discharges have been submitted to fulfill paragraphs 30 TAC §213.24(1-5) of the technical report. All requirements of 30 TAC §213.24(1-5) have been met by the SWPPP document.

☒ The Temporary Stormwater Section (TCEQ-0602) is included with the application.



Parkhill

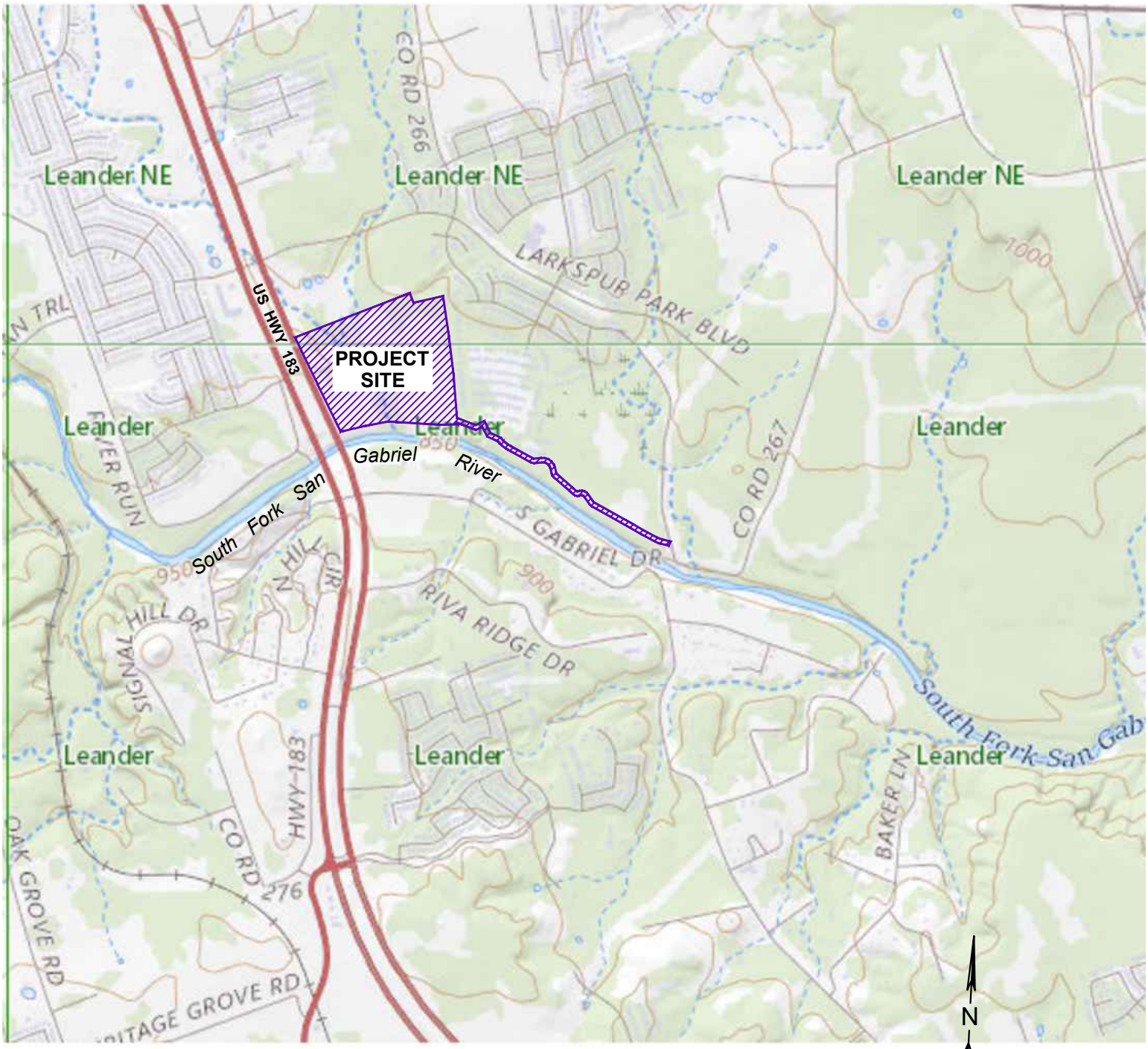
Parkhill.com

LEANDER MUNICIPAL ATHLETIC COMPLEX

CITY OF LEANDER
2201 N US HWY 183
LEANDER, TX, 78641

ROAD MAP

Issue:	
Date:	10/16/2023
Project No:	11876.22
Sheet:	1A



Parkhill

Parkhill.com

LEANDER MUNICIPAL ATHLETIC COMPLEX

CITY OF LEANDER
2201 N US HWY 183
LEANDER, TX, 78641

USGS Quadrangle Map

Issue:	
Date:	10/16/2023
Project No:	11876.22
Sheet:	1B

PROJECT NARRATIVE

Leander Municipal Athletic Complex (LMAC) is located at 2401 US HWY 183 in Leander, Texas 78641. The project site is 77.1 acres bordered by US Highway 183 on the west, South Fork San Gabriel River on the south. The project site is located within the city limits of Leander, Williamson County, Texas. The entire park site is currently undeveloped. The entire project site is located within the Edwards Aquifer Contributing Zone. A portion of the property adjacent to the tributary and river is located within the 100-year floodplain per the Flood Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) #48491C0455F, revised December 20, 2019.

The existing land is open space consisting of native trees and grasses that gently slopes towards a tributary of South Fork San Gabriel River. The tributary runs from north to south through the middle of the project site and empties into the South Fork San Gabriel River on the south edge of the site. There are no existing structures on site to be demolished.

The project consists of softball fields, multipurpose fields, restrooms, concessions, parking, utilities and associated infrastructure as well as walking trails, picnic shelters, and an outdoor sports court. Phase I of this project includes two entry drives, one vehicular bridge, one parking lot, 6,500 linear feet of trail, several softball fields, one restroom concession building, and a maintenance yard. A portion of the utilities will be designed and constructed to service the Phase I restroom and concession building and the maintenance yard and will be extended in future phases. The remainder of the fields, restroom buildings, parking, trails, and utilities will be constructed in future phases.

Much of the offsite area to the north drains to the tributary of the South Fork San Gabriel River that runs through the middle of the LMAC site. There is an existing detention pond to the north of the northeast corner of the site. The detention outfall releases water to a drainage channel that runs to the south, along the eastern edge of the site. A dual span 15’x3’ box culvert is proposed along this channel under the Entry Drive from the east. The channel will be improved as part of Phase 1 of the project to ensure the conveyance of the 100-year storm event along the edge of the property.

There is one vehicular bridge proposed as part of this project. The vehicular bridge is 140’ long and spans a tributary of South Fork San Gabriel River. There is one 80’ long pedestrian bridge proposed as part of this project that spans a channel draining to South Fork San Gabriel River. In addition, one pedestrian bridge is proposed as an alternate in this project. The alternate pedestrian bridge is 110’ long and spans the tributary of South Fork San Gabriel River.

The elevation of the site varies from 870’ to 905’ and drains primarily from north to south.

6.69 acres of impervious cover is proposed for the site in Phase 1 including, drives, bridges, parking, trails, and structures.

Proposed permanent BMPs consist of bioretention, engineered vegetative filter strips, and permeable synthetic turf fields. These BMPs will treat TSS load generated by the parking lots, drives, site paving, and building proposed for Phase 1 of this project.

A Storm Water Pollution Prevention Plan will be maintained for the site and temporary BMPs will be implemented to prevent erosion and sedimentation until completion of construction. All areas not covered by impervious surfacing will be revegetated prior to the removal of the temporary BMPs.

1,730 linear feet of sanitary sewer and eight manholes are proposed with Phase I of this project. All manholes located within the 100-year floodplain will be watertight. A lift station, force main, and additional gravity sanitary sewer line will be installed in a future phase of this project. 3,440 linear feet of water line is proposed with Phase 1 of the project.

FACTORS AFFECTING SURFACE WATER QUALITY

Materials that are anticipated to be used on site that could be a potential source of contamination include the following:

During Construction:

1. Concrete and HMAC materials
2. Wood, plastic, and metal materials
3. Tar and hydrocarbons from paving operations
4. Oil, grease, fuel and hydraulic fluid from construction equipment and vehicle drippings
5. Fertilizers, herbicides, and pesticides
6. Cleaning solutions and detergents
7. Miscellaneous construction trash and debris
8. Soil erosion and sedimentation due to construction activity

Ultimate Use:

1. Pollutants generated from vehicles utilizing the site
2. Fertilizers, herbicides, and pesticides used to maintain landscaping
3. Miscellaneous trash and debris generated from the public

(This is not intended to be an all-inclusive list)

All practical management practices will be used to reduce the risk of spills and other exposure of any contaminant to surface groundwater.

VOLUME AND CHARACTER OF STORMWATER

Existing Conditions

The existing storm water runoff for the site consists of five (5) drainage areas, encompassing the entire site. The total existing drainage area is 76.0 acres of undeveloped land consisting of native vegetation and trees. 33.4 acres (DA No. 2 & 4) drain to the tributary of the South Fork San Gabriel River that runs across the site from north to south, emptying into the South Fork San Gabriel River on the south edge of the site. 42.6 acres (DA No. 1, 3 & 5) of the existing land drains overland to the south, directly to the South Fork San Gabriel River.

There is an existing detention pond above the northeast corner of the site. The detention outfall releases water to a drainage channel that runs north to south, along the eastern edge of the site to the South Fork San Gabriel River.

The site is completely located within the Edwards Aquifer Contributing Zone. Hydrology calculations are provided on the Pre-Development Drainage Area Map located at the end of this report (**Exhibit 3**).

Proposed Conditions

The post-development drainage path follows the existing drainage path for the most part. Much of the site drains towards the tributary, then south to South Fork San Gabriel River. The majority of the east and west edges of the site drain south to South Fork San Gabriel River. Drainage Areas 2.01 to 2.04 will be constructed as part of Phase 2 of the project (Ref Post-Development Drainage Area Map, **Exhibit 3**).

The proposed storm water runoff for the site consists of twenty-one (21) drainage areas, which correspond to the different types of permanent BMP methods being proposed. The BMP Drainage Area Map is provided at the end of this report (**Exhibit 3**).

- Area A includes a portion of the Phase 1 and Phase 2 parking areas. This area drains to Bioretention Pond “A”, then is released into the tributary of the South Fork San Gabriel River.
- Areas B, C & D include Entry Drives “A” and “B” and drain to 15’ Engineered Vegetative Filter Strips, then flow overland to the tributary of the South Fork San Gabriel River.
- Area E encompasses the Regional Trail, which sheet flows over a 5.2’ Reduced-Width Engineered Vegetative Filter Strip.
- Areas G, H, I, and J include site paving and synthetic turf fields. Each of these areas drain through a base of stone and aggregate, then into a storm under drain system. Area G and H drain to the South Fork San Gabriel River. Area I drains to the proposed improved channel on the eastern edge of the site, then to the South Fork San Gabriel River. Area J drains to the tributary of the South Fork San Gabriel River.
- Area L includes a portion of Entry Drive “C” and the maintenance yard and drains to Bioretention Pond “L”, then to the proposed improved channel on the eastern edge of the site.
- Area S includes a portion of the Phase 1 parking area. This area drains to Bioretention Pond “S”, then is released into the tributary of the South Fork San Gabriel River.
- Area R includes a portion of the Phase 1 parking area. This area drains to Bioretention Pond “R”, then is released into the tributary of the South Fork San Gabriel River.

- Areas F, K, M, N, O, P, Q, T and U have minimal impervious cover and no proposed BMPs.

The site is completely located within the Edwards Aquifer Contributing Zone. Hydrology calculations are provided on the Post-Development Drainage Area Map located at the end of this report (**Exhibit 3**). TSS Removal Calculations by area are shown on the BMP Drainage Area Map located at the end of this report (**Exhibit 3**).

BMPS FOR UP-GRADIENT STORMWATER

Much of the storm water that originates up-gradient from the site drains directly to the tributary of the South Fork San Gabriel River that runs through the center of the project site. 84.8 acres of the upstream properties drain to an existing detention pond north of the northeast corner of the site. The outfall from this detention runs through a natural channel along the eastern edge of the LMAC property. The existing detention pond treats over 80% of the TSS from the storm water collected prior to exiting the pond onto the project site.

BMPS FOR ON-SITE STORMWATER

The stormwater originating on-site will be treated by several different Proposed BMPs. A BMP Drainage Area Map is provided at the end of this report (**Exhibit 3**).

- Area A includes a portion of the Phase 1 and Phase 2 parking areas. This area drains to Bioretention Pond "A", then is released into the tributary of the South Fork San Gabriel River.
- Areas B, C & D include Entry Drives "A" and "B" and drain to 15' Engineered Vegetative Filter Strips, then flow overland to the tributary of the South Fork San Gabriel River.
- Area E encompasses the Regional Trail, which sheet flows over a 5.2' Reduced-Width Engineered Vegetative Filter Strip.
- Areas G, H, I, and J include site paving and synthetic turf fields. Each of these areas drain through a base of stone and aggregate, then into a storm under drain system. Area G and H drain to the South Fork San Gabriel River. Area I drains to the proposed improved channel on the eastern edge of the site, then to the South Fork San Gabriel River. Area J drains to the tributary of the South Fork San Gabriel River.
- Area L includes a portion of Entry Drive "C" and the maintenance yard and drains to Bioretention Pond "L", then to the proposed improved channel on the eastern edge of the site.
- Area S includes a portion of the Phase 1 parking area. This area drains to Bioretention Pond "S", then is released into the tributary of the South Fork San Gabriel River.
- Area R includes a portion of the Phase 1 parking area. This area drains to Bioretention Pond "R", then is released into the tributary of the South Fork San Gabriel River.
- Areas F, K, M, N, O, P, Q, T and U have minimal impervious cover and no proposed BMPs.

Please reference **Attachment M** of this section for design calculations. Construction Plans for the BMPs are provided in **Exhibit 4**, located at the end of this report.

BMPS FOR SURFACE STREAMS

On-site Permanent Best Management Practices have been designed to prevent pollution caused by contaminated stormwater runoff from entering surface streams or the aquifer. All runoff from the site drains to South Fork San Gabriel River. Prior to entering South Fork San Gabriel River, runoff will flow to the proposed BMPs described in **Attachment K** to ensure that 80% of the increase in Total Suspended Solids is removed as per current TCEQ requirements.

Please reference **Attachment M** of this section for design calculations. Construction Plans for the BMPs are provided in **Exhibit 4**, located at the end of this report.

CONSTRUCTION PLANS

Calculations to meet the load removal requirements for the project and the load removal provided by the permanent BMPs are provided in the attached spreadsheets which have been signed and sealed by a professional engineer licensed in the state of Texas. The load removal requirements are derived from the equations from the Technical Guidance Manual as well as the Addendum Sheets based upon project area and increase in impervious cover. All stormwater runoff from impervious areas have been accounted for and will be treated by the proposed permanent BMPs. The proposed permanent BMPs will remove the required 80% of the increase in Total Suspended Solids. Provided within the calculations is a summary of the amount of pollutant load required to be removed from the drainage areas, along with the amount of removal provided by each permanent BMP. Please refer to the table below for TSS removal calculations per BMP type.

LMAC PHASE 1 - TSS REMOVAL CALCULATIONS								
Drainage Basin	Total Area (ac.)	Pre-Development Impervious Area (ac.)	Post-Development Impervious Area (ac.)	Impervious Area treated by BMP (ac.)	Proposed BMP	Lm (lbs)	Lr (lbs)	Notes
A	1.86	0.00	0.27	0.98	Bioretention	235	875	Includes treatment of 0.71 ac. of impervious cover planned for Phase 2.
B	1.35	0.00	0.42	0.42	Engineered Vegetative Filter Strip	366	409	
C	1.22	0.00	0.40	0.40	Engineered Vegetative Filter Strip	348	388	
D	0.38	0.00	0.30	0.28	Engineered Vegetative Filter Strip	261	265	
E	4.55	0.00	1.32	1.30	Reduced Width Engineered Vegetative Filter Strip	1149	1149	
F	1.90	0.00	0.43	0.00	N/A	374	0	
G	2.03	0.00	0.67	0.67	Synthetic Turf	583	670	Permeable Synthetic Turf removal efficiency assumed to be 89% (similar to permeable pavement).
H	1.55	0.00	0.24	0.24	Synthetic Turf	209	257	
I	2.01	0.00	0.55	0.55	Synthetic Turf	479	559	
J	1.32	0.00	0.00	0.00	Synthetic Turf	0	0	
K	1.47	0.00	0.09	0.00	N/A	78	0	
L	1.12	0.00	0.61	0.68	Bioretention	531	635	Includes treatment of 0.07 ac. of impervious cover planned for Phase 2.
M	2.35	0.00	0.10	0.00	N/A	87	0	
N	0.76	0.00	0.00	0.00	N/A	0	0	
O	0.52	0.00	0.15	0.15	N/A	131	0	
P	0.67	0.00	0.00	0.00	N/A	0	0	
Q	2.46	0.00	0.00	0.00	N/A	0	0	
R	1.60	0.00	0.51	0.61	Bioretention	444	500	Includes treatment of 0.10 ac. of impervious cover planned for Phase 2.
S	1.12	0.00	0.49	0.49	Bioretention	426	450	
T	0.21	0.00	0.12	0.00	N/A	104	0	
U	0.04	0.00	0.02	0.00	N/A	17	0	
TOTAL	30.49	0.00	6.69			5822	6157	

Construction Plans, details, specifications, and construction notes are provided in **Exhibit 4** at the end of this report.

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
Text shown in blue indicate location of instructions in the Technical Guidance Manual - RG-348.
Characters shown in red are data entry fields.
Characters shown in black (Bold) are calculated fields. Changes to these fields will remove the equations used in the spreadsheet.

1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = A

Total drainage basin/outfall area =	1.86	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.27	acres
Post-development impervious fraction within drainage basin/outfall area =	0.15	
$L_{M\ THIS\ BASIN}$ =	235	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Bioretention
Removal efficiency = 89 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	1.86	acres
A_I =	0.98	acres
A_P =	0.88	acres
L_R =	979	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 875 lbs.

F = 0.89

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	1.60	inches
Post Development Runoff Coefficient =	0.37	
On-site Water Quality Volume =	4027	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	805	
Total Capture Volume (required water quality volume(s) x 1.20) =	4832	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

7. Retention/Irrigation System — Designed as Required in RG-348 — Pages 3-42 to 3-46

Required Water Quality Volume for retention basin = **NA** cubic feet

Irrigation Area Calculations:

Soil infiltration/permeability rate = **0.1** in/hr — Enter determined permeability rate or assumed value of 0.1
Irrigation area = **NA** square feet
NA acres

8. Extended Detention Basin System — Designed as Required in RG-348 — Pages 3-46 to 3-51

Required Water Quality Volume for extended detention basin = **NA** cubic feet

9. Filter area for Sand Filters — Designed as Required in RG-348 — Pages 3-58 to 3-63

9A. Full Sedimentation and Filtration System

Water Quality Volume for sedimentation basin = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet — For minimum water depth of 2 feet
Minimum sedimentation basin area = **NA** square feet — For maximum water depth of 8 feet

9B. Partial Sedimentation and Filtration System

Water Quality Volume for combined basins = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet — For minimum water depth of 2 feet
Minimum sedimentation basin area = **NA** square feet — For maximum water depth of 8 feet

10. Bioretention System — Designed as Required in RG-348 — Pages 3-63 to 3-65

Required Water Quality Volume for Bioretention Basin = **4832** cubic feet

BIORETENTION CALCULATIONS

DEPTH OF INFILTRATION:
$n_{ponding}$ = 1.00
n_{mulch} = 0.70
n_{soil} = 0.35
n_{gravel} = 0.40

$d_{infiltration}$ = (0.5')(1.00) + (0.25')(0.70) + (4.0')(0.35) + (0.67')(0.40) = 2.35 FT

Areq = 4832 / 2.35 = 2056 SF
Aprovided = 2133 SF

11. Wet Basins — Designed as Required in RG-348 — Pages 3-66 to 3-71

Required capacity of Permanent Pool = **NA** cubic feet — Permanent Pool Capacity is 1.20 times the WQV
Required capacity at WQV Elevation = **NA** cubic feet — Total Capacity should be the Permanent Pool Capacity plus a second WQV.

12. Constructed Wetlands — Designed as Required in RG-348 — Pages 3-71 to 3-73

Required Water Quality Volume for Constructed Wetlands = **NA** cubic feet

13. AquaLogic™ Cartridge System — Designed as Required in RG-348 — Pages 3-74 to 3-78

** 2005 Technical Guidance Manual (RG-348) does not exempt the required 20% increase with maintenance contract with AquaLogic™.

Required Sedimentation chamber capacity = **NA** cubic feet
Filter canisters (FCs) to treat WQV = **NA** cartridges
Filter basin area (RIA_F) = **NA** square feet

14. Stormwater Management StormFilter® by CONTECH

Required Water Quality Volume for Contech StormFilter System = **NA** cubic feet

THE SIZING REQUIREMENTS FOR THE FOLLOWING BMPs / LOAD REMOVALS ARE BASED UPON FLOW RATES - NOT CALCULATED WATER QUALITY VOLUMES

15. Grassy Swales — Designed as Required in RG-348 — Pages 3-51 to 3-54

Design parameters for the swale:

Drainage Area to be Treated by the Swale = A = 2.42 acres
Impervious Cover in Drainage Area = 0.11 acres
Rainfall intensity = i = 1.1 in/hr
Swale Slope = 0.025 ft/ft
Side Slope (z) = 3
Design Water Depth = y = 0.55 ft
Weighted Runoff Coefficient = C = 0.35

A_{CS} = cross-sectional area of flow in Swale = 1.17 sf
P_W = Wetted Perimeter = 3.96 feet
R_H = hydraulic radius of flow cross-section = A_{CS}/P_W = 0.30 feet
n = Manning's roughness coefficient = 0.2

15A. Using the Method Described in the RG-348

Manning's Equation: $Q = \frac{1.49}{n} A_{CS} R_H^{2/3} S^{0.5}$

$b = \frac{0.134 \times Q}{y^{1.67} S^{0.5}} - zy$ = 0.48 feet

Q = CiA = 0.93 cfs

To calculate the flow velocity in the swale:

V (Velocity of Flow in the swale) = Q/A_{CS} = 0.79 ft/sec

To calculate the resulting swale length:

PARKHILL SMITH & COOPER, INC. F-560
STATE OF TEXAS
CASEY A. HADSALL
139380
LICENSED
PROFESSIONAL ENGINEER
06/03/24

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

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1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = B

Total drainage basin/outfall area =	1.35	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.42	acres
Post-development impervious fraction within drainage basin/outfall area =	0.31	
$L_{M\ THIS\ BASIN}$ =	366	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Vegetated Filter Strips
Removal efficiency = 85 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	1.35	acres
A_I =	0.42	acres
A_P =	0.93	acres
L_R =	409	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 409 lbs.

F = 1.00

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	4.00	inches
Post Development Runoff Coefficient =	0.26	
On-site Water Quality Volume =	5171	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	1034	
Total Capture Volume (required water quality volume(s) x 1.20) =	6205	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
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1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = C

Total drainage basin/outfall area =	1.22	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.40	acres
Post-development impervious fraction within drainage basin/outfall area =	0.33	
$L_{M\ THIS\ BASIN}$ =	348	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Vegetated Filter Strips
Removal efficiency = 85 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	1.22	acres
A_I =	0.40	acres
A_P =	0.82	acres
L_R =	388	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 388 lbs.

F = 1.00

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	4.00	inches
Post Development Runoff Coefficient =	0.27	
On-site Water Quality Volume =	4821	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	964	
Total Capture Volume (required water quality volume(s) x 1.20) =	5785	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
Text shown in blue indicate location of instructions in the Technical Guidance Manual - RG-348.
Characters shown in red are data entry fields.
Characters shown in black (Bold) are calculated fields. Changes to these fields will remove the equations used in the spreadsheet.

1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	**5823**	lbs.

*** The values entered in these fields should be for the total project area.**

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = D

Total drainage basin/outfall area =	0.38	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.30	acres
Post-development impervious fraction within drainage basin/outfall area =	**0.79**	
$L_{M\ THIS\ BASIN}$ =	**261**	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Vegetated Filter Strips
Removal efficiency = **85** percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	0.38	acres
A_I =	0.28	acres
A_P =	**0.10**	acres
L_R =	**265**	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 265 lbs.

F = **1.00**

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	**4.00**	inches
Post Development Runoff Coefficient =	**0.54**	
On-site Water Quality Volume =	**3006**	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	**0**	
Off-site Runoff Coefficient =	**0.00**	
Off-site Water Quality Volume =	**0**	cubic feet
Storage for Sediment =	**601**	
Total Capture Volume (required water quality volume(s) x 1.20) =	**3607**	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
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1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = E

Total drainage basin/outfall area =	4.55	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	1.32	acres
Post-development impervious fraction within drainage basin/outfall area =	0.29	
$L_{M\ THIS\ BASIN}$ =	1149	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Vegetated Filter Strips
Removal efficiency = 85 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	4.55	acres
A_I =	1.30	acres
A_P =	3.25	acres
L_R =	1271	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 1149 lbs.

F = 0.90

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	1.70	inches
Post Development Runoff Coefficient =	0.25	
On-site Water Quality Volume =	7040	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	1408	
Total Capture Volume (required water quality volume(s) x 1.20) =	8448	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
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1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = F

Total drainage basin/outfall area =	1.90	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.43	acres
Post-development impervious fraction within drainage basin/outfall area =	0.23	
$L_{M\ THIS\ BASIN}$ =	374	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Vegetated Filter Strips
Removal efficiency = 85 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	1.76	acres
A_I =	0.00	acres
A_P =	1.76	acres
L_R =	26	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 0 lbs.

F = 0.00

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	#N/A	inches
Post Development Runoff Coefficient =	0.02	
On-site Water Quality Volume =	#N/A	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	#N/A	cubic feet
Storage for Sediment =	#N/A	
Total Capture Volume (required water quality volume(s) x 1.20) =	#N/A	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
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1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = G

Total drainage basin/outfall area =	2.03	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.67	acres
Post-development impervious fraction within drainage basin/outfall area =	0.33	
$L_{M\ THIS\ BASIN}$ =	583	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Bioretention
Removal efficiency = 89 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	2.03	acres
A_I =	0.67	acres
A_P =	1.36	acres
L_R =	681	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 670 lbs.

F = 0.98

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	3.33	inches
Post Development Runoff Coefficient =	0.27	
On-site Water Quality Volume =	6704	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	1341	
Total Capture Volume (required water quality volume(s) x 1.20) =	8045	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

7. Retention/Irrigation System — Designed as Required in RG-348 — Pages 3-42 to 3-46

Required Water Quality Volume for retention basin = **NA** cubic feet

Irrigation Area Calculations:

Soil infiltration/permeability rate = **0.1** in/hr — **Enter determined permeability rate or assumed value of 0.1**
Irrigation area = **NA** square feet
NA acres

8. Extended Detention Basin System — Designed as Required in RG-348 — Pages 3-46 to 3-51

Required Water Quality Volume for extended detention basin = **NA** cubic feet

9. Filter area for Sand Filters — Designed as Required in RG-348 — Pages 3-58 to 3-63

9A. Full Sedimentation and Filtration System

Water Quality Volume for sedimentation basin = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet **For minimum water depth of 2 feet**
Minimum sedimentation basin area = **NA** square feet **For maximum water depth of 8 feet**

9B. Partial Sedimentation and Filtration System

Water Quality Volume for combined basins = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet **For minimum water depth of 2 feet**
Minimum sedimentation basin area = **NA** square feet **For maximum water depth of 8 feet**

SYNTHETIC TURF CALCULATIONS

DEPTH OF INFILTRATION:
n_{base} = 0.30

$d_{infiltration}$ = (0.5')(0.30) = 0.15 FT

AREA OF TURF FIELD = 54886 SF

WATER QUALITY VOLUME PROVIDED
= (54886)(0.15) = 8233 CF

10. Bioretention System — Designed as Required in RG-348 — Pages 3-63 to 3-65

Required Water Quality Volume for Bioretention Basin = **8045** cubic feet

11. Wet Basins — Designed as Required in RG-348 — Pages 3-66 to 3-71

Required capacity of Permanent Pool = **NA** cubic feet **Permanent Pool Capacity is 1.20 times the WQV**
Required capacity at WQV Elevation = **NA** cubic feet **Total Capacity should be the Permanent Pool Capacity plus a second WQV.**

12. Constructed Wetlands — Designed as Required in RG-348 — Pages 3-71 to 3-73

Required Water Quality Volume for Constructed Wetlands = **NA** cubic feet

13. AquaLogic™ Cartridge System — Designed as Required in RG-348 — Pages 3-74 to 3-78

**** 2005 Technical Guidance Manual (RG-348) does not exempt the required 20% increase with maintenance contract with AquaLogic™.**

Required Sedimentation chamber capacity = **NA** cubic feet
Filter canisters (FCs) to treat WQV = **NA** cartridges
Filter basin area (RIA_F) = **NA** square feet

14. Stormwater Management StormFilter® by CONTECH

Required Water Quality Volume for Contech StormFilter System = **NA** cubic feet

THE SIZING REQUIREMENTS FOR THE FOLLOWING BMPs / LOAD REMOVALS ARE BASED UPON FLOW RATES - NOT CALCULATED WATER QUALITY VOLUMES

15. Grassy Swales — Designed as Required in RG-348 — Pages 3-51 to 3-54

Design parameters for the swale:

Drainage Area to be Treated by the Swale = A = 1.27 acres
Impervious Cover in Drainage Area = 0.54 acres
Rainfall intensity = i = 1.1 in/hr
Swale Slope = 0.0125 ft/ft
Side Slope (z) = 10
Design Water Depth = y = 0.20 ft
Weighted Runoff Coefficient = C = 0.50

A_{CS} = cross-sectional area of flow in Swale = 2.48 sf
P_W = Wetted Perimeter = 14.43 feet
R_H = hydraulic radius of flow cross-section = A_{CS}/P_W = 0.17 feet
n = Manning's roughness coefficient = 0.2

15A. Using the Method Described in the RG-348

Manning's Equation: $Q = \frac{1.49}{n} A_{CS} R_H^{2/3} S^{0.5}$

$b = \frac{0.134 \times Q}{y^{1.67} S^{0.5}} - zy$ = 10.41 feet

Q = CiA = 0.70 cfs

To calculate the flow velocity in the swale:

V (Velocity of Flow in the swale) = Q/A_{CS} = 0.28 ft/sec

To calculate the resulting swale length:

PARKHILL SMITH & COOPER, INC. F-560
STATE OF TEXAS
CASEY A. HADSALL
139380
LICENSED
PROFESSIONAL ENGINEER
06/03/24

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
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1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = H

Total drainage basin/outfall area =	1.55	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.24	acres
Post-development impervious fraction within drainage basin/outfall area =	0.15	
$L_{M\ THIS\ BASIN}$ =	209	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Bioretention
Removal efficiency = 89 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	1.55	acres
A_I =	0.24	acres
A_P =	1.31	acres
L_R =	257	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 257 lbs.

F = 1.00

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	4.00	inches
Post Development Runoff Coefficient =	0.17	
On-site Water Quality Volume =	3817	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	763	
Total Capture Volume (required water quality volume(s) x 1.20) =	4581	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

7. Retention/Irrigation System — Designed as Required in RG-348 — Pages 3-42 to 3-46

Required Water Quality Volume for retention basin = **NA** cubic feet

Irrigation Area Calculations:

Soil infiltration/permeability rate = **0.1** in/hr — Enter determined permeability rate or assumed value of 0.1
Irrigation area = **NA** square feet
NA acres

8. Extended Detention Basin System — Designed as Required in RG-348 — Pages 3-46 to 3-51

Required Water Quality Volume for extended detention basin = **NA** cubic feet

9. Filter area for Sand Filters — Designed as Required in RG-348 — Pages 3-58 to 3-63

9A. Full Sedimentation and Filtration System

Water Quality Volume for sedimentation basin = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet — For minimum water depth of 2 feet
Minimum sedimentation basin area = **NA** square feet — For maximum water depth of 8 feet

9B. Partial Sedimentation and Filtration System

Water Quality Volume for combined basins = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet — For minimum water depth of 2 feet
Minimum sedimentation basin area = **NA** square feet — For maximum water depth of 8 feet

SYNTHETIC TURF CALCULATIONS

DEPTH OF INFILTRATION:
n_{base} = 0.30

$d_{infiltration}$ = (0.5')(0.30) = 0.15 FT

AREA OF TURF FIELD = 54886 SF

WATER QUALITY VOLUME PROVIDED
= (54886)(0.15) = 8233 CF

10. Bioretention System — Designed as Required in RG-348 — Pages 3-63 to 3-65

Required Water Quality Volume for Bioretention Basin = **4581** cubic feet

11. Wet Basins — Designed as Required in RG-348 — Pages 3-66 to 3-71

Required capacity of Permanent Pool = **NA** cubic feet — Permanent Pool Capacity is 1.20 times the WQV
Required capacity at WQV Elevation = **NA** cubic feet — Total Capacity should be the Permanent Pool Capacity plus a second WQV.

12. Constructed Wetlands — Designed as Required in RG-348 — Pages 3-71 to 3-73

Required Water Quality Volume for Constructed Wetlands = **NA** cubic feet

13. AquaLogic™ Cartridge System — Designed as Required in RG-348 — Pages 3-74 to 3-78

** 2005 Technical Guidance Manual (RG-348) does not exempt the required 20% increase with maintenance contract with AquaLogic™.

Required Sedimentation chamber capacity = **NA** cubic feet
Filter canisters (FCs) to treat WQV = **NA** cartridges
Filter basin area (RIA_F) = **NA** square feet

14. Stormwater Management StormFilter® by CONTECH

Required Water Quality Volume for Contech StormFilter System = **NA** cubic feet

THE SIZING REQUIREMENTS FOR THE FOLLOWING BMPs / LOAD REMOVALS ARE BASED UPON FLOW RATES - NOT CALCULATED WATER QUALITY VOLUMES

15. Grassy Swales — Designed as Required in RG-348 — Pages 3-51 to 3-54

Design parameters for the swale:

Drainage Area to be Treated by the Swale = A = 1.27 acres
Impervious Cover in Drainage Area = 0.54 acres
Rainfall intensity = i = 1.1 in/hr
Swale Slope = 0.0125 ft/ft
Side Slope (z) = 10
Design Water Depth = y = 0.20 ft
Weighted Runoff Coefficient = C = 0.50

A_{CS} = cross-sectional area of flow in Swale = 2.48 sf
P_W = Wetted Perimeter = 14.43 feet
R_H = hydraulic radius of flow cross-section = A_{CS}/P_W = 0.17 feet
n = Manning's roughness coefficient = 0.2

15A. Using the Method Described in the RG-348

Manning's Equation: $Q = \frac{1.49}{n} A_{CS} R_H^{2/3} S^{0.5}$

$b = \frac{0.134 \times Q}{y^{1.67} S^{0.5}} - zy$ = 10.41 feet

Q = CiA = 0.70 cfs

To calculate the flow velocity in the swale:

V (Velocity of Flow in the swale) = Q/A_{CS} = 0.28 ft/sec

To calculate the resulting swale length:

PARKHILL SMITH & COOPER, INC. F-560
STATE OF TEXAS
CASEY A. HADSALL
139380
LICENSED
PROFESSIONAL ENGINEER
06/03/24

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
Text shown in blue indicate location of instructions in the Technical Guidance Manual - RG-348.
Characters shown in red are data entry fields.
Characters shown in black (Bold) are calculated fields. Changes to these fields will remove the equations used in the spreadsheet.

1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = I

Total drainage basin/outfall area =	2.01	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.55	acres
Post-development impervious fraction within drainage basin/outfall area =	0.27	
$L_{M\ THIS\ BASIN}$ =	479	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Bioretention
Removal efficiency = 89 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	2.01	acres
A_I =	0.55	acres
A_P =	1.46	acres
L_R =	564	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 559 lbs.

F = 0.99

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	3.66	inches
Post Development Runoff Coefficient =	0.24	
On-site Water Quality Volume =	6524	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	1305	
Total Capture Volume (required water quality volume(s) x 1.20) =	7829	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

7. Retention/Irrigation System — Designed as Required in RG-348 — Pages 3-42 to 3-46

Required Water Quality Volume for retention basin = **NA** cubic feet

Irrigation Area Calculations:

Soil infiltration/permeability rate = **0.1** in/hr — Enter determined permeability rate or assumed value of 0.1
Irrigation area = **NA** square feet
NA acres

8. Extended Detention Basin System — Designed as Required in RG-348 — Pages 3-46 to 3-51

Required Water Quality Volume for extended detention basin = **NA** cubic feet

9. Filter area for Sand Filters — Designed as Required in RG-348 — Pages 3-58 to 3-63

9A. Full Sedimentation and Filtration System

Water Quality Volume for sedimentation basin = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet — For minimum water depth of 2 feet
Minimum sedimentation basin area = **NA** square feet — For maximum water depth of 8 feet

9B. Partial Sedimentation and Filtration System

Water Quality Volume for combined basins = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet — For minimum water depth of 2 feet
Minimum sedimentation basin area = **NA** square feet — For maximum water depth of 8 feet

SYNTHETIC TURF CALCULATIONS

DEPTH OF INFILTRATION:
n_{base} = 0.30

$d_{infiltration}$ = (0.5')(0.30) = 0.15 FT

AREA OF TURF FIELD = 52272 SF

WATER QUALITY VOLUME PROVIDED = (52272)(0.15) = 7841 CF

10. Bioretention System — Designed as Required in RG-348 — Pages 3-63 to 3-65

Required Water Quality Volume for Bioretention Basin = **7829** cubic feet

11. Wet Basins — Designed as Required in RG-348 — Pages 3-66 to 3-71

Required capacity of Permanent Pool = **NA** cubic feet — Permanent Pool Capacity is 1.20 times the WQV
Required capacity at WQV Elevation = **NA** cubic feet — Total Capacity should be the Permanent Pool Capacity plus a second WQV.

12. Constructed Wetlands — Designed as Required in RG-348 — Pages 3-71 to 3-73

Required Water Quality Volume for Constructed Wetlands = **NA** cubic feet

13. AquaLogic™ Cartridge System — Designed as Required in RG-348 — Pages 3-74 to 3-78

** 2005 Technical Guidance Manual (RG-348) does not exempt the required 20% increase with maintenance contract with AquaLogic™.

Required Sedimentation chamber capacity = **NA** cubic feet
Filter canisters (FCs) to treat WQV = **NA** cartridges
Filter basin area (RIA_F) = **NA** square feet

14. Stormwater Management StormFilter® by CONTECH

Required Water Quality Volume for Contech StormFilter System = **NA** cubic feet

THE SIZING REQUIREMENTS FOR THE FOLLOWING BMPs / LOAD REMOVALS ARE BASED UPON FLOW RATES - NOT CALCULATED WATER QUALITY VOLUMES

15. Grassy Swales — Designed as Required in RG-348 — Pages 3-51 to 3-54

Design parameters for the swale:

Drainage Area to be Treated by the Swale = A = 1.27 acres
Impervious Cover in Drainage Area = 0.54 acres
Rainfall intensity = i = 1.1 in/hr
Swale Slope = 0.0125 ft/ft
Side Slope (z) = 10
Design Water Depth = y = 0.20 ft
Weighted Runoff Coefficient = C = 0.50

A_{CS} = cross-sectional area of flow in Swale = 2.48 sf
P_W = Wetted Perimeter = 14.43 feet
R_H = hydraulic radius of flow cross-section = A_{CS}/P_W = 0.17 feet
n = Manning's roughness coefficient = 0.2

15A. Using the Method Described in the RG-348

Manning's Equation: $Q = \frac{1.49}{n} A_{CS} R_H^{2/3} S^{0.5}$

$b = \frac{0.134 \times Q}{y^{1.67} S^{0.5}} - zy$ = 10.41 feet

Q = CiA = 0.70 cfs

To calculate the flow velocity in the swale:

V (Velocity of Flow in the swale) = Q/A_{CS} = 0.28 ft/sec

To calculate the resulting swale length:

PARKHILL SMITH & COOPER, INC. F-560
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Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
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1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = K

Total drainage basin/outfall area =	1.47	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.09	acres
Post-development impervious fraction within drainage basin/outfall area =	0.06	
$L_{M\ THIS\ BASIN}$ =	78	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Bioretention
Removal efficiency = 89 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	1.47	acres
A_I =	0.09	acres
A_P =	1.38	acres
L_R =	110	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 0 lbs.

F = 0.00

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	#N/A	inches
Post Development Runoff Coefficient =	0.09	
On-site Water Quality Volume =	#N/A	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	#N/A	cubic feet
Storage for Sediment =	#N/A	
Total Capture Volume (required water quality volume(s) x 1.20) =	#N/A	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

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1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = L

Total drainage basin/outfall area =	1.12	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.61	acres
Post-development impervious fraction within drainage basin/outfall area =	0.54	
$L_{M\ THIS\ BASIN}$ =	531	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Bioretention
Removal efficiency = 89 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	1.12	acres
A_I =	0.68	acres
A_P =	0.44	acres
L_R =	677	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 635 lbs.

F = 0.94

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	2.40	inches
Post Development Runoff Coefficient =	0.43	
On-site Water Quality Volume =	4152	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	830	
Total Capture Volume (required water quality volume(s) x 1.20) =	4983	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

7. Retention/Irrigation System — Designed as Required in RG-348 — Pages 3-42 to 3-46

Required Water Quality Volume for retention basin = **NA** cubic feet

Irrigation Area Calculations:

Soil infiltration/permeability rate = **0.1** in/hr — Enter determined permeability rate or assumed value of 0.1
Irrigation area = **NA** square feet
NA acres

8. Extended Detention Basin System — Designed as Required in RG-348 — Pages 3-46 to 3-51

Required Water Quality Volume for extended detention basin = **NA** cubic feet

9. Filter area for Sand Filters — Designed as Required in RG-348 — Pages 3-58 to 3-63

9A. Full Sedimentation and Filtration System

Water Quality Volume for sedimentation basin = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet — For minimum water depth of 2 feet
Minimum sedimentation basin area = **NA** square feet — For maximum water depth of 8 feet

9B. Partial Sedimentation and Filtration System

Water Quality Volume for combined basins = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet — For minimum water depth of 2 feet
Minimum sedimentation basin area = **NA** square feet — For maximum water depth of 8 feet

BIORETENTION CALCULATIONS

DEPTH OF INFILTRATION:
$n_{ponding}$ = 1.00
n_{mulch} = 0.70
n_{soil} = 0.35
n_{gravel} = 0.40

$d_{infiltration}$ = (0.5')(1.00) + (0.25')(0.70) + (4.0')(0.35) + (0.67')(0.40) = 2.35 FT

Areq = 4983 / 2.35 = 2121 SF
Aprovided = 2220 SF

10. Bioretention System — Designed as Required in RG-348 — Pages 3-63 to 3-65

Required Water Quality Volume for Bioretention Basin = **4983** cubic feet

11. Wet Basins — Designed as Required in RG-348 — Pages 3-66 to 3-71

Required capacity of Permanent Pool = **NA** cubic feet — Permanent Pool Capacity is 1.20 times the WQV
Required capacity at WQV Elevation = **NA** cubic feet — Total Capacity should be the Permanent Pool Capacity plus a second WQV.

12. Constructed Wetlands — Designed as Required in RG-348 — Pages 3-71 to 3-73

Required Water Quality Volume for Constructed Wetlands = **NA** cubic feet

13. AquaLogic™ Cartridge System — Designed as Required in RG-348 — Pages 3-74 to 3-78

** 2005 Technical Guidance Manual (RG-348) does not exempt the required 20% increase with maintenance contract with AquaLogic™.

Required Sedimentation chamber capacity = **NA** cubic feet
Filter canisters (FCs) to treat WQV = **NA** cartridges
Filter basin area (RIA_F) = **NA** square feet

14. Stormwater Management StormFilter® by CONTECH

Required Water Quality Volume for Contech StormFilter System = **NA** cubic feet

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15. Grassy Swales — Designed as Required in RG-348 — Pages 3-51 to 3-54

Design parameters for the swale:

Drainage Area to be Treated by the Swale = A = 1.27 acres
Impervious Cover in Drainage Area = 0.54 acres
Rainfall intensity = i = 1.1 in/hr
Swale Slope = 0.0125 ft/ft
Side Slope (z) = 10
Design Water Depth = y = 0.20 ft
Weighted Runoff Coefficient = C = 0.50

A_{CS} = cross-sectional area of flow in Swale = 2.48 sf
P_W = Wetted Perimeter = 14.43 feet
R_H = hydraulic radius of flow cross-section = A_{CS}/P_W = 0.17 feet
n = Manning's roughness coefficient = 0.2

15A. Using the Method Described in the RG-348

Manning's Equation: $Q = \frac{1.49}{n} A_{CS} R_H^{2/3} S^{0.5}$

$b = \frac{0.134 \times Q}{y^{1.67} S^{0.5}} - zy$ = 10.41 feet

Q = CiA = 0.70 cfs

To calculate the flow velocity in the swale:

V (Velocity of Flow in the swale) = Q/A_{CS} = 0.28 ft/sec

To calculate the resulting swale length:

PARKHILL SMITH & COOPER, INC. F-560
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TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
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1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = M

Total drainage basin/outfall area =	2.35	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.10	acres
Post-development impervious fraction within drainage basin/outfall area =	0.04	
$L_{M\ THIS\ BASIN}$ =	87	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Grassy Swale
Removal efficiency = 70 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	2.35	acres
A_I =	0.10	acres
A_P =	2.25	acres
L_R =	105	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 0 lbs.

F = 0.00

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	#N/A	inches
Post Development Runoff Coefficient =	0.07	
On-site Water Quality Volume =	#N/A	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	#N/A	cubic feet
Storage for Sediment =	#N/A	
Total Capture Volume (required water quality volume(s) x 1.20) =	#N/A	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

Texas Commission on Environmental Quality

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County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = O

Total drainage basin/outfall area =	0.52	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.15	acres
Post-development impervious fraction within drainage basin/outfall area =	0.29	
$L_{M\ THIS\ BASIN}$ =	131	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Grassy Swale
Removal efficiency = 70 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	0.52	acres
A_I =	0.15	acres
A_P =	0.37	acres
L_R =	121	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 0 lbs.

F = 0.00

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	#N/A	inches
Post Development Runoff Coefficient =	0.25	
On-site Water Quality Volume =	#N/A	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	#N/A	cubic feet
Storage for Sediment =	#N/A	
Total Capture Volume (required water quality volume(s) x 1.20) =	#N/A	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
Text shown in blue indicate location of instructions in the Technical Guidance Manual - RG-348.
Characters shown in red are data entry fields.
Characters shown in black (Bold) are calculated fields. Changes to these fields will remove the equations used in the spreadsheet.

1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = R

Total drainage basin/outfall area =	1.60	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.51	acres
Post-development impervious fraction within drainage basin/outfall area =	0.32	
$L_{M\ THIS\ BASIN}$ =	444	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Bioretention
Removal efficiency = 89 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	1.60	acres
A_I =	0.61	acres
A_P =	0.99	acres
L_R =	616	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 500 lbs.

F = 0.81

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	1.12	inches
Post Development Runoff Coefficient =	0.30	
On-site Water Quality Volume =	1938	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	388	
Total Capture Volume (required water quality volume(s) x 1.20) =	2325	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

7. Retention/Irrigation System — Designed as Required in RG-348 — Pages 3-42 to 3-46

Required Water Quality Volume for retention basin = **NA** cubic feet

Irrigation Area Calculations:

Soil infiltration/permeability rate = **0.1** in/hr — Enter determined permeability rate or assumed value of 0.1
Irrigation area = **NA** square feet
NA acres

8. Extended Detention Basin System — Designed as Required in RG-348 — Pages 3-46 to 3-51

Required Water Quality Volume for extended detention basin = **NA** cubic feet

9. Filter area for Sand Filters — Designed as Required in RG-348 — Pages 3-58 to 3-63

9A. Full Sedimentation and Filtration System

Water Quality Volume for sedimentation basin = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet — For minimum water depth of 2 feet
Minimum sedimentation basin area = **NA** square feet — For maximum water depth of 8 feet

9B. Partial Sedimentation and Filtration System

Water Quality Volume for combined basins = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet — For minimum water depth of 2 feet
Minimum sedimentation basin area = **NA** square feet — For maximum water depth of 8 feet

BIORETENTION CALCULATIONS

DEPTH OF INFILTRATION:
$n_{ponding} = 1.00$
$n_{mulch} = 0.70$
$n_{soil} = 0.35$
$n_{gravel} = 0.40$

$d_{infiltration} = (0.5')(1.00) + (0.25')(0.70) + (4.0')(0.35) + (0.67')(0.40) = 2.35$ FT

Areq = 2325 / 2.35 = 990 SF
Aprovided = 1011 SF

10. Bioretention System — Designed as Required in RG-348 — Pages 3-63 to 3-65

Required Water Quality Volume for Bioretention Basin = **2325** cubic feet

11. Wet Basins — Designed as Required in RG-348 — Pages 3-66 to 3-71

Required capacity of Permanent Pool = **NA** cubic feet — Permanent Pool Capacity is 1.20 times the WQV
Required capacity at WQV Elevation = **NA** cubic feet — Total Capacity should be the Permanent Pool Capacity plus a second WQV.

12. Constructed Wetlands — Designed as Required in RG-348 — Pages 3-71 to 3-73

Required Water Quality Volume for Constructed Wetlands = **NA** cubic feet

13. AquaLogic™ Cartridge System — Designed as Required in RG-348 — Pages 3-74 to 3-78

** 2005 Technical Guidance Manual (RG-348) does not exempt the required 20% increase with maintenance contract with AquaLogic™.

Required Sedimentation chamber capacity = **NA** cubic feet
Filter canisters (FCs) to treat WQV = **NA** cartridges
Filter basin area (RIA_F) = **NA** square feet

14. Stormwater Management StormFilter® by CONTECH

Required Water Quality Volume for Contech StormFilter System = **NA** cubic feet

THE SIZING REQUIREMENTS FOR THE FOLLOWING BMPs / LOAD REMOVALS ARE BASED UPON FLOW RATES - NOT CALCULATED WATER QUALITY VOLUMES

15. Grassy Swales — Designed as Required in RG-348 — Pages 3-51 to 3-54

Design parameters for the swale:

Drainage Area to be Treated by the Swale = A = 1.27 acres
Impervious Cover in Drainage Area = 0.54 acres
Rainfall intensity = i = 1.1 in/hr
Swale Slope = 0.0125 ft/ft
Side Slope (z) = 10
Design Water Depth = y = 0.20 ft
Weighted Runoff Coefficient = C = 0.50

A_{CS} = cross-sectional area of flow in Swale = 2.48 sf
P_W = Wetted Perimeter = 14.43 feet
R_H = hydraulic radius of flow cross-section = A_{CS}/P_W = 0.17 feet
n = Manning's roughness coefficient = 0.2

15A. Using the Method Described in the RG-348

Manning's Equation: $Q = \frac{1.49}{n} A_{CS} R_H^{2/3} S^{0.5}$

$b = \frac{0.134 \times Q}{y^{1.67} S^{0.5}} - zy$ = 10.41 feet

Q = CiA = 0.70 cfs

To calculate the flow velocity in the swale:

V (Velocity of Flow in the swale) = Q/A_{CS} = 0.28 ft/sec

To calculate the resulting swale length:

PARKHILL SMITH & COOPER, INC. F-560
STATE OF TEXAS
CASEY A. HADSALL
139380
LICENSED
PROFESSIONAL ENGINEER
06/03/24

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
Text shown in blue indicate location of instructions in the Technical Guidance Manual - RG-348.
Characters shown in red are data entry fields.
Characters shown in black (Bold) are calculated fields. Changes to these fields will remove the equations used in the spreadsheet.

1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = S

Total drainage basin/outfall area =	1.12	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.49	acres
Post-development impervious fraction within drainage basin/outfall area =	0.44	
$L_{M\ THIS\ BASIN}$ =	426	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Bioretention
Removal efficiency = 89 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	1.12	acres
A_I =	0.49	acres
A_P =	0.63	acres
L_R =	493	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 450 lbs.

F = 0.91

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	1.80	inches
Post Development Runoff Coefficient =	0.33	
On-site Water Quality Volume =	2379	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	0	cubic feet
Storage for Sediment =	476	
Total Capture Volume (required water quality volume(s) x 1.20) =	2855	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

7. Retention/Irrigation System — Designed as Required in RG-348 — Pages 3-42 to 3-46

Required Water Quality Volume for retention basin = **NA** cubic feet

Irrigation Area Calculations:

Soil infiltration/permeability rate = **0.1** in/hr — Enter determined permeability rate or assumed value of 0.1
Irrigation area = **NA** square feet
NA acres

8. Extended Detention Basin System — Designed as Required in RG-348 — Pages 3-46 to 3-51

Required Water Quality Volume for extended detention basin = **NA** cubic feet

9. Filter area for Sand Filters — Designed as Required in RG-348 — Pages 3-58 to 3-63

9A. Full Sedimentation and Filtration System

Water Quality Volume for sedimentation basin = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet — For minimum water depth of 2 feet
Minimum sedimentation basin area = **NA** square feet — For maximum water depth of 8 feet

9B. Partial Sedimentation and Filtration System

Water Quality Volume for combined basins = **NA** cubic feet

Minimum filter basin area = **NA** square feet

Maximum sedimentation basin area = **NA** square feet — For minimum water depth of 2 feet
Minimum sedimentation basin area = **NA** square feet — For maximum water depth of 8 feet

10. Bioretention System — Designed as Required in RG-348 — Pages 3-63 to 3-65

Required Water Quality Volume for Bioretention Basin = **2855** cubic feet

BIORETENTION CALCULATIONS

DEPTH OF INFILTRATION:
$n_{ponding}$ = 1.00
n_{mulch} = 0.70
n_{soil} = 0.35
n_{gravel} = 0.40

$d_{infiltration}$ = (0.5')(1.00) + (0.25')(0.70) + (4.0')(0.35) + (0.67')(0.40) = 2.35 FT

Areq = 2855 / 2.35 = 1215 SF
Aprovided = 1404 SF

11. Wet Basins — Designed as Required in RG-348 — Pages 3-66 to 3-71

Required capacity of Permanent Pool = **NA** cubic feet — Permanent Pool Capacity is 1.20 times the WQV
Required capacity at WQV Elevation = **NA** cubic feet — Total Capacity should be the Permanent Pool Capacity plus a second WQV.

12. Constructed Wetlands — Designed as Required in RG-348 — Pages 3-71 to 3-73

Required Water Quality Volume for Constructed Wetlands = **NA** cubic feet

13. AquaLogic™ Cartridge System — Designed as Required in RG-348 — Pages 3-74 to 3-78

** 2005 Technical Guidance Manual (RG-348) does not exempt the required 20% increase with maintenance contract with AquaLogic™.

Required Sedimentation chamber capacity = **NA** cubic feet
Filter canisters (FCs) to treat WQV = **NA** cartridges
Filter basin area (RIA_F) = **NA** square feet

14. Stormwater Management StormFilter® by CONTECH

Required Water Quality Volume for Contech StormFilter System = **NA** cubic feet

THE SIZING REQUIREMENTS FOR THE FOLLOWING BMPs / LOAD REMOVALS ARE BASED UPON FLOW RATES - NOT CALCULATED WATER QUALITY VOLUMES

15. Grassy Swales — Designed as Required in RG-348 — Pages 3-51 to 3-54

Design parameters for the swale:

Drainage Area to be Treated by the Swale = A = 1.27 acres
Impervious Cover in Drainage Area = 0.54 acres
Rainfall intensity = i = 1.1 in/hr
Swale Slope = 0.0125 ft/ft
Side Slope (z) = 10
Design Water Depth = y = 0.20 ft
Weighted Runoff Coefficient = C = 0.50

A_{CS} = cross-sectional area of flow in Swale = 2.48 sf
P_W = Wetted Perimeter = 14.43 feet
R_H = hydraulic radius of flow cross-section = A_{CS}/P_W = 0.17 feet
n = Manning's roughness coefficient = 0.2

15A. Using the Method Described in the RG-348

Manning's Equation: $Q = \frac{1.49}{n} A_{CS} R_H^{2/3} S^{0.5}$

$b = \frac{0.134 \times Q}{y^{1.67} S^{0.5}} - zy$ = 10.41 feet

Q = CiA = 0.70 cfs

To calculate the flow velocity in the swale:

V (Velocity of Flow in the swale) = Q/A_{CS} = 0.28 ft/sec

To calculate the resulting swale length:

PARKHILL SMITH & COOPER, INC. F-560
STATE OF TEXAS
CASEY A. HADSALL
139380
LICENSED
PROFESSIONAL ENGINEER
06/03/24

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
Text shown in blue indicate location of instructions in the Technical Guidance Manual - RG-348.
Characters shown in red are data entry fields.
Characters shown in black (Bold) are calculated fields. Changes to these fields will remove the equations used in the spreadsheet.

1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = T

Total drainage basin/outfall area =	0.21	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.12	acres
Post-development impervious fraction within drainage basin/outfall area =	0.57	
$L_{M\ THIS\ BASIN}$ =	104	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Bioretention
Removal efficiency = 89 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	0.21	acres
A_I =	0.12	acres
A_P =	0.09	acres
L_R =	120	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 0 lbs.

F = 0.00

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	#N/A	inches
Post Development Runoff Coefficient =	0.40	
On-site Water Quality Volume =	#N/A	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	#N/A	cubic feet
Storage for Sediment =	#N/A	
Total Capture Volume (required water quality volume(s) x 1.20) =	#N/A	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Project Name: Leander Municipal Athletic Complex
Date Prepared: 5/23/2024

Additional information is provided for cells with a red triangle in the upper right corner. Place the cursor over the cell.
Text shown in blue indicate location of instructions in the Technical Guidance Manual - RG-348.
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1. The Required Load Reduction for the total project: Calculations from RG-348 Pages 3-27 to 3-30

Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$

where:

$L_{M\ TOTAL\ PROJECT}$ = Required TSS removal resulting from the proposed development = 80% of increased load
A_N = Net increase in impervious area for the project
P = Average annual precipitation, inches

Site Data: Determine Required Load Removal Based on the Entire Project

County =	Williamson	
Total project area included in plan * =	30.49	acres
Predevelopment impervious area within the limits of the plan * =	0.00	acres
Total post-development impervious area within the limits of the plan* =	6.69	acres
Total post-development impervious cover fraction * =	0.22	
P =	32	inches
$L_{M\ TOTAL\ PROJECT}$ =	5823	lbs.

* The values entered in these fields should be for the total project area.

Number of drainage basins / outfalls areas leaving the plan area = 21

2. Drainage Basin Parameters (This information should be provided for each basin):

Drainage Basin/Outfall Area No. = U

Total drainage basin/outfall area =	0.04	acres
Predevelopment impervious area within drainage basin/outfall area =	0.00	acres
Post-development impervious area within drainage basin/outfall area =	0.02	acres
Post-development impervious fraction within drainage basin/outfall area =	0.50	
$L_{M\ THIS\ BASIN}$ =	17	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP = Bioretention
Removal efficiency = 89 percent

Aqualogic Cartridge Filter
Bioretention
Contech StormFilter
Constructed Wetland
Extended Detention
Grassy Swale
Retention / Irrigation
Sand Filter
Stormceptor
Vegetated Filter Strips
Vortechs
Wet Basin
Wet Vault

4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.

RG-348 Page 3-33 Equation 3.7: $L_R = (\text{BMP efficiency}) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

where:

A_C = Total On-Site drainage area in the BMP catchment area
A_I = Impervious area proposed in the BMP catchment area
A_P = Pervious area remaining in the BMP catchment area
L_R = TSS Load removed from this catchment area by the proposed BMP

A_C =	0.04	acres
A_I =	0.02	acres
A_P =	0.02	acres
L_R =	20	lbs

5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area

Desired $L_{M\ THIS\ BASIN}$ = 0 lbs.

F = 0.00

6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area. Calculations from RG-348 Pages 3-34 to 3-36

Rainfall Depth =	#N/A	inches
Post Development Runoff Coefficient =	0.36	
On-site Water Quality Volume =	#N/A	cubic feet

Calculations from RG-348 Pages 3-36 to 3-37

Off-site area draining to BMP =	0.00	acres
Off-site Impervious cover draining to BMP =	0.00	acres
Impervious fraction of off-site area =	0	
Off-site Runoff Coefficient =	0.00	
Off-site Water Quality Volume =	#N/A	cubic feet
Storage for Sediment =	#N/A	
Total Capture Volume (required water quality volume(s) x 1.20) =	#N/A	cubic feet

The following sections are used to calculate the required water quality volume(s) for the selected BMP.
The values for BMP Types not selected in cell C45 will show NA.

INSPECTION, MAINTENANCE, REPAIR AND RETROFIT PLAN

An inspection, maintenance, repair and retrofit plan for the proposed permanent BMPs is shown below.

VEGETATIVE FILTER STRIPS

Once a vegetated area is well established, little additional maintenance is generally necessary. The key to establishing a viable vegetated feature is the care and maintenance it receives in the first few months after it is planted. Once established, all vegetated BMPs require some basic maintenance to ensure the health of the plants including:

- *Pest Management*. An Integrated Pest Management (IPM) Plan should be developed for vegetated areas. This plan should specify how problem insects and weeds will be controlled with minimal or no use of insecticides and herbicides.
- *Seasonal Mowing and Lawn Care*. If the filter strip is made up of turf grass, it should be mowed as needed to limit vegetation height to 18 inches, using a mulching mower (or removal of clippings). If native grasses are used, the filter may require less frequent mowing, but a minimum of twice annually. Grass clippings and brush debris should not be deposited on vegetated filter strip areas. Regular mowing should also include weed control practices; however, herbicide use should be kept to a minimum. Healthy grass can be maintained without using fertilizers because runoff usually contains sufficient nutrients. Irrigation of the site can help assure a dense and healthy vegetative cover.
- *Inspection*. Inspect filter strips at least twice annually for erosion or damage to vegetation; however, additional inspection after periods of heavy runoff is most desirable. The strip should be checked for uniformity of grass cover, debris and litter, and areas of sediment accumulation. More frequent inspections of the grass cover during the first few years after establishment will help to determine if any problems are developing, and to plan for long-term restorative maintenance needs. Bare spots and areas of erosion identified during semi-annual inspections must be replanted and restored to meet specifications. Construction of a level spreader device may be necessary to reestablish shallow overland flow.
- *Debris and Litter Removal*. Trash tends to accumulate in vegetated areas, particularly along highways. Any filter strip structures (i.e. level spreaders) should be kept free of obstructions to reduce floatables being flushed downstream, and for aesthetic reasons. The need for this practice is determined through periodic inspection but should be performed no less than 4 times per year.
- *Sediment Removal*. Sediment removal is not normally required in filter strips since the vegetation normally grows through it and binds it to the soil. However, sediment may accumulate along the upstream boundary of the strip preventing uniform overland flow. Excess sediment should be removed by hand or with flat-bottomed shovels.
- *Grass Reseeding and Mulching*. A healthy dense grass should be maintained on the filter strip. If areas are eroded, they should be filled, compacted, and reseeded so that the final grade is level. Grass damaged during the sediment removal process should be promptly replaced using the same seed mix used during filter strip establishment. If possible, flow should be diverted from the damaged areas until the grass is firmly established. Bare spots and areas of erosion identified during semi-annual inspections must be replanted and restored to meet specifications. Corrective maintenance, such as weeding or replanting should be done more frequently in the first two to three years after installation to ensure stabilization. Dense vegetation may require irrigation immediately after planting, and during particularly dry periods, particularly as the vegetation is initially established.

INSPECTION, MAINTENANCE, REPAIR AND RETROFIT PLAN

An inspection, maintenance, repair and retrofit plan for the proposed permanent BMPs is shown below.

VEGETATIVE FILTER STRIPS

Once a vegetated area is well established, little additional maintenance is generally necessary. The key to establishing a viable vegetated feature is the care and maintenance it receives in the first few months after it is planted. Once established, all vegetated BMPs require some basic maintenance to ensure the health of the plants including:

- *Pest Management*. An Integrated Pest Management (IPM) Plan should be developed for vegetated areas. This plan should specify how problem insects and weeds will be controlled with minimal or no use of insecticides and herbicides.
- *Seasonal Mowing and Lawn Care*. If the filter strip is made up of turf grass, it should be mowed as needed to limit vegetation height to 18 inches, using a mulching mower (or removal of clippings). If native grasses are used, the filter may require less frequent mowing, but a minimum of twice annually. Grass clippings and brush debris should not be deposited on vegetated filter strip areas. Regular mowing should also include weed control practices; however, herbicide use should be kept to a minimum. Healthy grass can be maintained without using fertilizers because runoff usually contains sufficient nutrients. Irrigation of the site can help assure a dense and healthy vegetative cover.
- *Inspection*. Inspect filter strips at least twice annually for erosion or damage to vegetation; however, additional inspection after periods of heavy runoff is most desirable. The strip should be checked for uniformity of grass cover, debris and litter, and areas of sediment accumulation. More frequent inspections of the grass cover during the first few years after establishment will help to determine if any problems are developing, and to plan for long-term restorative maintenance needs. Bare spots and areas of erosion identified during semi-annual inspections must be replanted and restored to meet specifications. Construction of a level spreader device may be necessary to reestablish shallow overland flow.
- *Debris and Litter Removal*. Trash tends to accumulate in vegetated areas, particularly along highways. Any filter strip structures (i.e. level spreaders) should be kept free of obstructions to reduce floatables being flushed downstream, and for aesthetic reasons. The need for this practice is determined through periodic inspection but should be performed no less than 4 times per year.
- *Sediment Removal*. Sediment removal is not normally required in filter strips since the vegetation normally grows through it and binds it to the soil. However, sediment may accumulate along the upstream boundary of the strip preventing uniform overland flow. Excess sediment should be removed by hand or with flat-bottomed shovels.
- *Grass Reseeding and Mulching*. A healthy dense grass should be maintained on the filter strip. If areas are eroded, they should be filled, compacted, and reseeded so that the final grade is level. Grass damaged during the sediment removal process should be promptly replaced using the same seed mix used during filter strip establishment. If possible, flow should be diverted from the damaged areas until the grass is firmly established. Bare spots and areas of erosion identified during semi-annual inspections must be replanted and restored to meet specifications. Corrective maintenance, such as weeding or replanting should be done more frequently in the first two to three years after installation to ensure stabilization. Dense vegetation may require irrigation immediately after planting, and during particularly dry periods, particularly as the vegetation is initially established.

BIORETENTION

The primary maintenance requirement for bioretention areas is that of inspection and repair or replacement of the treatment area's components. Generally, this involves nothing more than the routine periodic maintenance that is required of any landscaped area. Bioretention system components should blend over time through plant and root growth, organic decomposition, and the development of a natural soil horizon. These biologic and physical processes over time will lengthen the facility's life span and reduce the need for extensive maintenance.

Routine maintenance should include a semi-annual health evaluation of the trees and shrubs and subsequent removal of any dead or diseased vegetation. Diseased vegetation should be treated as needed using preventative and low-toxic measures to the extent possible. BMPs have the potential to create very attractive habitats for mosquitoes and other vectors because of highly organic, often heavily vegetated areas mixed with shallow water. Routine inspections for areas of standing water within the BMP and corrective measures to restore proper infiltration rates are necessary to prevent creating mosquito and other vector habitat. In addition, bioretention BMPs are susceptible to invasion by aggressive plant species such as cattails, which increase the chances of standing water and subsequent vector production if not routinely maintained. In order to maintain the treatment area's appearance, it may be necessary to prune and weed. Furthermore, mulch replacement is suggested when erosion is evident or when the site begins to look unattractive. Specifically, the entire area may require mulch replacement every two to three years, although spot mulching may be sufficient when there are random void areas.

Recommended maintenance guidelines include:

- *Inspections.* BMP facilities should be inspected at least twice a year (once during or immediately following wet weather) to evaluate facility operation. During each inspection, erosion areas inside and downstream of the BMP must be identified and repaired or revegetated immediately.
- *Sediment Removal.* Remove sediment from the facility when sediment depth reaches 3 inches or when the sediment interferes with the health of vegetation or ability of the facility to meet required drawdown times. Sediment removal should be performed at least every 2 years.
- *Drain Time.* When the drain time exceeds 72 hours as observed in the observation well, the filter media should be removed and replaced with more permeable material.
- *Vegetation.* All dead and diseased vegetation considered beyond treatment shall be removed and replaced during semi-annual inspections. Diseased trees and shrubs should be treated during inspections. Remulch any bare areas by hand whenever needed. Replace mulch annually in the spring, or more frequently if needed, in landscaped areas of the basin where grass or groundcover is not planted. Grass areas in and around bioretention facilities must be mowed at least twice annually to limit vegetation height to 18 inches. More frequent mowing to maintain aesthetic appeal may be necessary in landscaped areas.
- *Debris and Litter Removal.* Debris and litter will accumulate in the facility and should be removed during regular mowing operations and inspections.
- *Filter Underdrain.* Clean underdrain piping network to remove any sediment buildup every 5 years, or as needed to maintain design drawdown time.

SYNTHETIC TURF

Recommended maintenance guidelines for synthetic turf include:

- *Inspections.* BMP facilities should be inspected at least twice a year (once during or immediately following wet weather) to evaluate facility operation. During each inspection, erosion areas inside and downstream of the BMP must be identified and repaired immediately.
- *Debris and Litter Removal.* Debris and litter will accumulate in the facility and should be removed during regular mowing operations and inspections.
- *Brush Artificial Turf.* Brush the surface of the synthetic turf field every 6 weeks to rejuvenate the matted fibers and level the op portion of the infill.
- *Infill Replacement.* Check and replenish the infill level especially in high use areas, at least once a year.
- *Filter Underdrain.* Clean underdrain piping network to remove any sediment buildup every 5 years, or as needed to maintain design drawdown time.

SIGNATURE

This inspection and maintenance plan outlines the procedures necessary to maintain the performance of the Permanent Best Management Practices for this project. It should be noted that the plan provides guidelines that are pre-approved by TCEQ, which must be followed for the BMP to operate as designed. Any deviations from the inspection and maintenance plans as outlined above are prohibited, unless otherwise certified by a Texas Licensed Professional Engineer and approved by TCEQ.

It is the responsibility of the owner to contract with a representative to provide the inspections and maintenance as outlined in the plan for the duration of the project. The owner will maintain this responsibility until it is assumed or transferred to another entity in writing. If the property is leased or sold, the responsibility for the maintenance will be required to be transferred through the lease agreement, binding covenants, closing documents, or other binding legal instrument.

I, the owner, have read and understand the requirements of the Inspection and Maintenance Plan for the proposed Permanent Best Management Practices for my project. I acknowledge that I will maintain responsibility for the implementation and execution of the plan until the responsibility is transferred or assumed by another party in writing through a binding legal instrument.

2-16-2024

Owner's Representative: Sarvesh Dhakal, PE, CFM - Asst. City Engineer — Date

Owner: City of Leander

MEASURES FOR MINIMIZING SURFACE STREAM CONTAMINATION

Phase 1 of this project adds 6.69 acres of impervious cover that drains towards the Edwards Aquifer Contributing Zone. The project disturbs 30.49 acres of the total site. Storm water will be filtered through the permanent BMPs outlined in **Attachment K** of this section and the majority of the cleansed water will be released at a similar rate to existing hydrology conditions.

All storm sewer proposed for the site outfall to the South Fork San Gabriel River or it's tributary. The maximum outfall velocity is 10 CFS and there will be rock riprap to protect each outfall area from erosion. All storm sewer lines are shown on the Overall Drainage Layout sheet (**Exhibit 3**).

The 100-year flow is increased by 188 CFS from the added impervious cover of this project, as shown on the Proposed Conditions Drainage Area Map (**Exhibit 3**). The portion of the South Fork San Gabriel River that runs through the project site was determined to be a Detention Exempt Stream Reach in the Williamson County Detention Policy & Planning Guidance 2019 study by Doucet & Associates. This portion of the river has a stormwater discharge time to peak sufficiently long enough to allow an adjacent proposed development to release undetained stormwater discharges directly into the reach without adversely impacting downstream peak discharges.

Parkhill

SECTION 2

TEMPORARY STORMWATER

255 N. Center Street, Suite 200, Arlington, Texas 76011 • Phone: (817) 633-0422 • Fax: (817) 649-7645 • www.parkhill.com

Temporary Stormwater Section

Texas Commission on Environmental Quality

for Regulated Activities on the Edwards Aquifer Recharge Zone and Relating to 30 TAC §213.5(b)(4)(A), (B), (D)(I) and (G); Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

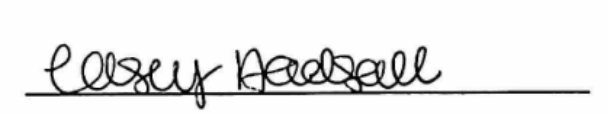
Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **Temporary Stormwater Section** is hereby submitted for TCEQ review and executive director approval. The application was prepared by:

Print Name of Customer/Agent: Casey Hadsall, PE

Date: 02/23/2024

Signature of Customer/Agent:



Regulated Entity Name: Leander Municipal Athletic Complex

Project Information

Potential Sources of Contamination

Examples: Fuel storage and use, chemical storage and use, use of asphaltic products, construction vehicles tracking onto public roads, and existing solid waste.

1. Fuels for construction equipment and hazardous substances which will be used during construction:

   ☐ The following fuels and/or hazardous substances will be stored on the site: _____

   These fuels and/or hazardous substances will be stored in:

   ☐ Aboveground storage tanks with a cumulative storage capacity of less than 250 gallons will be stored on the site for less than one (1) year.

☐ Aboveground storage tanks with a cumulative storage capacity between 250 gallons and 499 gallons will be stored on the site for less than one (1) year.

☐ Aboveground storage tanks with a cumulative storage capacity of 500 gallons or more will be stored on the site. An Aboveground Storage Tank Facility Plan application must be submitted to the appropriate regional office of the TCEQ prior to moving the tanks onto the project.

☒ Fuels and hazardous substances will not be stored on the site.

2. ☒ **Attachment A - Spill Response Actions**. A site specific description of the measures to be taken to contain any spill of hydrocarbons or hazardous substances is attached.

3. ☒ Temporary aboveground storage tank systems of 250 gallons or more cumulative storage capacity must be located a minimum horizontal distance of 150 feet from any domestic, industrial, irrigation, or public water supply well, or other sensitive feature.

4. ☒ **Attachment B - Potential Sources of Contamination**. A description of any activities or processes which may be a potential source of contamination affecting surface water quality is attached.

Sequence of Construction

5. ☒ **Attachment C - Sequence of Major Activities**. A description of the sequence of major activities which will disturb soils for major portions of the site (grubbing, excavation, grading, utilities, and infrastructure installation) is attached.

   ☒ For each activity described, an estimate (in acres) of the total area of the site to be disturbed by each activity is given.

   ☒ For each activity described, include a description of appropriate temporary control measures and the general timing (or sequence) during the construction process that the measures will be implemented.

6. ☒ Name the receiving water(s) at or near the site which will be disturbed or which will receive discharges from disturbed areas of the project: South Fork San Gabriel River

Temporary Best Management Practices (TBMPs)

Erosion control examples: tree protection, interceptor swales, level spreaders, outlet stabilization, blankets or matting, mulch, and sod. Sediment control examples: stabilized construction exit, silt fence, filter dikes, rock berms, buffer strips, sediment traps, and sediment basins. Please refer to the Technical Guidance Manual for guidelines and specifications. All structural BMPs must be shown on the site plan.

7. ☒ **Attachment D – Temporary Best Management Practices and Measures**. TBMPs and measures will prevent pollution of surface water, groundwater, and stormwater. The construction-phase BMPs for erosion and sediment controls have been designed to retain sediment on site to the extent practicable. The following information is attached:

☒ A description of how BMPs and measures will prevent pollution of surface water, groundwater or stormwater that originates upgradient from the site and flows across the site.

☒ A description of how BMPs and measures will prevent pollution of surface water or groundwater that originates on-site or flows off site, including pollution caused by contaminated stormwater runoff from the site.

☒ A description of how BMPs and measures will prevent pollutants from entering surface streams, sensitive features, or the aquifer.

☒ A description of how, to the maximum extent practicable, BMPs and measures will maintain flow to naturally-occurring sensitive features identified in either the geologic assessment, TCEQ inspections, or during excavation, blasting, or construction.

8. ☐ The temporary sealing of a naturally-occurring sensitive feature which accepts recharge to the Edwards Aquifer as a temporary pollution abatement measure during active construction should be avoided.

   ☐ **Attachment E - Request to Temporarily Seal a Feature**. A request to temporarily seal a feature is attached. The request includes justification as to why no reasonable and practicable alternative exists for each feature.

   ☒ There will be no temporary sealing of naturally-occurring sensitive features on the site.

9. ☒ **Attachment F - Structural Practices**. A description of the structural practices that will be used to divert flows away from exposed soils, to store flows, or to otherwise limit runoff discharge of pollutants from exposed areas of the site is attached. Placement of structural practices in floodplains has been avoided.

10. ☒ **Attachment G - Drainage Area Map**. A drainage area map supporting the following requirements is attached:

    ☐ For areas that will have more than 10 acres within a common drainage area disturbed at one time, a sediment basin will be provided.

    ☐ For areas that will have more than 10 acres within a common drainage area disturbed at one time, a smaller sediment basin and/or sediment trap(s) will be used.

    ☐ For areas that will have more than 10 acres within a common drainage area disturbed at one time, a sediment basin or other equivalent controls are not attainable, but other TBMPs and measures will be used in combination to protect down slope and side slope boundaries of the construction area.

    ☒ There are no areas greater than 10 acres within a common drainage area that will be disturbed at one time. A smaller sediment basin and/or sediment trap(s) will be used in combination with other erosion and sediment controls within each disturbed drainage area.

☒ There are no areas greater than 10 acres within a common drainage area that will be disturbed at one time. Erosion and sediment controls other than sediment basins or sediment traps within each disturbed drainage area will be used.

11. ☐ **Attachment H - Temporary Sediment Pond(s) Plans and Calculations**. Temporary sediment pond or basin construction plans and design calculations for a proposed temporary BMP or measure have been prepared by or under the direct supervision of a Texas Licensed Professional Engineer. All construction plans and design information must be signed, sealed, and dated by the Texas Licensed Professional Engineer. Construction plans for the proposed temporary BMPs and measures are attached.

☒ N/A

12. ☒ **Attachment I - Inspection and Maintenance for BMPs.** A plan for the inspection of each temporary BMP(s) and measure(s) and for their timely maintenance, repairs, and, if necessary, retrofit is attached. A description of the documentation procedures, recordkeeping practices, and inspection frequency are included in the plan and are specific to the site and/or BMP.

13. ☒ All control measures must be properly selected, installed, and maintained in accordance with the manufacturer's specifications and good engineering practices. If periodic inspections by the applicant or the executive director, or other information indicate a control has been used inappropriately, or incorrectly, the applicant must replace or modify the control for site situations.

14. ☒ If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize offsite impacts to water quality (e.g., fugitive sediment in street being washed into surface streams or sensitive features by the next rain).

15. ☒ Sediment must be removed from sediment traps or sedimentation ponds not later than when design capacity has been reduced by 50%. A permanent stake will be provided that can indicate when the sediment occupies 50% of the basin volume.

16. ☒ Litter, construction debris, and construction chemicals exposed to stormwater shall be prevented from becoming a pollutant source for stormwater discharges (e.g., screening outfalls, picked up daily).

Soil Stabilization Practices

Examples: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, or preservation of mature vegetation.

17. ☒ **Attachment J - Schedule of Interim and Permanent Soil Stabilization Practices**. A schedule of the interim and permanent soil stabilization practices for the site is attached.

18. ☒ Records must be kept at the site of the dates when major grading activities occur, the dates when construction activities temporarily or permanently cease on a portion of the site, and the dates when stabilization measures are initiated.

19. ☒ Stabilization practices must be initiated as soon as practicable where construction activities have temporarily or permanently ceased.

Administrative Information

20. ☒ All structural controls will be inspected and maintained according to the submitted and approved operation and maintenance plan for the project.

21. ☒ If any geologic or manmade features, such as caves, faults, sinkholes, etc., are discovered, all regulated activities near the feature will be immediately suspended. The appropriate TCEQ Regional Office shall be immediately notified. Regulated activities must cease and not continue until the TCEQ has reviewed and approved the methods proposed to protect the aquifer from any adverse impacts.

22. ☒ Silt fences, diversion berms, and other temporary erosion and sediment controls will be constructed and maintained as appropriate to prevent pollutants from entering sensitive features discovered during construction.

SPILL RESPONSE ACTIONS

If there is an accidental spill on site, the contractor shall respond with appropriate action. The contractor will be required to contact the owner and in turn the owner shall contact the TCEQ in event of an on-site spill. In addition to the following guidance, reference the latest version of the TCEQ's Technical Guidance Manual (TGM) RG-348 Section 1.4.16 and https://www.tceq.texas.gov/response/spills/spill_rq.html.

The following steps help reduce the storm water impacts of leaks and spills.

Education:

1. Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material used, and what the appropriate response is for "significant" and "insignificant" spills. Employees should also be aware of when a spill must be reported to the TCEQ. Information is available in 30 TAC 327.4 and 40 CFR 302.4.
2. Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
3. Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate this into regular safety meetings).
4. Establish a continuing education program to indoctrinate new employees.
5. Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures:

1. To the extent that the work can be accomplished safely, spills of oil, petroleum products, and substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
2. Store hazardous materials and wastes in covered containers and protect from vandalism.
3. Place a stockpile of spill cleanup materials where it will be readily accessible.
4. Train employees in spill prevention and cleanup.
5. Designate responsible individuals to oversee and enforce control measures.
6. Spills should be covered and protected from storm water run-on during rainfall to the extent that it doesn't compromise cleanup activities.
7. Do not bury or wash spills with water.

Cleanup:

1. Clean up leaks and spills immediately.
2. Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be disposed of as hazardous waste.
3. Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills:

1. Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
2. Use absorbent materials on small spills rather than hosing down or burying the spill.
3. Absorbent materials should be promptly removed and disposed of properly.
4. Follow the practice below for a minor spill:
    - Contain the spread of the spill.
    - Recover spilled materials.
    - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills:

Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

Spills should be cleaned up immediately:

1. Contain spread of the spill.
2. Notify the project foreman immediately.
3. If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
4. If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
5. If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant & Hazardous Spills:

For significant or hazardous spills that are in reportable quantities:

1. Notify the TCEQ by telephone as soon as possible and within 24 hours at (512)339-2929 (Austin) or 210-490-3096 (San Antonio) between 8 AM and 5 PM. After hours, contact the Environmental Release Hotline at 1-800-832-8224. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
2. For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
3. Notification should first be made by telephone and followed up with a written report.
4. The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
5. Other agencies which may need to be consulted include, but not limited to, the City Police Department, County Sheriff Office, Fire Departments, etc.

Vehicle and Equipment Maintenance:

1. If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runoff of stormwater and the runoff of spills.
2. Regularly inspect onsite vehicles and equipment for leaks and repair immediately
3. Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
4. Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
5. Place drip pans or absorbent materials under paving equipment when not in use.
6. Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
7. Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
8. Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
9. Store cracked batteries in a non- leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling:

1. If fueling must occur on site, use designated areas, located away from drainage courses, to prevent the runoff of stormwater and the runoff of spills.
2. Discourage "topping off" of fuel tanks.
3. Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

POTENTIAL SOURCES OF CONTAMINATION

Potential Source: Oil, grease, fuel, and hydraulic fluid contamination from construction equipment and vehicle dripping.

Preventative Measures: Vehicle maintenance when possible will be performed within the construction staging area or a local maintenance shop.

Potential Source: Miscellaneous trash and litter from construction workers and material wrappings.

Preventative Measures: Stage/storage/spoils location will be placed throughout the site to encourage proper disposal of trash.

Potential Source: Silt leaving the site.

Preventative Measures: Contractor will install all temporary best management practices shown on Erosion Control Plan prior to start of construction including a silt fence and a stabilized construction entrance to prevent silt spreading onto adjoining streets.

Potential Source: Construction Debris.

Preventative Measures: Construction debris will be monitored daily by contractor. Debris will be collected weekly and placed in disposal bins. Situations requiring immediate attention will be addressed on a case by case basis.

Potential Source: Soil and Mud from Construction Vehicle tires as they leave the site.

Preventative Measures: A stabilized construction exit shall be utilized as vehicles leave the site. Any soil, mud, etc. carried from the project onto public roads shall be cleaned up within 24 hours.

Potential Source: Sediment from soil, sand, gravel, and excavated materials stock piled on site.

Preventative Measures: Silt fence shall be installed on the down gradient side of the stock piled materials.

Potential Source: Portable toilet spill.

Preventative Measures: Toilets on the site will be emptied on a regular basis by the contracted toilet company.

SEQUENCE OF MAJOR ACTIVITIES

Intended Schedule or Sequence of Major Activities:

Note: The areas shown below include Phase 1 of the project site (all within the Contributing Zone).

1. Installation of Erosion Control Measures (48.9 Acres)
2. Rough Grading (29.1 Acres)
3. Finished Grading (29.1 Acres)
4. Final Subgrade Preparation (8.7 Acres)
5. Site Concrete Construction (6.7 Acres)
6. Pedestrian Bridge Installation (0.03 Acres)
7. Site Landscaping and Sodding (5.7 Acres)
8. Site cleanup and Removal of Temporary Erosion Control Measures (48.9 Acres)

TEMPORARY BEST MANAGEMENT PRACTICES AND MEASURES

A: As seen in the drainage area maps (**Exhibit 3**), the upgradient stormwater flows directly to the tributary of South Fork San Gabriel River or is treated prior to entering the LMAC project site. The outfall from the existing detention pond upstream of the site flows down the eastern edge of the site in an existing channel. The existing trees and vegetation in and along this channel will be protected to help maintain a stable ground surface and prevent loss of valuable topsoil. A rock berm will be installed at the south end of the channel to prevent silt from escaping the construction area in this channel.

B: Temporary Best Management Practices and Measures will be installed prior to soil disturbing construction activity to prevent pollution caused by contaminated storm water runoff from the site. Silt fencing will be placed along the down-gradient sides of the property to prevent silt from escaping the construction area. Temporary construction entrances will be placed on site to reduce vehicle "tracking" onto adjoining streets. Concrete washout pits will be used to collect all excess concrete during construction. A construction staging area will be used for equipment storage and vehicle maintenance. Inlet protection will be used to prevent silt from entering the storm drainage system.

Practices may also be implemented on site for interim and permanent stabilization. Stabilization practices may include but are not limited to: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of existing trees and vegetation, and other similar measures.

STRUCTURAL PRACTICES

Structural practices will be installed to prevent pollution caused by contaminated storm water runoff discharge from exposed areas of the site. All structural practices will be installed prior to the removal of any vegetative cover and/or altering the soil structure by clearing, grading, and compacting. The location of all structural practices for the subject site is shown on the Erosion Control Plan (**Exhibit 2**). Details and specifications for the selected structural practices are also provided in **Exhibit 2**. The following describes the structural practices used.

CONCRETE WASHOUT AREAS

The purpose of concrete washout areas is to prevent or reduce the discharge of pollutants to storm water from concrete waste by conducting washout offsite, performing onsite washout in a designated area, and training employees and subcontractors.

The following steps will help reduce storm water pollution from concrete wastes:

1. Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
2. Avoid mixing excess amounts of fresh concrete.
3. Perform washout of concrete trucks in designated areas only.
4. Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
5. Do not allow excess concrete to be dumped onsite, except in designated areas.

For on-site washout:

1. Locate washout area at least 50 feet from sensitive features, storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
2. Wash out wastes into the temporary pit where the concrete can set, be broken up, and then disposed properly.

Below grade concrete washout facilities are typical. These consist of a lined excavation sufficiently large to hold expected volume of washout material. Above grade facilities are used if excavation is not practical. Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this section, with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. Plastic lining material should be a minimum of 10mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and disposed of. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and disposed of. Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

SILT FENCE

A silt fence is a barrier consisting of geotextile fabric supported by metal posts to prevent soil and sediment loss from a site. When properly used, silt fences can be highly effective at controlling sediment from disturbed areas. They cause runoff to pond, allowing heavier solids to settle out. If not properly

installed, silt fences are not likely to be effective.

The purpose of a silt fence is to intercept and detain water-borne sediment from unprotected areas of a limited extent. Silt fence is used during the period of construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. This fence should remain in place until the disturbed area is permanently stabilized. Silt fence should not be used where there is a concentration of water in a channel or drainage way. If concentrated flow occurs after installation, corrective action must be taken such as placing a rock berm in the areas of concentrated flow.

Silt fencing within the site may be temporarily moved during the day to allow construction activity provided it is replaced and properly anchored to the ground at the end of the day. Silt fences on the perimeter of the site or around drainage ways should not be moved at any time.

Materials and installation shall conform to details shown in **Exhibit 2**.

TEMPORARY CONSTRUCTION ENTRANCE/EXIT

The purpose of a temporary gravel construction entrance is to provide a stable entrance/exit condition from the construction site and keep mud and sediment off public roads. A stabilized construction entrance is a stabilized pad of crushed stone located at any point traffic will be entering or leaving the construction site from a public right-of-way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking or flowing of sediment onto public rights-of-way. This practice should be used at all points of construction ingress and egress.

Excessive amounts of mud can also present a safety hazard to roadway users. To minimize the amount of sediment loss to nearby roads, access to the construction site should be limited to as few points as possible and vegetation around the perimeter should be protected were access is not necessary. A rock stabilized construction entrance should be used at all designated access points.

Materials and installation shall conform to details shown in **Exhibit 2**.

INLET PROTECTION

Storm sewers that are made operational prior to stabilization of the associated drainage areas can convey large amounts of sediment to natural drainage ways. In case of extreme sediment loading, the storm sewer itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets. The following guidelines for inlet protection are based primarily on recommendations by the Virginia Dept. of Conservation and Recreation (1992) and the North Central Texas Council of Governments (NCTCOG, 1993b).

In developments for which drainage is to be conveyed by underground storm sewers (i.e., streets with curbs and gutters), all inlets that may receive storm runoff from disturbed areas should be protected. Temporary inlet protection is a series of different measures that provide protection against silt transport or accumulation in storm sewer systems. This clogging can greatly reduce or completely stop the flow in the pipes. The different measures are used for different site conditions and inlet types.

Care should be taken when choosing a specific type of inlet protection. Field experience has shown that inlet protection that causes excessive ponding in an area of high construction activity may become so

inconvenient that it is removed or bypassed, thus transmitting sediment-laden flows unchecked. In such situations, a structure with an adequate overflow mechanism should be utilized.

It should also be noted that inlet protection devices are designed to be installed on construction sites and not on streets and roads open to the public. When used on public streets these devices will cause ponding of runoff, which can cause minor flooding and can present a traffic hazard. An example of appropriate siting would be a new subdivision where the storm drain system is installed before the area is stabilized and the streets open to the general public. When construction occurs adjacent to active streets, the sediment should be controlled on site and not on public thoroughfares. Occasionally, roadwork or utility installation will occur on public roads. In these cases, inlet protection is an appropriate temporary BMP.

The following inlet protection devices are for drainage areas of one acre or less. Runoff from larger disturbed areas should be routed to a temporary sediment trap or basin. Filter barrier protection using silt fence is appropriate when the drainage area is less than one acre and the basin slope is less than five percent. This type of protection is not applicable in paved areas.

Block and gravel protection is used when flows exceed 0.5 cubic feet per second and it is necessary to allow for overtopping to prevent flooding. This form of protection is also useful for curb type inlets as it works well in paved areas.

Wire mesh and gravel protection is used when flows exceed 0.5 cubic feet per second and construction traffic may occur over the inlet. This form of protection may be used with both curb and drop inlets.

Excavated impoundment protection around a drop inlet may be used for protection against sediment entering a storm drain inlet. With this method, it is necessary to install weep holes to allow the impoundment to drain completely. If this measure is implemented, the impoundment should be sized such that the volume of excavation is 3,600 cubic feet per acre (equivalent to 1 inch of runoff) of disturbed area entering the inlet.

Materials:

1. Filter fabric should be a nylon reinforced polypropylene fabric which meets the following minimum criteria: Tensile Strength, 90 lbs.; Puncture Rating, 60 lbs.; Mullen Burst Rating, 280 psi; Apparent Opening Size, U.S. Sieve No. 70.
2. Posts for fabric should be 2” x 4” pressure treated wood stakes or galvanized steel, tubular in cross-section or they may be standard fence “T” posts.
3. Concrete blocks should be standard 8” x 8” x 16” concrete masonry units.
4. Wire mesh should be standard hardware cloth or comparable wire mesh with an opening size not to exceed 1/2 inch.

Guidelines for installation:

<u>Silt Fence Drop Inlet Protection</u>

1. Silt fence should conform to the specifications listed above and should be cut from a continuous roll to avoid joints.
2. For stakes, use 2 x 4-inch wood or equivalent metal with a minimum length of 3 feet.

3. Space stakes evenly around the perimeter of the inlet a maximum of 3 feet apart, and securely drive them into the ground, approximately 18 inches deep.
4. To provide needed stability to the installation, a frame with 2 x 4- inch wood strips around the crest of the overflow area at a maximum of 1½ feet above the drop inlet crest should be provided.
5. Place the bottom 12 inches of the fabric in a trench and backfill the trench with 12 inches of compacted soil.
6. Fasten fabric securely by staples or wire to the stakes and frame. Joints must be overlapped to the next stake.
7. It may be necessary to build a temporary dike on the down slope side of the structure to prevent bypass flow.

If the drop inlet is above the finished grade, the grate may be completely covered with filter fabric. The fabric should be securely attached to the entire perimeter of the inlet using 1"x 2" wood strips and appropriate fasteners.

Bagged Gravel Inlet Filter

Sandbags filled with pea gravel can also be used to construct a sediment barrier around curb and drain inlets. The sandbags should be filled with washed pea gravel and stacked to form a continuous barrier about 1 foot high around the inlets. The bags should be tightly abutted against each other to prevent runoff from flowing between the bags.

Common Trouble Points:

1. Gaps between the inlet protection and the curb (flows bypass around side of filter).
2. Filter fabric skirt not anchored to pavement (flows pass under filter).

Materials and installation shall conform to details shown in **Exhibit 2**.

DRAINAGE AREA MAP

The project site drains to South Fork San Gabriel River. Pre- and Post-Development Drainage Maps are provided at the end of this form, in **Exhibit 3**. Silt fencing and inlet protection will be used in combination with other erosion and sediment controls within the disturbed drainage areas as discussed in **Attachment D.**

INSPECTION AND MAINTENANCE FOR BMPs

MAINTENANCE

All temporary and sediment control BMPs will be maintained and repaired as needed to assure continued performance of their intended function. All maintenance and repair of BMPs will be conducted in accordance with manufacturers' specifications.

All temporary erosion and sediment control BMPs will be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment will be removed or stabilized on site. Disturbed soil areas resulting from removal of BMPs or vegetation will be permanently stabilized as soon as possible.

Erosion and sediment controls are designed to prevent soil erosion and sediment migration offsite, to the extent practicable, which may result from construction activity. This design considers local topography, soil type, and rainfall.

Control measures must be installed and maintained according to the manufacturer's specifications. If periodic inspections or other information indicates a control has been used inappropriately, or incorrectly, the permitee must replace or modify the control for site situations.

If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize off-site impacts, and whenever feasible, prior to the next rain event.

The controls must be installed, maintained, and operated in a manner that will limit, to the extent practicable, offsite transport of litter, construction debris, and construction materials.

INSPECTIONS

An inspection will be performed by the qualified personnel, as designated by the permitee, on a weekly basis and after any rainfall event. An inspection and maintenance report shall be made per inspection. Based on the inspection results, the controls shall be corrected before the next scheduled inspection.

A log of inspection results will be maintained on-site and will include the name of the inspector, date, major observations, and necessary corrective measures. Reports of maintenance and inspection activities will be maintained on-site, in conformance with the TPDES permit conditions. Reports must identify any incidents of non-compliance. Where a report does not identify any incidents of non-compliance, the report must contain a certification that the facility or site is in compliance with the SWPPP. This report must be signed by the responsible party.

Major observations shall, at a minimum, include the following:

- The locations of discharges of sediment or other pollutants from the site
- Locations of BMPs that need to be maintained
- Locations of BMPs that failed to operate as designed or proved inadequate for a particular location
- Location where additional BMPs are needed.

All needed repairs or modifications will be reported to the contractors to permit the timely implementation of required actions. Necessary repairs of modifications will be implemented within seven

days of inspection. The SWPPP will be modified within seven days to reflect any modifications to measures as a result of inspection.

The SWPPP must be amended whenever there is a change in design, construction, operation, or maintenance that has a significant effect on the discharge of pollutants to the waters of the United States that was not addressed in the SWPPP.

The SWPPP must be amended when inspections or investigations by site operations, local, state or federal officials indicate that the SWPPP is proving ineffective in eliminating or significantly minimizing pollutants from the construction site or otherwise is not achieving the general objectives of controlling pollutants in storm water discharges associated with construction activity.

SCHEDULE OF INTERIM AND PERMANENT SOIL STABILIZATION PRACTICES

Construction practices shall disturb the minimal amount of existing ground cover as required for land clearing, grading, and construction activity for the shortest amount of time possible to minimize the potential of erosion and sedimentation from the site. Existing vegetation shall be maintained and left in place until it is necessary to disturb for construction activity. For this project the following stabilization practices will be implemented:

1. Hydraulic Mulch and Seeding: Disturbed areas subject to erosion shall be stabilized with hydraulic mulch and/or seeded and watered to provide interim stabilization. For areas that are not to be sodded as per the project landscaping plan, a minimum of 85% vegetative cover will be established to provide permanent stabilization.

Records of the following shall be maintained by the permitee in the attached Project Timeline:

1. The dates when major grading activities occur;

2. The dates when construction activities temporarily or permanently cease on a portion of the site; and

3. The dates when stabilization measures are initiated.

Stabilization measures must be initiated as soon as practical in portions of the site where construction activities have temporarily or permanently ceased, and except as provided in the following, must be initiated no more that fourteen (14) days after the construction activity in that portion of the site has temporarily or permanently ceased:

Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently ceased is precluded by snow cover or frozen ground conditions, stabilization measures must be initiated as soon as practical.

Where construction activity on a portion of the site is temporarily ceased and earth disturbing activities will be resumed within twenty-one (21) days, temporary stabilization measures do not have to be initiated on that portion of the site.

In arid areas (areas with an average rainfall of 0-10 inches), semiarid areas (areas with an average annual rainfall of 10 to 20 inches), and areas experiencing droughts where the initiation of stabilization measures by the 14th day after construction activity has temporarily or permanently ceased is precluded by seasonably arid conditions, stabilization measures must be initiated as soon as practical.

PROJECT TIMELINE

DATES WHEN MAJOR GRADING ACTIVITIES OCCUR	
Date	Construction Activity

DATES WHEN CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE	
Date	Construction Activity

DATES WHEN STABILIZATION MEASURES ARE INITIATED	
Date	Stabilization Activity

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SECTION 3

ADDITIONAL FORMS

255 N. Center Street, Suite 200, Arlington, Texas 76011 • Phone: (817) 633-0422 • Fax: (817) 649-7645 • www.parkhill.com

Agent Authorization Form
For Required Signature
Edwards Aquifer Protection Program
Relating to 30 TAC Chapter 213
Effective June 1, 1999

I Russell Alabastro,
Print Name

CIP Project Manager,
Title - Owner/President/Other

of City of Leander,
Corporation/Partnership/Entity Name

have authorized Casey Hadsall, PE
Print Name of Agent/Engineer

of Parkhill, Inc.
Print Name of Firm

to represent and act on the behalf of the above named Corporation, Partnership, or Entity for the purpose of preparing and submitting this plan application to the Texas Commission on Environmental Quality (TCEQ) for the review and approval consideration of regulated activities.

I also understand that:

1. The applicant is responsible for compliance with 30 Texas Administrative Code Chapter 213 and any condition of the TCEQ's approval letter. The TCEQ is authorized to assess administrative penalties of up to $10,000 per day per violation.

2. For those submitting an application who are not the property owner, but who have the right to control and possess the property, additional authorization is required from the owner.

3. Application fees are due and payable at the time the application is submitted. The application fee must be sent to the TCEQ cashier or to the appropriate regional office. The application will not be considered until the correct fee is received by the commission.

4. A notarized copy of the Agent Authorization Form must be provided for the person preparing the application, and this form must accompany the completed application.

5. No person shall commence any regulated activity on the Edwards Aquifer Recharge Zone, Contributing Zone or Transition Zone until the appropriate application for the activity has been filed with and approved by the Executive Director.

SIGNATURE PAGE:

Applicant's Signature

01/24/2024
Date

THE STATE OF Texas §

County of Williamson §

BEFORE ME, the undersigned authority, on this day personally appeared Russell Alabastro known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that (s)he executed same for the purpose and consideration therein expressed.

GIVEN under my hand and seal of office on this 24th day of January, 2024.

Lorraine B Eldred
NOTARY PUBLIC

LORRAINE B ELDRED
Notary Public
STATE OF TEXAS
ID# 124552760
My Comm. Exp. Jul. 23, 2024

Lorraine B. Eldred
Typed or Printed Name of Notary

MY COMMISSION EXPIRES: Jul. 23, 2024

Application Fee Form

Texas Commission on Environmental Quality
Name of Proposed Regulated Entity: Leander Municipal Athletic Complex
Regulated Entity Location: 2201 N US HWY 183, Leander, TX 78641
Name of Customer: Parkhill
Contact Person: Casey Hadsall, PE Phone: 817-633-0403
Customer Reference Number (if issued):CN 600646012
Regulated Entity Reference Number (if issued):RN _____

Austin Regional Office (3373)

☐ Hays ☐ Travis ☒ Williamson

San Antonio Regional Office (3362)

☐ Bexar ☐ Medina ☐ Uvalde
☐ Comal ☐ Kinney

Application fees must be paid by check, certified check, or money order, payable to the **Texas Commission on Environmental Quality**. Your canceled check will serve as your receipt. **This form must be submitted with your fee payment**. This payment is being submitted to:

☒ Austin Regional Office
☒ Mailed to: TCEQ - Cashier
Revenues Section
Mail Code 214
P.O. Box 13088
Austin, TX 78711-3088

☐ San Antonio Regional Office
☐ Overnight Delivery to: TCEQ - Cashier
12100 Park 35 Circle
Building A, 3rd Floor
Austin, TX 78753
(512)239-0357

Site Location (Check All That Apply):

☐ Recharge Zone ☒ Contributing Zone ☐ Transition Zone

Type of Plan	***Size***	***Fee Due***
Water Pollution Abatement Plan, Contributing Zone Plan: One Single Family Residential Dwelling	Acres	$
Water Pollution Abatement Plan, Contributing Zone Plan: Multiple Single Family Residential and Parks	Acres	$
Water Pollution Abatement Plan, Contributing Zone Plan: Non-residential	40 < 100 Acres	$ 8,000
Sewage Collection System	L.F.	$
Lift Stations without sewer lines	Acres	$
Underground or Aboveground Storage Tank Facility	Tanks	$
Piping System(s)(only)	Each	$
Exception	Each	$
Extension of Time	Each	$

Signature: Casey Hadsall

Date: 02-16-2024

Application Fee Schedule

Texas Commission on Environmental Quality
Edwards Aquifer Protection Program 30 TAC Chapter 213 (effective 05/01/2008)

Water Pollution Abatement Plans and Modifications

Contributing Zone Plans and Modifications

Project	*Project Area in Acres*	*Fee*
One Single Family Residential Dwelling	< 5	$650
Multiple Single Family Residential and Parks	< 5 5 < 10 10 < 40 40 < 100 100 < 500 ≥ 500	$1,500 $3,000 $4,000 $6,500 $8,000 $10,000
Non-residential (Commercial, industrial, institutional, multi-family residential, schools, and other sites where regulated activities will occur)	< 1 1 < 5 5 < 10 10 < 40 40 < 100 ≥ 100	$3,000 $4,000 $5,000 $6,500 $8,000 $10,000

Organized Sewage Collection Systems and Modifications

Project	*Cost per Linear Foot*	*Minimum Fee-Maximum Fee*
Sewage Collection Systems	$0.50	$650 - $6,500

Underground and Aboveground Storage Tank System Facility Plans and Modifications

Project	*Cost per Tank or Piping System*	*Minimum Fee-Maximum Fee*
Underground and Aboveground Storage Tank Facility	$650	$650 - $6,500

Exception Requests

Project	*Fee*
Exception Request	$500

Extension of Time Requests

Project	***Fee***
Extension of Time Request	$150

TCEQ Core Data Form

TCEQ Use Only

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission (*If other is checked please describe in space provided.*)

☒ New Permit, Registration or Authorization (*Core Data Form should be submitted with the program application.*)

☐ Renewal (*Core Data Form should be submitted with the renewal form*) ☐ Other

2. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number *(if issued)*
CN 600646012		RN

SECTION II: Customer Information

4. General Customer Information	5. Effective Date for Customer Information Updates (mm/dd/yyyy)	

☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership

☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name (*If an individual, print last name first: eg: Doe, John*) *If new Customer, enter previous Customer below:*

City of Leander

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number *(if applicable)*

11. Type of Customer: ☐ Corporation ☐ Individual Partnership: ☐ General ☐ Limited

Government: ☒ City ☐ County ☐ Federal ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees ☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher

13. Independently Owned and Operated? ☐ Yes ☐ No

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following*

☐ Owner ☐ Operator ☒ Owner & Operator

☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other:

15. Mailing Address: 201 N. Brushy Street

City	Leander	State	TX	ZIP	78641	ZIP + 4	

16. Country Mailing Information *(if outside USA)*	17. E-Mail Address *(if applicable)*
	ralabastro@leandertx.gov

18. Telephone Number	19. Extension or Code	20. Fax Number *(if applicable)*
(512) 528-2700		( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information (*If 'New Regulated Entity" is selected below this form should be accompanied by a permit application*)

☒ New Regulated Entity ☐ Update to Regulated Entity Name ☐ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC).

22. Regulated Entity Name (*Enter name of the site where the regulated action is taking place.*)

Leander Municipal Athletic Complex

23. Street Address of the Regulated Entity: *(No PO Boxes)*	2201 N US HWY 183							
	City	Leander	**State**	TX	**ZIP**	78641	**ZIP + 4**	
24. County	Williamson							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:					
26. Nearest City			**State**	**Nearest ZIP Code**	
Leander			TX	78641	
27. Latitude (N) In Decimal:	30.624645		**28. Longitude (W) In Decimal:**	-97.859383	
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
30	37	28.72	97	51	33.78

29. Primary SIC Code (4 digits)	**30. Secondary SIC Code** (4 digits)	**31. Primary NAICS Code** (5 or 6 digits)	**32. Secondary NAICS Code** (5 or 6 digits)
7999		713990	

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

Parks and Recreation

34. Mailing Address:	**201 N. Brushy Street**							
	City	**Leander**	**State**	**TX**	**ZIP**	**78641**	**ZIP + 4**	

35. E-Mail Address:	**amichie@nbtexas.org**

36. Telephone Number	**37. Extension or Code**	**38. Fax Number** *(if applicable)*
(512) 528-2750		**( ) -**

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☒ Edwards Aquifer	☐ Emissions Inventory Air	☐ Industrial Hazardous Waste
☐ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

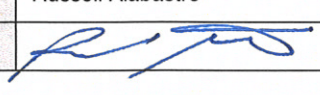
SECTION IV: Preparer Information

40. Name:	Casey Hadsall	**41. Title:**	Civil Engineer (PE)

42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**
(817) 633-0403		(817) 649-7645	chadsall@parkhill.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	City of Leander	**Job Title:**	CIP Project Manager
Name *(In Print):*	Russell Alabastro	**Phone:**	(512) 528- **2700**
Signature:		**Date:**	01/24/2024

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SECTION 4

EXHIBITS

255 N. Center Street, Suite 200, Arlington, Texas 76011 • Phone: (817) 633-0422 • Fax: (817) 649-7645 • www.parkhill.com

Parkhill

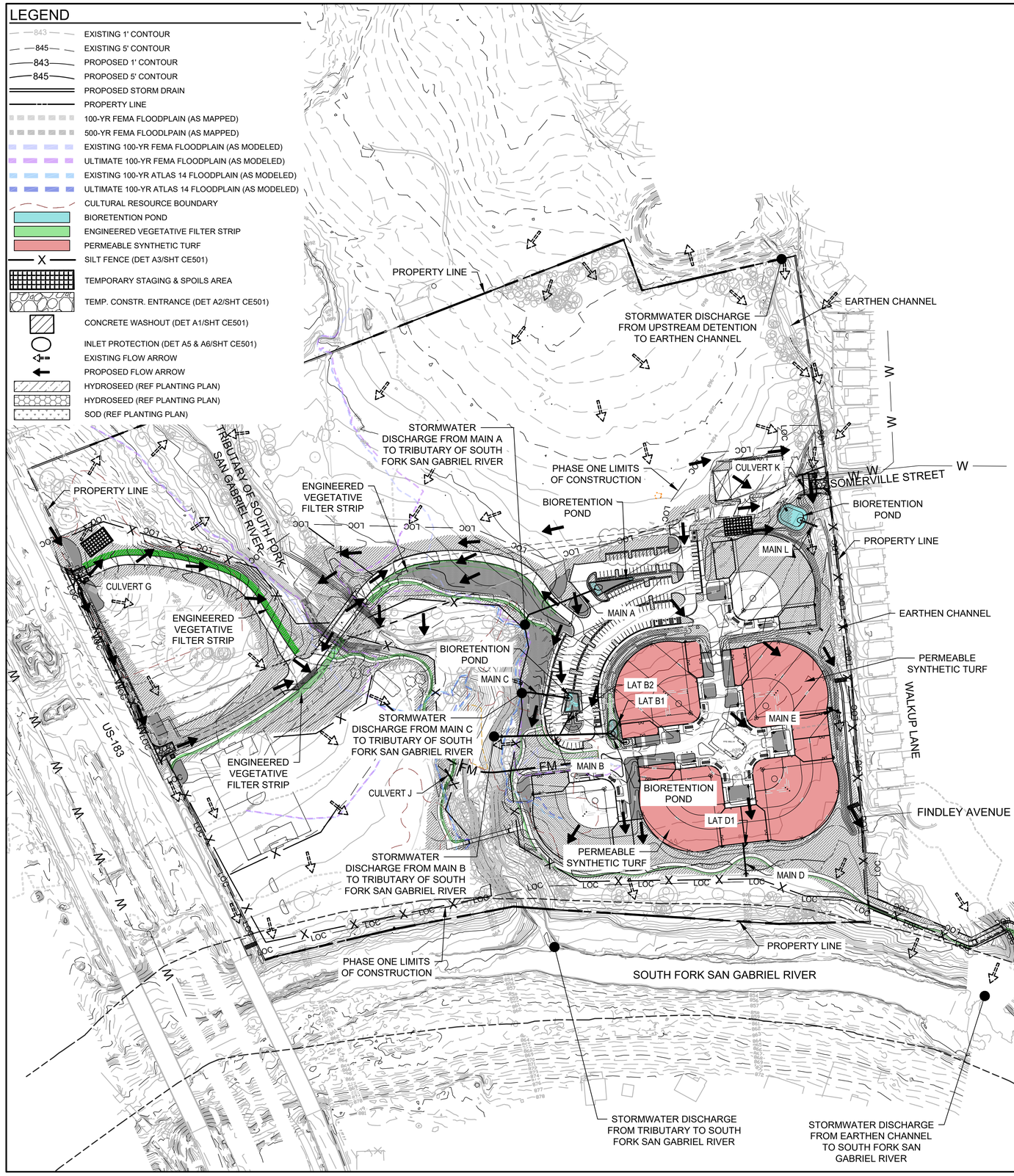
EXHIBIT 1

CONTRIBUTING ZONE SITE PLAN

255 N. Center Street, Suite 200, Arlington, Texas 76011 • Phone: (817) 633-0422 • Fax: (817) 649-7645 • www.parkhill.com

LEGEND

- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- PROPOSED 1' CONTOUR
- PROPOSED 5' CONTOUR
- PROPOSED STORM DRAIN
- PROPERTY LINE
- 100-YR FEMA FLOODPLAIN (AS MAPPED)
- 500-YR FEMA FLOODLPAIN (AS MAPPED)
- EXISTING 100-YR FEMA FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR FEMA FLOODPLAIN (AS MODELED)
- EXISTING 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- CULTURAL RESOURCE BOUNDARY
- BIORETENTION POND
- ENGINEERED VEGETATIVE FILTER STRIP
- PERMEABLE SYNTHETIC TURF
- SILT FENCE (DET A3/SHT CE501)
- TEMPORARY STAGING & SPOILS AREA
- TEMP. CONSTR. ENTRANCE (DET A2/SHT CE501)
- CONCRETE WASHOUT (DET A1/SHT CE501)
- INLET PROTECTION (DET A5 & A6/SHT CE501)
- EXISTING FLOW ARROW
- PROPOSED FLOW ARROW
- HYDROSEED (REF PLANTING PLAN)
- HYDROSEED (REF PLANTING PLAN)
- SOD (REF PLANTING PLAN)



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
CONTRIBUTING ZONE PLAN
GENERAL CONSTRUCTION NOTES
(REV. JULY 15, 2015)

EDWARDS AQUIFER PROTECTION PROGRAM CONSTRUCTION NOTES – LEGAL DISCLAIMER

THE FOLLOWING/LISTED "CONSTRUCTION NOTES" ARE INTENDED TO BE ADVISORY IN NATURE ONLY AND DO NOT CONSTITUTE AN APPROVAL OR CONDITIONAL APPROVAL BY THE EXECUTIVE DIRECTOR (ED), NOR DO THEY CONSTITUTE A COMPREHENSIVE LISTING OF RULES OR CONDITIONS TO BE FOLLOWED DURING CONSTRUCTION. FURTHER ACTIONS MAY BE REQUIRED TO ACHIEVE COMPLIANCE WITH TCEQ REGULATIONS FOUND IN TITLE 30, TEXAS ADMINISTRATIVE CODE (TAC), CHAPTERS 213 AND 217, AS WELL AS LOCAL ORDINANCES AND REGULATIONS PROVIDING FOR THE PROTECTION OF WATER QUALITY. ADDITIONALLY, NOTHING CONTAINED IN THE FOLLOWING/LISTED "CONSTRUCTION NOTES" RESTRICTS THE POWERS OF THE ED, THE COMMISSION OR ANY OTHER GOVERNMENTAL ENTITY TO PREVENT, CORRECT, OR CURTAIL ACTIVITIES THAT RESULT OR MAY RESULT IN POLLUTION OF THE EDWARDS AQUIFER OR HYDROLOGICALLY CONNECTED SURFACE WATERS. THE HOLDER OF ANY EDWARDS AQUIFER PROTECTION PLAN CONTAINING "CONSTRUCTION NOTES" IS STILL RESPONSIBLE FOR COMPLIANCE WITH TITLE 30, TAC, CHAPTERS 213 OR ANY OTHER APPLICABLE TCEQ REGULATION, AS WELL AS ALL CONDITIONS OF AN EDWARDS AQUIFER PROTECTION PLAN THROUGH ALL PHASES OF PLAN IMPLEMENTATION. FAILURE TO COMPLY WITH ANY CONDITION OF THE ED'S APPROVAL, WHETHER OR NOT IN CONTRADICTION OF ANY "CONSTRUCTION NOTES," IS A VIOLATION OF TCEQ REGULATIONS AND ANY VIOLATION IS SUBJECT TO ADMINISTRATIVE RULES, ORDERS, AND PENALTIES AS PROVIDED UNDER TITLE 30, TAC § 213.10 (RELATING TO ENFORCEMENT). SUCH VIOLATIONS MAY ALSO BE SUBJECT TO CIVIL PENALTIES AND INJUNCTION. THE FOLLOWING/LISTED "CONSTRUCTION NOTES" IN NO WAY REPRESENT AN APPROVED EXCEPTION BY THE ED TO ANY PART OF TITLE 30 TAC, CHAPTERS 213 AND 217, OR ANY OTHER TCEQ APPLICABLE REGULATION.

1. A WRITTEN NOTICE OF CONSTRUCTION MUST BE SUBMITTED TO THE TCEQ REGIONAL OFFICE AT LEAST 48 HOURS PRIOR TO THE START OF ANY REGULATED ACTIVITIES. THIS NOTICE MUST INCLUDE:
   - 1.1. THE NAME OF THE APPROVED PROJECT;
   - 1.2. THE ACTIVITY START DATE; AND
   - 1.3. THE CONTACT INFORMATION OF THE PRIME CONTRACTOR.
2. ALL CONTRACTORS CONDUCTING REGULATED ACTIVITIES ASSOCIATED WITH THIS PROJECT SHOULD BE PROVIDED WITH COMPLETE COPIES OF THE APPROVED CONTRIBUTING ZONE PLAN (CZP) AND THE TCEQ LETTER INDICATING THE SPECIFIC CONDITIONS OF ITS APPROVAL. DURING THE COURSE OF THESE REGULATED ACTIVITIES, THE CONTRACTOR(S) SHOULD KEEP COPIES OF THE APPROVED PLAN AND APPROVAL LETTER ONSITE.
3. NO HAZARDOUS SUBSTANCE STORAGE TANK SHALL BE INSTALLED WITHIN 150 FEET OF A WATER SUPPLY SOURCE, DISTRIBUTION SYSTEM, WELL, OR SENSITIVE FEATURE.
4. PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITY, ALL TEMPORARY EROSION AND SEDIMENTATION (E&S) CONTROL MEASURES MUST BE PROPERLY INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS. IF INSPECTIONS INDICATE A CONTROL HAS BEEN USED INAPPROPRIATELY, OR INCORRECTLY, THE APPLICANT MUST REPLACE OR MODIFY THE CONTROL FOR SITE SITUATIONS. THESE CONTROLS MUST REMAIN IN PLACE UNTIL THE DISTURBED AREAS HAVE BEEN PERMANENTLY STABILIZED.
5. ANY SEDIMENT THAT ESCAPES THE CONSTRUCTION SITE MUST BE COLLECTED AND PROPERLY DISPOSED OF BEFORE THE NEXT RAIN EVENT TO ENSURE IT IS NOT WASHED INTO SURFACE STREAMS, SENSITIVE FEATURES, ETC.
6. SEDIMENT MUST BE REMOVED FROM THE SEDIMENT TRAPS OR SEDIMENTATION BASINS WHEN IT OCCUPIES 50% OF THE BASIN'S DESIGN CAPACITY.
7. LITTER, CONSTRUCTION DEBRIS, AND CONSTRUCTION CHEMICALS EXPOSED TO STORMWATER SHALL BE PREVENTED FROM BEING DISCHARGED OFFSITE.
8. ALL EXCAVATED MATERIAL THAT WILL BE STORED ON-SITE MUST HAVE PROPER E&S CONTROLS.
9. IF PORTIONS OF THE SITE WILL HAVE A CEASE IN CONSTRUCTION ACTIVITY LASTING LONGER THAN 14 DAYS, SOIL STABILIZATION IN THOSE AREAS SHALL BE INITIATED AS SOON AS POSSIBLE PRIOR TO THE 14TH DAY OF INACTIVITY. IF ACTIVITY WILL RESUME PRIOR TO THE 21ST DAY, STABILIZATION MEASURES ARE NOT REQUIRED. IF DROUGHT CONDITIONS OR INCLEMENT WEATHER PREVENT ACTION BY THE 14TH DAY, STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS POSSIBLE.
10. THE FOLLOWING RECORDS SHOULD BE MAINTAINED AND MADE AVAILABLE TO THE TCEQ UPON REQUEST:
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    - 11.B. ANY CHANGE IN THE NATURE OR CHARACTER OF THE REGULATED ACTIVITY FROM THAT WHICH WAS ORIGINALLY APPROVED;
    - 11.C. ANY CHANGE THAT WOULD SIGNIFICANTLY IMPACT THE ABILITY TO PREVENT POLLUTION OF THE EDWARDS AQUIFER; OR
    - 11.D. ANY DEVELOPMENT OF LAND PREVIOUSLY IDENTIFIED AS UNDEVELOPED IN THE APPROVED CONTRIBUTING ZONE PLAN.

AUSTIN REGIONAL OFFICE	SAN ANTONIO REGIONAL OFFICE
12100 PARK 35 CIRCLE, BUILDING A	14250 JUDSON ROAD
AUSTIN, TEXAS 78753-1808	SAN ANTONIO, TEXAS 78233-4480
PHONE (512) 339-2929	PHONE (210) 490-3096
FAX (512) 339-3795	FAX (210) 545-4329

CITY APPROVAL STAMP

Parkhill

PARKHILL SMITH & COOPER INC. F-560
STATE OF TEXAS
CASEY A. HADSALL
139380
LICENSED PROFESSIONAL ENGINEER
06/11/24

Parkhill.com

LEANDER MUNICIPAL ATHLETIC COMPLEX
At San Gabriel River Park

City of Leander

ADDRESS
2201 N US HWY 183
Leander, Texas 78641

CLIENT
City of Leander
201 N. Brushy St, Leander, TX 78641

PROJECT NO.
11876.22

KEY PLAN

REVISIONS

#	DATE	DESCRIPTION
-	06/11/2024	TCEQ Contributing Zone Plan

SHEET

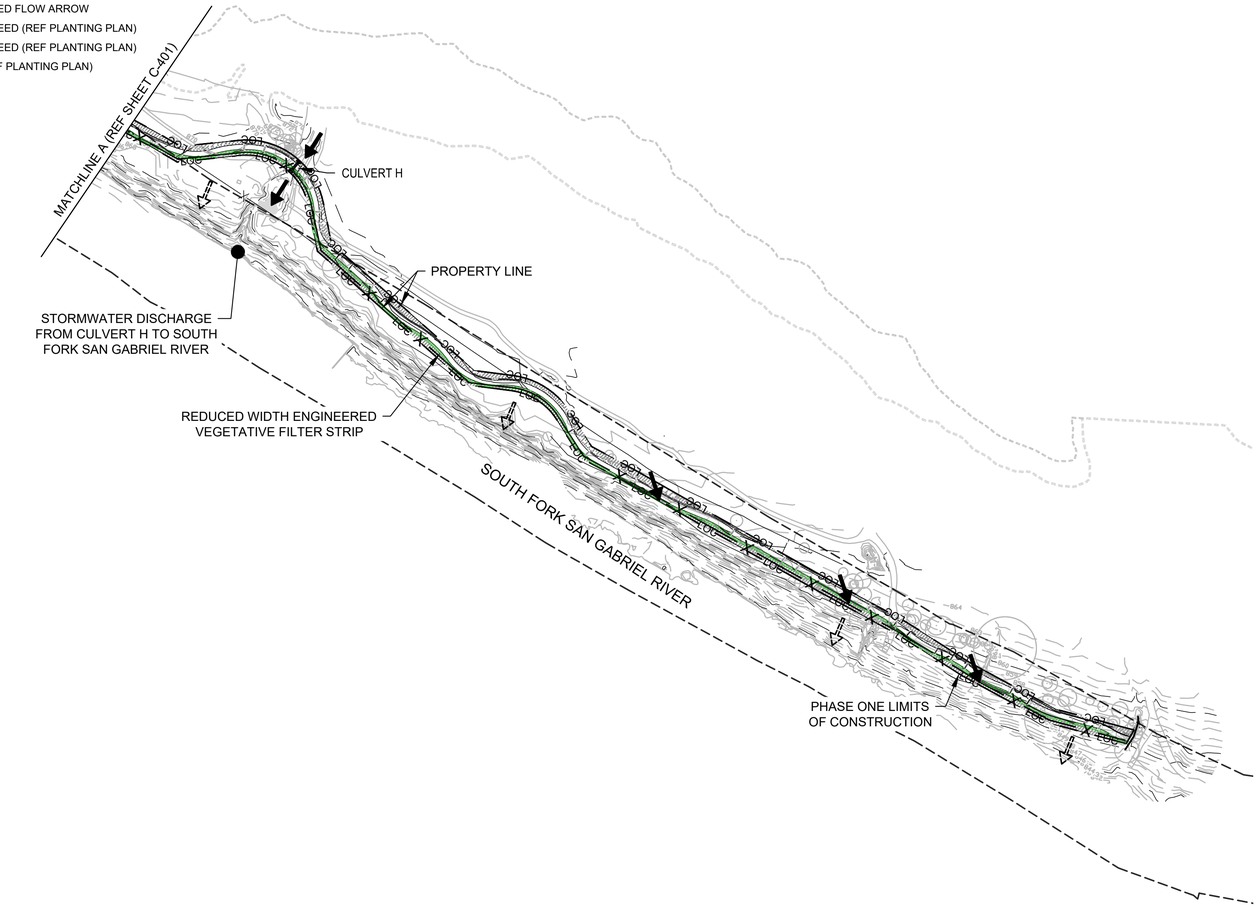
Contributing Zone Site Plan

C-401

A:\2022\11876.2203_DSGN\01_DWG\050_CIVIL\04_EXHIBITS\C-401 CONTRIBUTING ZONE SITE PLAN.DWG, 6/11/2024 4:17:04 PM, chadsall

LEGEND

- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- PROPOSED 1' CONTOUR
- PROPOSED 5' CONTOUR
- PROPOSED STORM DRAIN
- PROPERTY LINE
- 100-YR FEMA FLOODPLAIN (AS MAPPED)
- 500-YR FEMA FLOODLPAIN (AS MAPPED)
- EXISTING 100-YR FEMA FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR FEMA FLOODPLAIN (AS MODELED)
- EXISTING 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- CULTURAL RESOURCE BOUNDARY
- BIORETENTION POND
- ENGINEERED VEGETATIVE FILTER STRIP
- PERMEABLE SYNTHETIC TURF
- SILT FENCE (DET A3/SHT CE501)
- TEMPORARY STAGING & SPOILS AREA
- TEMP. CONSTR. ENTRANCE (DET A2/SHT CE501)
- CONCRETE WASHOUT (DET A1/SHT CE501)
- INLET PROTECTION (DET A5 & A6/SHT CE501)
- EXISTING FLOW ARROW
- PROPOSED FLOW ARROW
- HYDROSEED (REF PLANTING PLAN)
- HYDROSEED (REF PLANTING PLAN)
- SOD (REF PLANTING PLAN)



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
CONTRIBUTING ZONE PLAN
GENERAL CONSTRUCTION NOTES
(REV. JULY 15, 2015)

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N

0 150' 300'

CITY APPROVAL STAMP

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PARKHILL SMITH & COOPER INC. F-560
STATE OF TEXAS
CASEY A. HADSALL
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LICENSED
PROFESSIONAL ENGINEER
06/11/24

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At San Gabriel River Park

City of Leander

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Leander, Texas 78641

CLIENT
City of Leander
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PROJECT NO.
11876.22

KEY PLAN

REVISIONS

#	DATE	DESCRIPTION
-	06/11/2024	TCEQ Contributing Zone Plan

SHEET

Contributing Zone Site Plan

C-402

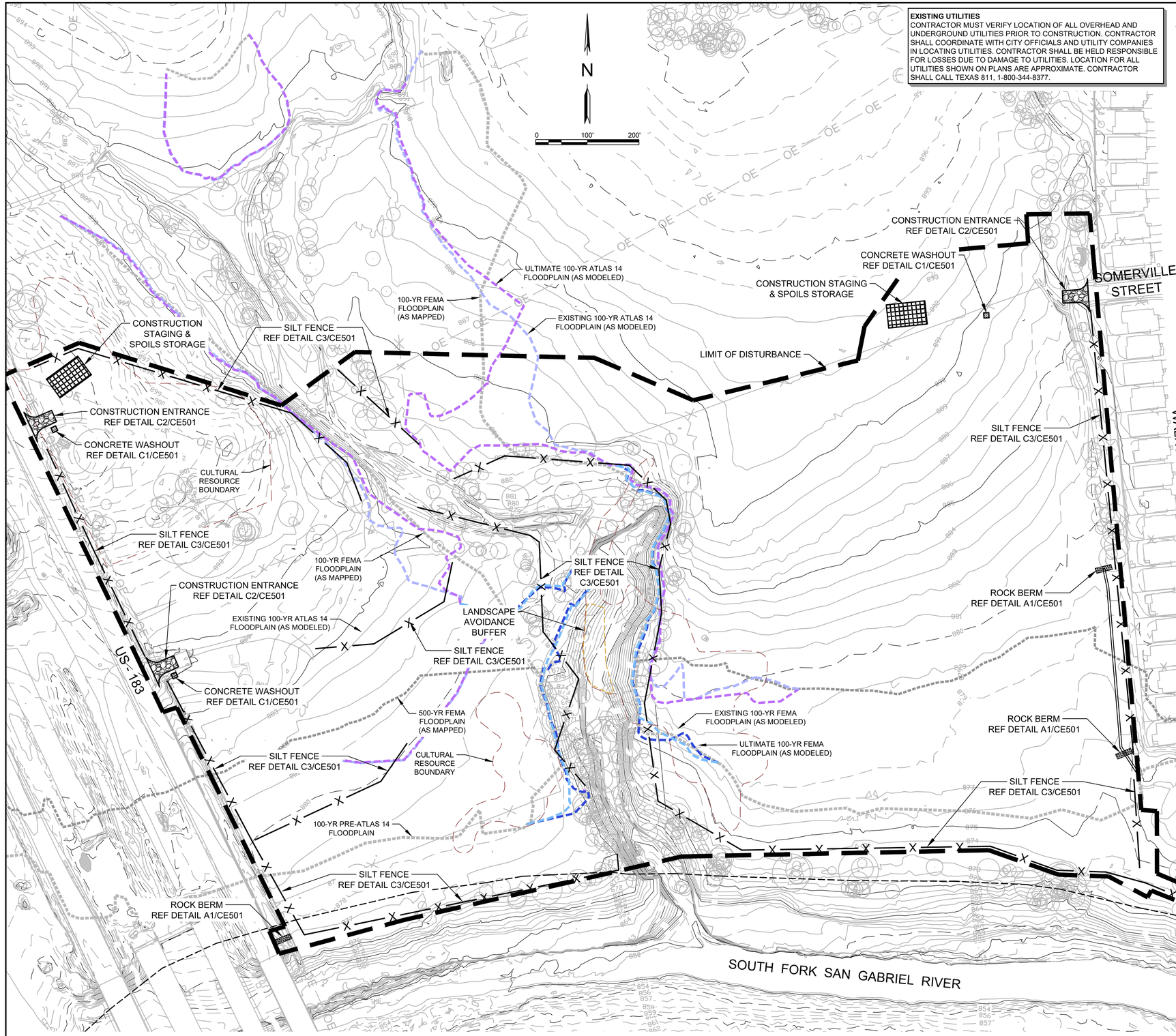
A:\2022\11876.22\03_DSGN\01_DWG\050_CIVIL\04_EXHIBITS\C-401 CONTRIBUTING ZONE SITE PLAN.DWG, 6/11/2024 4:17:04 PM, chadsall

Parkhill

EXHIBIT 2

EROSION CONTROL PLAN & DETAILS

255 N. Center Street, Suite 200, Arlington, Texas 76011 • Phone: (817) 633-0422 • Fax: (817) 649-7645 • www.parkhill.com



EXISTING UTILITIES
CONTRACTOR MUST VERIFY LOCATION OF ALL OVERHEAD AND UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL COORDINATE WITH CITY OFFICIALS AND UTILITY COMPANIES IN LOCATING UTILITIES. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR LOSSES DUE TO DAMAGE TO UTILITIES. LOCATION FOR ALL UTILITIES SHOWN ON PLANS ARE APPROXIMATE. CONTRACTOR SHALL CALL TEXAS 811, 1-800-344-8377.

LEGEND

- INUNDATION BOUNDARY - 100 YR
- 709 EXISTING 1' CONTOUR
- 710 EXISTING 5' CONTOUR
- 709 PROPOSED 1' CONTOUR
- 710 PROPOSED 5' CONTOUR
- PROPOSED LIMITS OF DISTURBANCE
- SILT FENCE (DETAIL A3/SHEET CE501)
- TEMPORARY STAGING & SPOILS AREA
- TEMPORARY CONSTRUCTION ENTRANCE (DETAIL A2/SHEET CE501)
- CONCRETE WASHOUT (DETAIL A1/SHEET CE501)
- INLET PROTECTION (DETAILS A5,A6/SHEET CE501)
- EXISTING 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- EXISTING 100-YR FEMA FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR FEMA FLOODPLAIN (AS MODELED)
- 100-YR FEMA FLOODPLAIN (AS MAPPED)
- 500-YR FEMA FLOODPLAIN (AS MAPPED)
- CULTURAL RESOURCE BOUNDARY

EROSION CONTROL NOTES:

1. THE CONTRACTOR IS REQUIRED TO INSPECT THE CONTROLS AND FENCES AT WEEKLY INTERVALS AND AFTER SIGNIFICANT RAINFALL EVENTS TO ENSURE THAT THEY ARE FUNCTIONING PROPERLY. THE CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE OF CONTROLS AND FENCES AND SHALL IMMEDIATELY MAKE ANY NECESSARY REPAIRS TO DAMAGED AREAS. SILT ACCUMULATION AT CONTROLS MUST BE REMOVED WHEN THE DEPTH REACHES SIX (6) INCHES.
2. THE TEMPORARY SPOILS DISPOSAL SITE IS TO BE SHOWN IN THE EROSION CONTROL MAP.
3. ANY ON-SITE SPOILS DISPOSAL SHALL BE REMOVED PRIOR ACCEPTANCE UNLESS SPECIFICALLY SHOWN ON THE PLANS. THE DEPTH OF SPOIL SHALL NOT EXCEED 10 FEET IN ANY AREA.
4. ALL AREAS DISTURBED OR EXPOSED DURING CONSTRUCTION SHALL BE RESTORED WITH A MINIMUM OF 6 INCHES OF TOPSOIL AND COMPOST BLEND. TOPSOIL ON SINGLE FAMILY LOTS MAY BE INSTALLED WITH HOME CONSTRUCTION. THE TOPSOIL AND COMPOST BLEND SHALL CONSIST OF 75% TOPSOIL AND 25% COMPOST.
5. SEEDING FOR REESTABLISHING VEGETATION SHALL COMPLY WITH THE AUSTIN GROW GREEN GUIDE OR WILLIAMSON COUNTY'S PROTOCOL FOR SUSTAINABLE ROADSIDES (SPEC 164--WC001 SEEDING FOR EROSION CONTROL). RESEEDING VARIETIES OF BERMUDA SHALL NOT BE USED.
6. STABILIZED CONSTRUCTION ENTRANCE IS REQUIRED AT ALL POINTS WHERE CONSTRUCTION TRAFFIC IS EXITING THE PROJECT ONTO EXISTING PAVEMENT. LINEAR CONSTRUCTION PROJECTS MAY REQUIRE SPECIAL CONSIDERATION. ROADWAYS SHALL REMAIN CLEAR OF SILT AND MUD.
7. TEMPORARY STOP SIGNS SHOULD BE INSTALLED AT ALL CONSTRUCTION ENTRANCES WHERE A STOP CONDITION DOES NOT ALREADY EXIST.
8. IN THE EVENT OF INCLEMENT WEATHER THAT MAY RESULT IN A FLOODING SITUATION, THE CONTRACTOR SHALL REMOVE INLET PROTECTION MEASURES UNTIL SUCH TIME AS THE WEATHER EVENT HAS PASSED.
9. THE CITY OF LEANDER INSPECTOR HAS THE AUTHORITY TO ADD OR MODIFY THE EROSION CONTROLS THROUGHOUT THE DURATION OF THE PROJECT.
10. PRIOR TO COMMENCEMENT OF CONSTRUCTION,SWPPP/EROSION CONTROLS MUST BE PLACED ON SITE, INSPECTED, AND APPROVED. CONTACT PATRICK WELLS TO SCHEDULE AN EROSION CONTROL INSPECTION (PWELLS@LEANDERTX.GOV; 5122850055).
11. REFERENCE SPECIFICATION SECTION 01 57 23 FOR TEMPORARY STORM WATER POLLUTION CONTROL SPECIFICATIONS.

TOTAL LIMIT OF PHASE ONE DISTURBED AREA = 48.9 ACRES

A1 PHASE I
EROSION CONTROL PLAN
1" = 100'

CITY APPROVAL STAMP

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Parkhill

PARKHILL SMITH & COOPER INC. F-560
STATE OF TEXAS
CASEY A. HADSALL
139380
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ADDRESS
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PROJECT NO.
11876.22

KEY PLAN

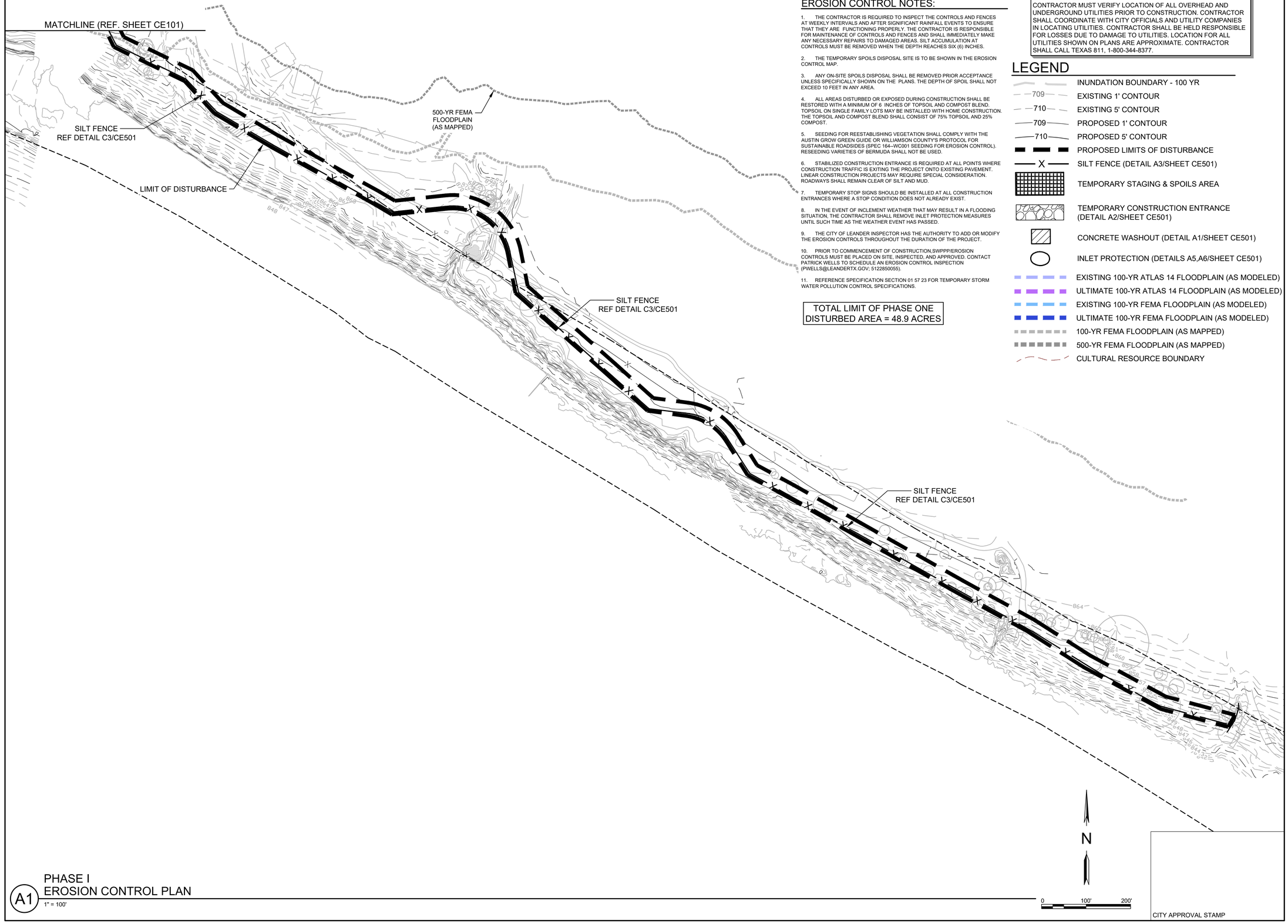
REVISIONS

#	DATE	DESCRIPTION
-	06/11/2024	TCEQ Contributing Zone Plan

SHEET

Erosion Control Plan

CE101



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3. ANY ON-SITE SPOILS DISPOSAL SHALL BE REMOVED PRIOR ACCEPTANCE UNLESS SPECIFICALLY SHOWN ON THE PLANS. THE DEPTH OF SPOIL SHALL NOT EXCEED 10 FEET IN ANY AREA.

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TOTAL LIMIT OF PHASE ONE
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LEGEND

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CLIENT
City of Leander
201 N. Brushy St, Leander, TX 78641

PROJECT NO.
11876.22

KEY PLAN

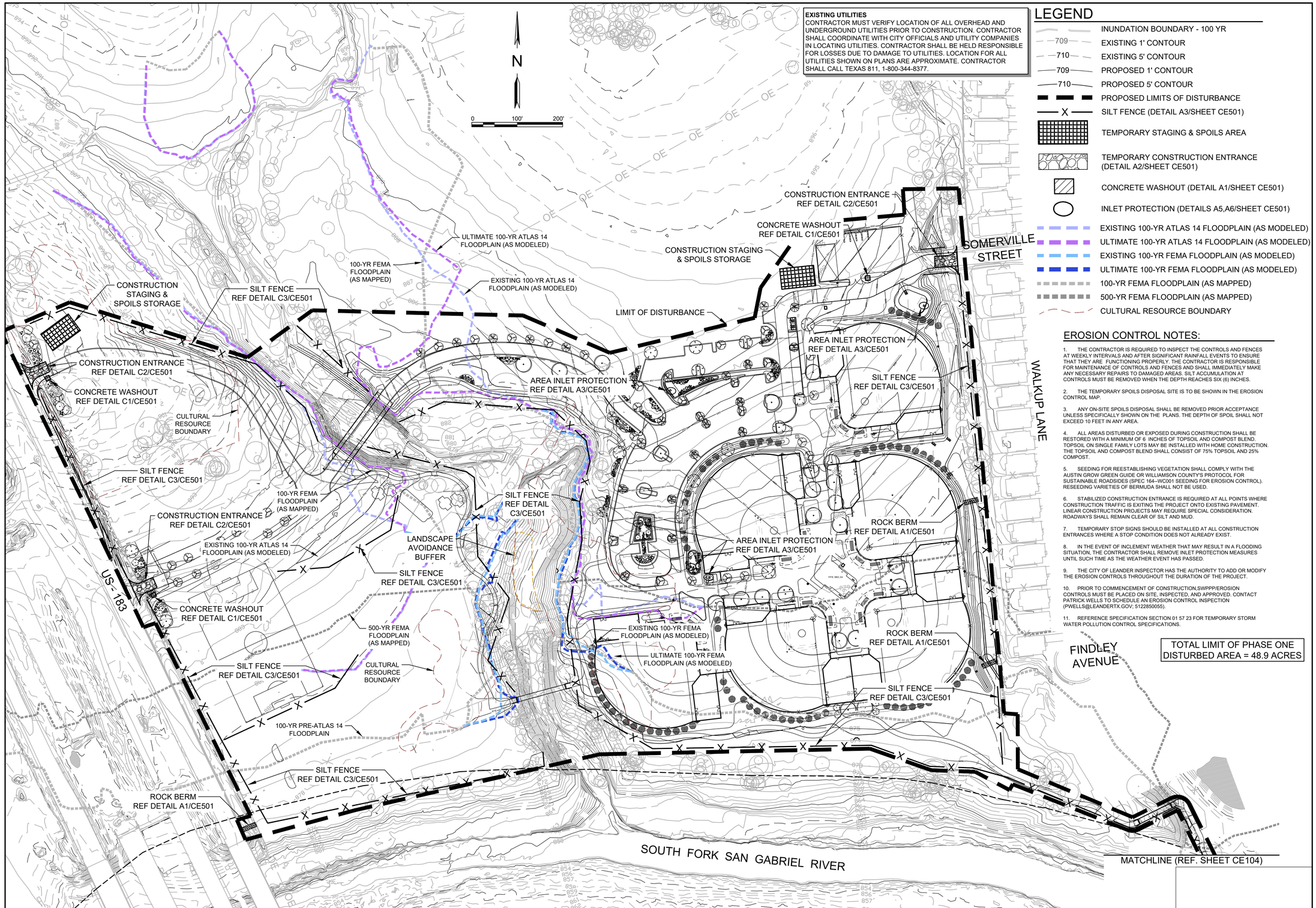
REVISIONS

#	DATE	DESCRIPTION
-	06/11/2024	TCEQ Contributing Zone Plan

SHEET

Erosion Control Plan

CE102



EROSION CONTROL NOTES:

1. THE CONTRACTOR IS REQUIRED TO INSPECT THE CONTROLS AND FENCES AT WEEKLY INTERVALS AND AFTER SIGNIFICANT RAINFALL EVENTS TO ENSURE THAT THEY ARE FUNCTIONING PROPERLY. THE CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE OF CONTROLS AND FENCES AND SHALL IMMEDIATELY MAKE ANY NECESSARY REPAIRS TO DAMAGED AREAS. SILT ACCUMULATION AT CONTROLS MUST BE REMOVED WHEN THE DEPTH REACHES SIX (6) INCHES.

2. THE TEMPORARY SPOILS DISPOSAL SITE IS TO BE SHOWN IN THE EROSION CONTROL MAP.

3. ANY ON-SITE SPOILS DISPOSAL SHALL BE REMOVED PRIOR ACCEPTANCE UNLESS SPECIFICALLY SHOWN ON THE PLANS. THE DEPTH OF SPOIL SHALL NOT EXCEED 10 FEET IN ANY AREA.

4. ALL AREAS DISTURBED OR EXPOSED DURING CONSTRUCTION SHALL BE RESTORED WITH A MINIMUM OF 6 INCHES OF TOPSOIL AND COMPOST BLEND. TOPSOIL ON SINGLE FAMILY LOTS MAY BE INSTALLED WITH HOME CONSTRUCTION. THE TOPSOIL AND COMPOST BLEND SHALL CONSIST OF 75% TOPSOIL AND 25% COMPOST.

5. SEEDING FOR REESTABLISHING VEGETATION SHALL COMPLY WITH THE AUSTIN GROW GREEN GUIDE OR WILLIAMSON COUNTY'S PROTOCOL FOR SUSTAINABLE ROADSIDES (SPEC 164--WC001 SEEDING FOR EROSION CONTROL). RESEEDING VARIETIES OF BERMUDA SHALL NOT BE USED.

6. STABILIZED CONSTRUCTION ENTRANCE IS REQUIRED AT ALL POINTS WHERE CONSTRUCTION TRAFFIC IS EXITING THE PROJECT ONTO EXISTING PAVEMENT. LINEAR CONSTRUCTION PROJECTS MAY REQUIRE SPECIAL CONSIDERATION. ROADWAYS SHALL REMAIN CLEAR OF SILT AND MUD.

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9. THE CITY OF LEANDER INSPECTOR HAS THE AUTHORITY TO ADD OR MODIFY THE EROSION CONTROLS THROUGHOUT THE DURATION OF THE PROJECT.

10. PRIOR TO COMMENCEMENT OF CONSTRUCTION,SWPPP/EROSION CONTROLS MUST BE PLACED ON SITE, INSPECTED, AND APPROVED. CONTACT PATRICK WELLS TO SCHEDULE AN EROSION CONTROL INSPECTION (PWELLS@LEANDERTX.GOV; 5122850055).

11. REFERENCE SPECIFICATION SECTION 01 57 23 FOR TEMPORARY STORM WATER POLLUTION CONTROL SPECIFICATIONS.

TOTAL LIMIT OF PHASE ONE DISTURBED AREA = 48.9 ACRES

A1 PHASE II EROSION CONTROL PLAN
1" = 100'

CITY APPROVAL STAMP

A:\2022\11876.22\03_DSGN\01_DWG\050_CIVIL\03_SHEETS\CE101-CE106-11876.DWG, 5/28/2024 2:41:45 PM, rhusbenet

Parkhill

PARKHILL SMITH & COOPER INC. F-560
STATE OF TEXAS
CASEY A. HADSALL
139380
LICENSED PROFESSIONAL ENGINEER
casey a. hadsall
06/11/24

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LEANDER MUNICIPAL ATHLETIC COMPLEX

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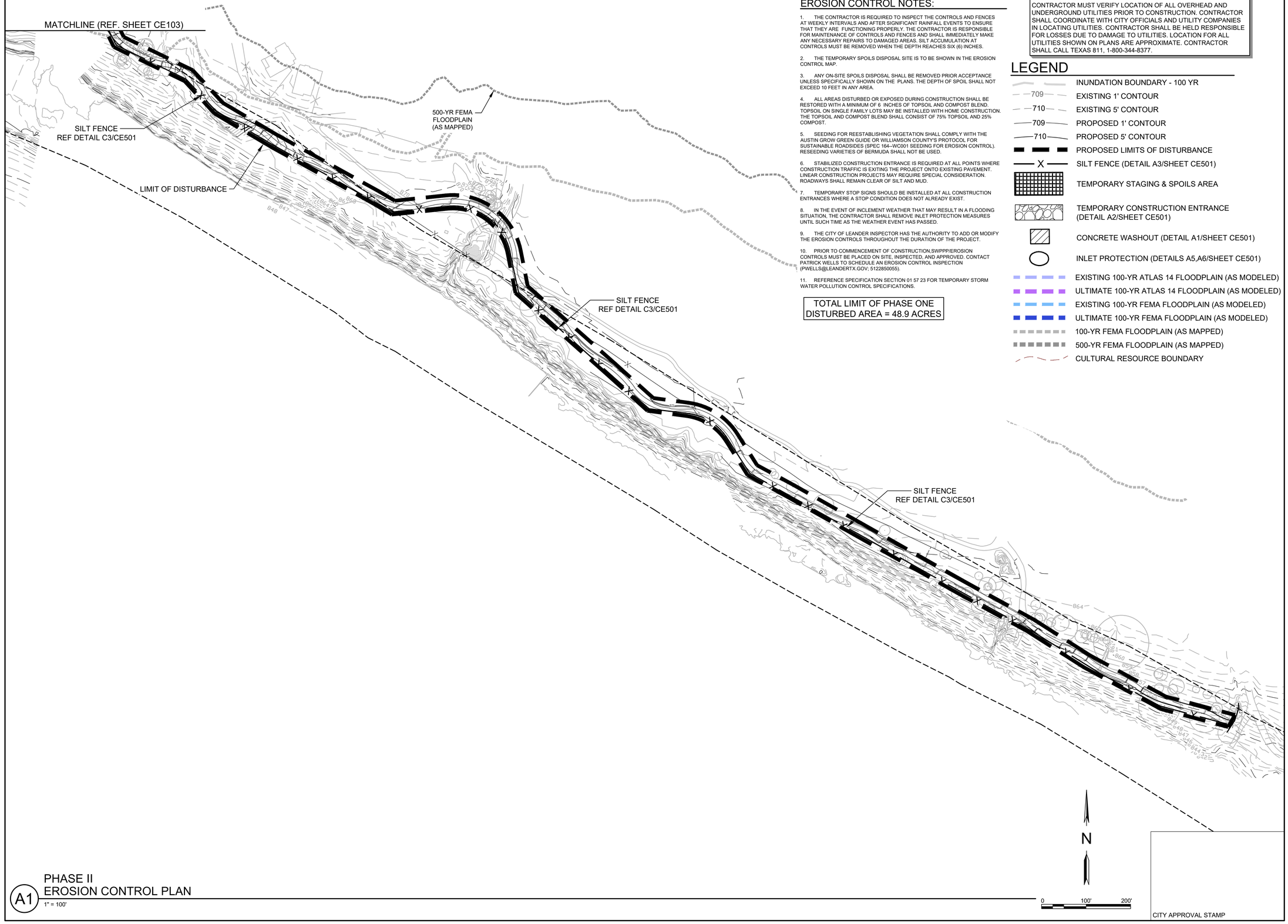
Erosion Control Plan

CE103



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LEGEND

- INUNDATION BOUNDARY - 100 YR
- 709 EXISTING 1' CONTOUR
- 710 EXISTING 5' CONTOUR
- 709 PROPOSED 1' CONTOUR
- 710 PROPOSED 5' CONTOUR
- PROPOSED LIMITS OF DISTURBANCE
- SILT FENCE (DETAIL A3/SHEET CE501)
- TEMPORARY STAGING & SPOILS AREA
- TEMPORARY CONSTRUCTION ENTRANCE (DETAIL A2/SHEET CE501)
- CONCRETE WASHOUT (DETAIL A1/SHEET CE501)
- INLET PROTECTION (DETAILS A5,A6/SHEET CE501)
- EXISTING 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
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- EXISTING 100-YR FEMA FLOODPLAIN (AS MODELED)
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- 100-YR FEMA FLOODPLAIN (AS MAPPED)
- 500-YR FEMA FLOODPLAIN (AS MAPPED)
- CULTURAL RESOURCE BOUNDARY

CITY APPROVAL STAMP

A1 PHASE II
EROSION CONTROL PLAN
1" = 100'

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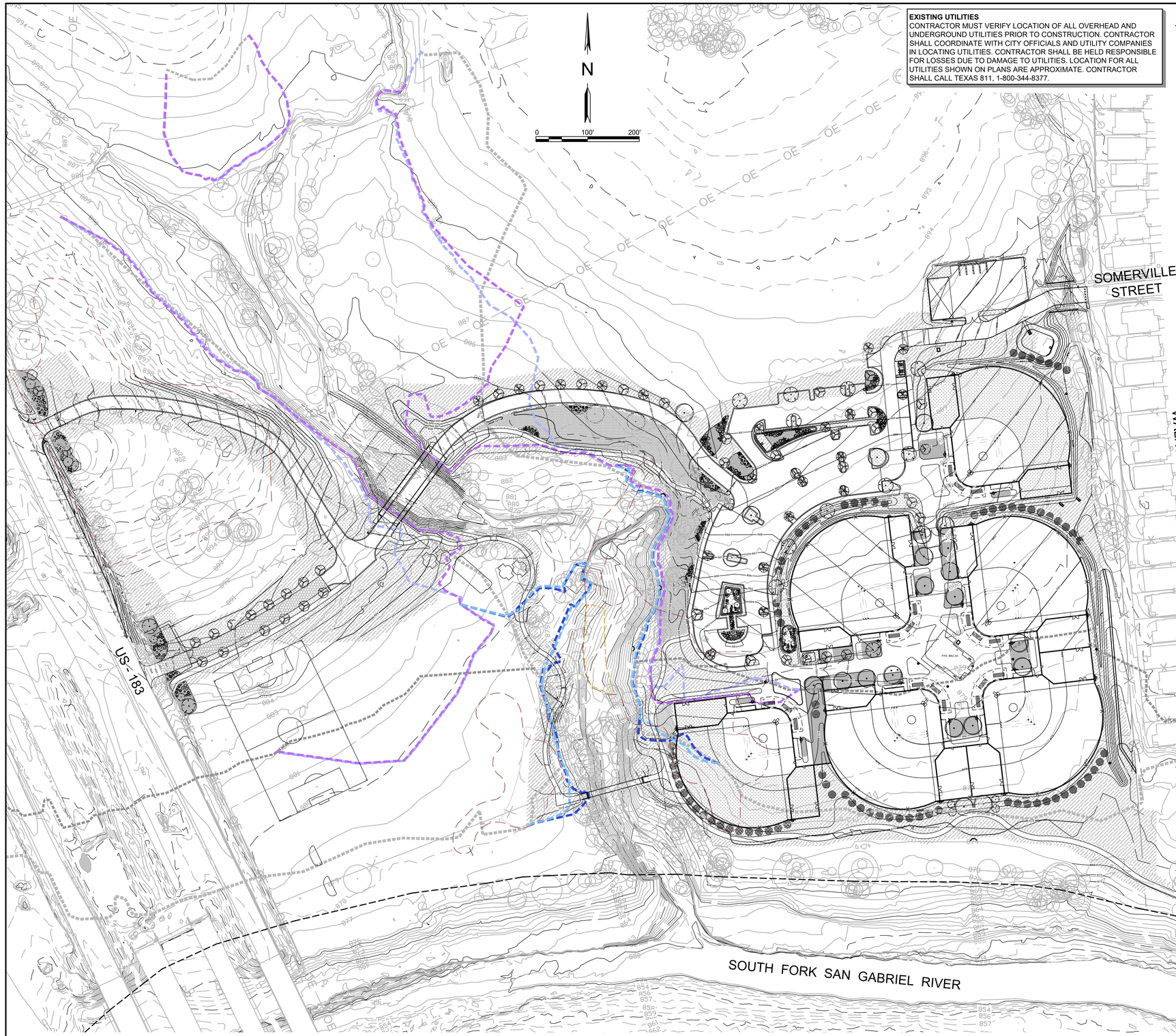
SHEET

Erosion Control Plan

CE104



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A1 PHASE III
EROSION CONTROL PLAN
1" = 100'

CITY APPROVAL STAMP

A:\2022\11876.22\03_DSGN\01_DWG\050_CIVIL\03_SHEETS\CE101-CE106-11876.DWG, 5/28/2024 2:41:45 PM, rhusbenet

Parkhill

PARKHILL SMITH & COOPER, INC. STATE OF TEXAS CASEY A. HADSALL 139380 LICENSED PROFESSIONAL ENGINEER
casey a. hadsall
06/11/24

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LEANDER MUNICIPAL ATHLETIC COMPLEX

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11876.22

KEY PLAN

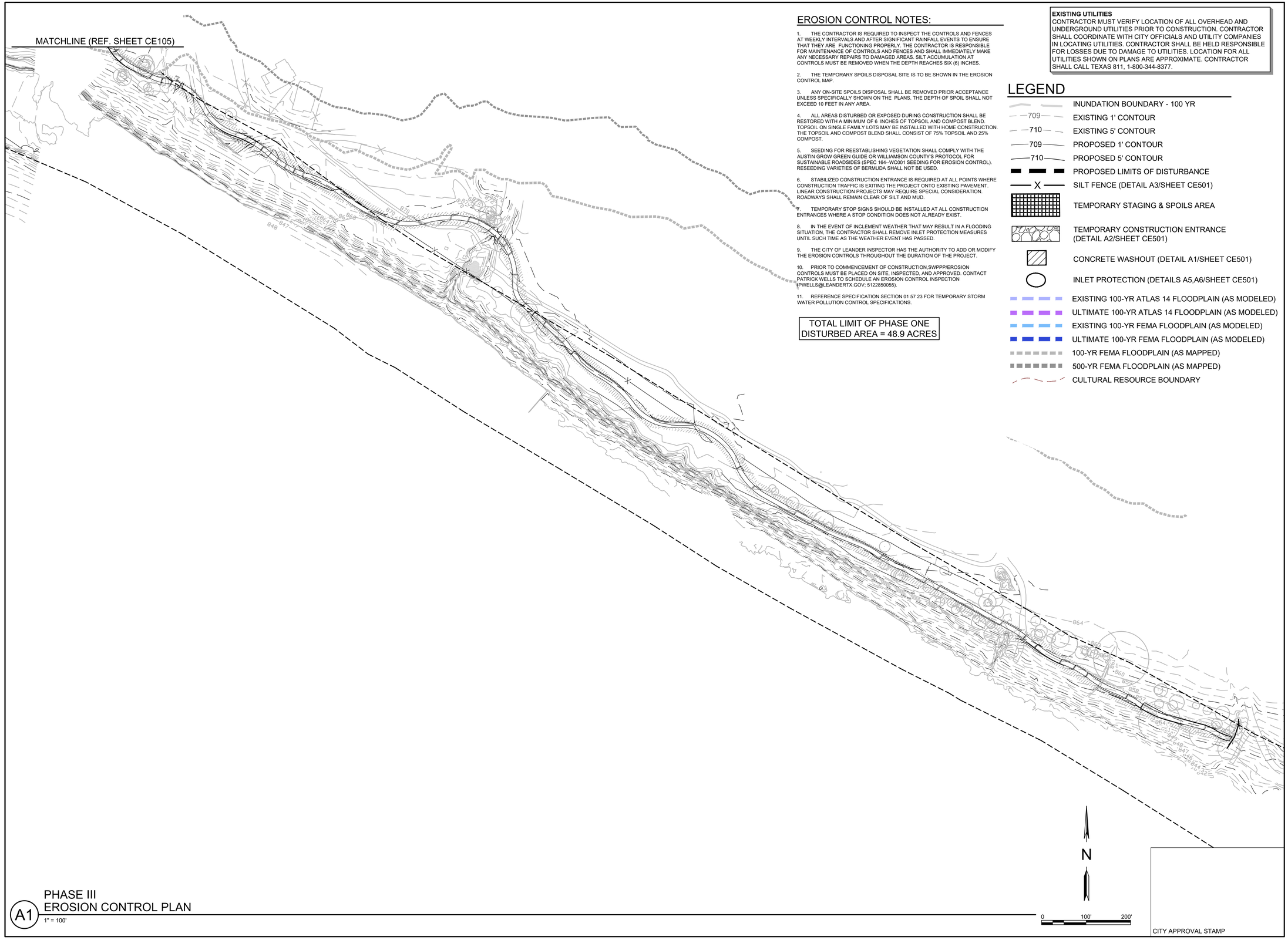
REVISIONS

#	DATE	DESCRIPTION
-	06/11/2024	TCEQ Contributing Zone Plan

SHEET

Erosion Control Plan

CE105



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N

0 100' 200'

CITY APPROVAL STAMP

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EROSION CONTROL PLAN
1" = 100'

A:\2022\11876.22\03_DSGN\01_DWG\050_CIVIL\03_SHEETS\CE101-CE106-11876.DWG, 5/28/2024 2:41:45 PM, rhusbenet

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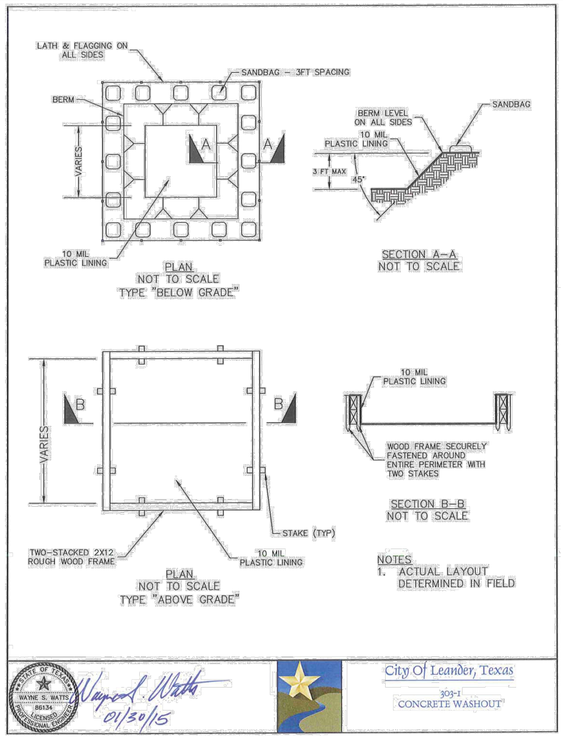
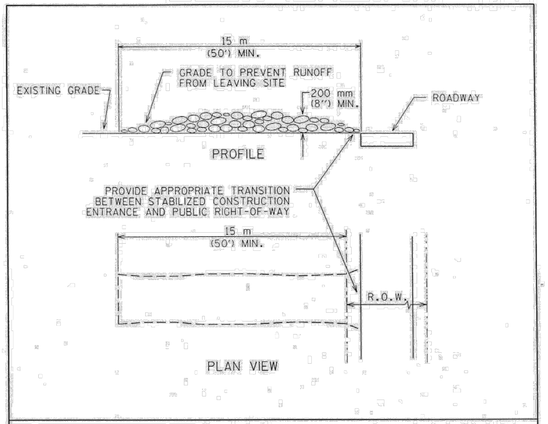
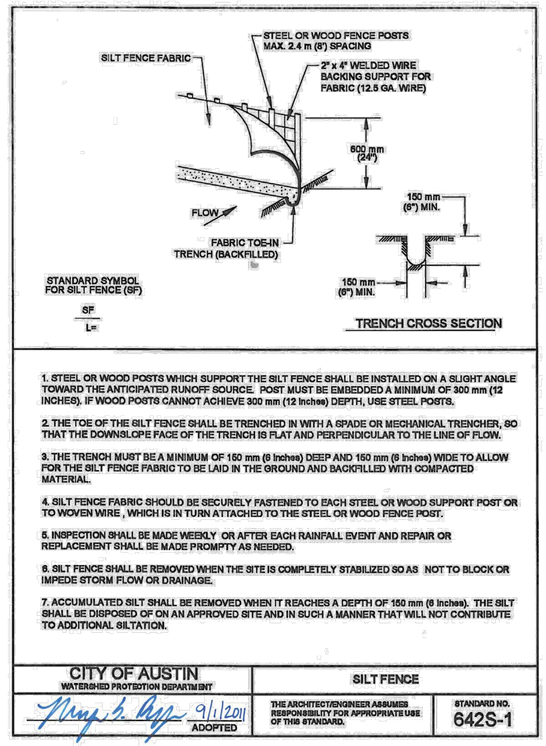
CE106



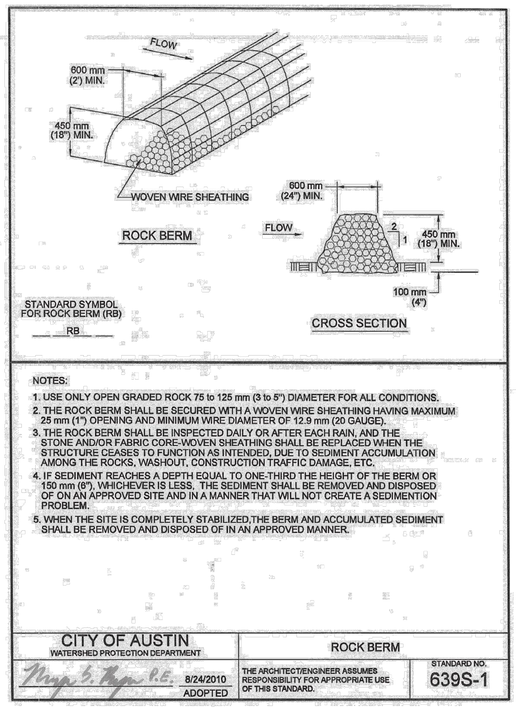
C1 CONCRETE WASHOUT
NOT TO SCALE



C2 STABILIZED CONSTRUCTION ENTRANCE
NOT TO SCALE



C3 SILT FENCE
NOT TO SCALE

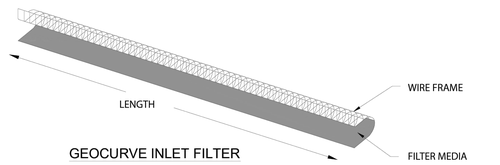


A1 ROCK BERM
NOT TO SCALE

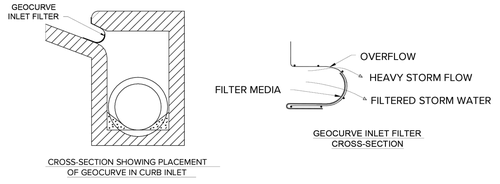
GeoCurve Product Data Sheet

GEOCURVE
STORMWATER CURB INLET FILTER

The GeoCurve Stormwater Curb Inlet Filter prevents sediment and debris from entering the storm sewer system, while complying to stormwater management requirements (SWPPP). The GeoCurve's compression fit technology allows the product to fit snug within the mouth of the inlet, hidden from oncoming traffic and pedestrians.



GEOCURVE INLET FILTER



GeoSolutions, Inc. | 13812 Aston Street, Houston, TX 77040
(713) 714-8243 | www.geocurve.net

A2 GEOCURVE CURB INLET PROTECTION
NOT TO SCALE

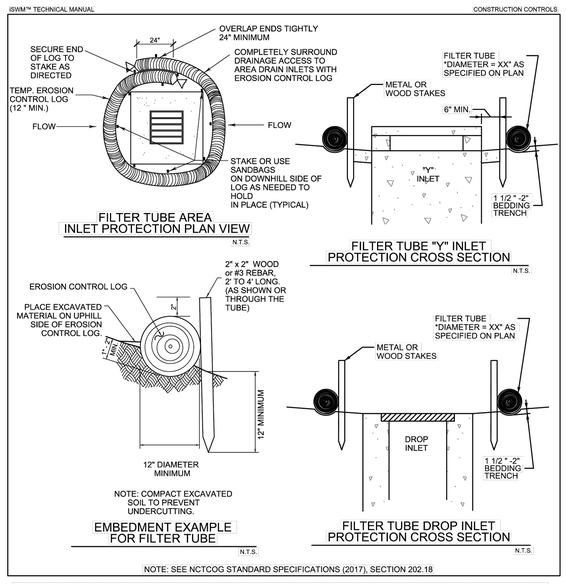


FIGURE 3.13 STANDARD CONSTRUCTION DETAIL - FILTER TUBE AREA INLET PROTECTION

A4 AREA INLET PROTECTION
NOT TO SCALE

CITY APPROVAL STAMP

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PARKHILL SMITH & COOPER, INC. F-560
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SHEET
Erosion Control Details

CE501

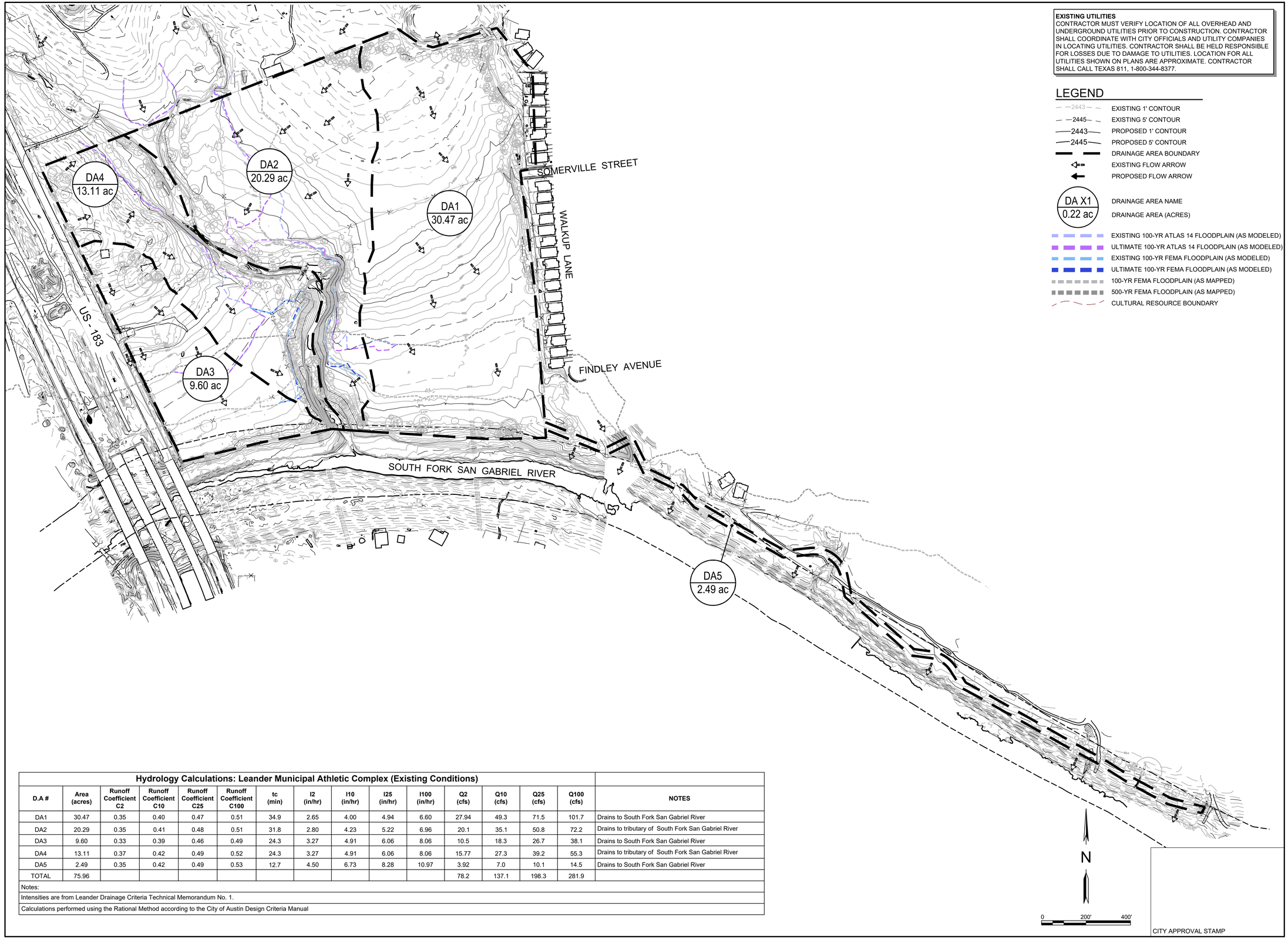
A:\2022\11876.22\03_DSGN\01_DWG\050_CIVIL\03_SHEETS\CE501-11876.DWG, 5/31/2024 11:55:54 AM, rhusbenet

Parkhill

EXHIBIT 3

DRAINAGE AREA MAPS &
OVERALL DRAINAGE LAYOUT

255 N. Center Street, Suite 200, Arlington, Texas 76011 • Phone: (817) 633-0422 • Fax: (817) 649-7645 • www.parkhill.com



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LEGEND

- 2443 — EXISTING 1' CONTOUR
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- DRAINAGE AREA BOUNDARY
- EXISTING FLOW ARROW
- PROPOSED FLOW ARROW
- DA X1 / 0.22 ac — DRAINAGE AREA NAME / DRAINAGE AREA (ACRES)
- EXISTING 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- EXISTING 100-YR FEMA FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR FEMA FLOODPLAIN (AS MODELED)
- 100-YR FEMA FLOODPLAIN (AS MAPPED)
- 500-YR FEMA FLOODPLAIN (AS MAPPED)
- CULTURAL RESOURCE BOUNDARY

Hydrology Calculations: Leander Municipal Athletic Complex (Existing Conditions)

D.A #	Area (acres)	Runoff Coefficient C2	Runoff Coefficient C10	Runoff Coefficient C25	Runoff Coefficient C100	tc (min)	I2 (in/hr)	I10 (in/hr)	I25 (in/hr)	I100 (in/hr)	Q2 (cfs)	Q10 (cfs)	Q25 (cfs)	Q100 (cfs)	NOTES
DA1	30.47	0.35	0.40	0.47	0.51	34.9	2.65	4.00	4.94	6.60	27.94	49.3	71.5	101.7	Drains to South Fork San Gabriel River
DA2	20.29	0.35	0.41	0.48	0.51	31.8	2.80	4.23	5.22	6.96	20.1	35.1	50.8	72.2	Drains to tributary of South Fork San Gabriel River
DA3	9.60	0.33	0.39	0.46	0.49	24.3	3.27	4.91	6.06	8.06	10.5	18.3	26.7	38.1	Drains to South Fork San Gabriel River
DA4	13.11	0.37	0.42	0.49	0.52	24.3	3.27	4.91	6.06	8.06	15.77	27.3	39.2	55.3	Drains to tributary of South Fork San Gabriel River
DA5	2.49	0.35	0.42	0.49	0.53	12.7	4.50	6.73	8.28	10.97	3.92	7.0	10.1	14.5	Drains to South Fork San Gabriel River
TOTAL	75.96										78.2	137.1	198.3	281.9	

Notes:
Intensities are from Leander Drainage Criteria Technical Memorandum No. 1.
Calculations performed using the Rational Method according to the City of Austin Design Criteria Manual

CITY APPROVAL STAMP

Parkhill

PARKHILL SMITH & COOPER, INC. F-560
STATE OF TEXAS
CASEY A. HADSALL
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PROFESSIONAL ENGINEER
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06/11/24

Parkhill.com

LEANDER MUNICIPAL ATHLETIC COMPLEX

At San Gabriel River Park

City of Leander

ADDRESS
2201 N US HWY 183
Leander, Texas 78641

CLIENT
City of Leander
201 N. Brushy St, Leander, TX 78641

PROJECT NO.
11876.22

KEY PLAN

REVISIONS

#	DATE	DESCRIPTION
-	06/11/2024	TCEQ Contributing Zone Plan

SHEET

Pre-Development Drainage Area Map

CH001

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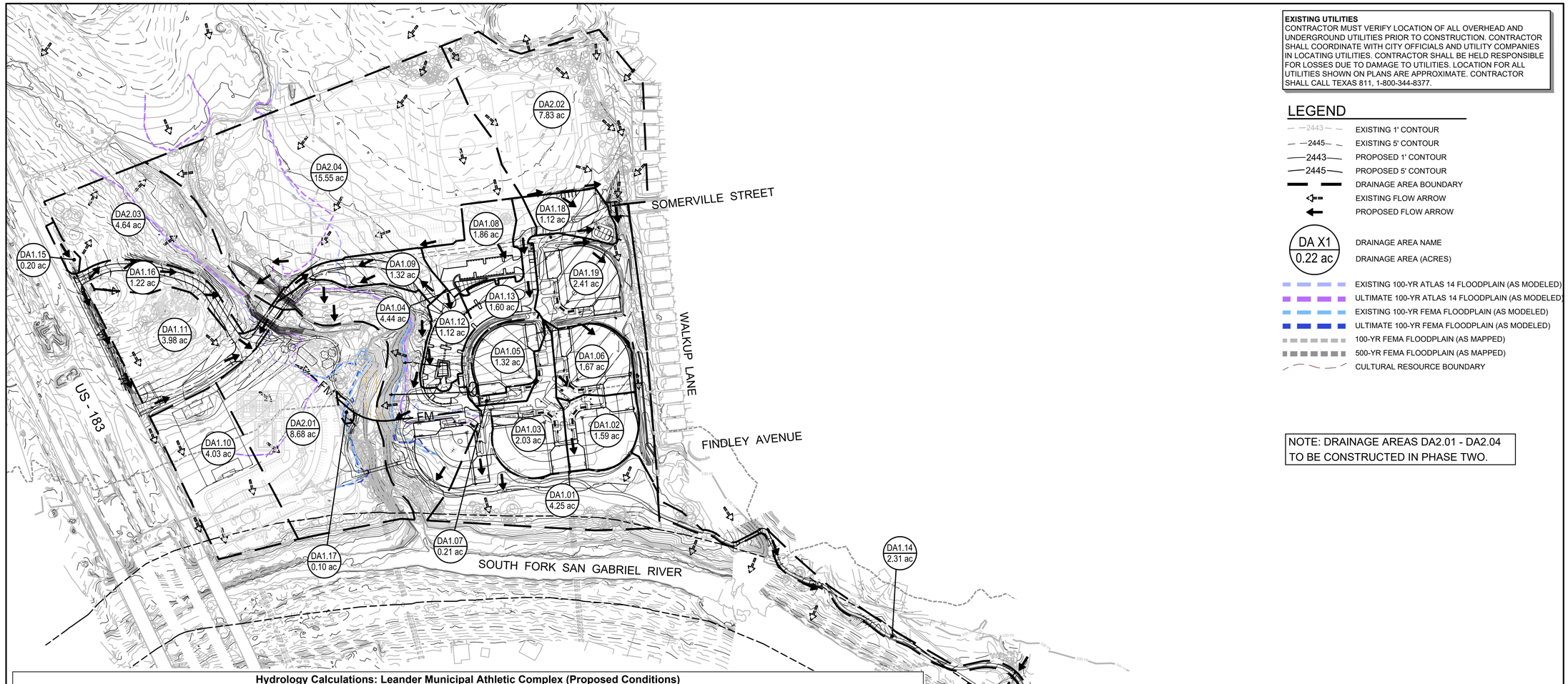

EXISTING UTILITIES
CONTRACTOR MUST VERIFY LOCATION OF ALL OVERHEAD AND UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL COORDINATE WITH CITY OFFICIALS AND UTILITY COMPANIES IN LOCATING UTILITIES. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR LOSSES DUE TO DAMAGE TO UTILITIES. LOCATION FOR ALL UTILITIES SHOWN ON PLANS ARE APPROXIMATE. CONTRACTOR SHALL CALL TEXAS 811, 1-800-344-8377.

LEGEND

- 2443 — EXISTING 1' CONTOUR
- 2445 — EXISTING 5' CONTOUR
- 2443 — PROPOSED 1' CONTOUR
- 2445 — PROPOSED 5' CONTOUR
- DRAINAGE AREA BOUNDARY
- EXISTING FLOW ARROW
- PROPOSED FLOW ARROW
- DA X1 / 0.22 ac — DRAINAGE AREA NAME / DRAINAGE AREA (ACRES)
- EXISTING 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- EXISTING 100-YR FEMA FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR FEMA FLOODPLAIN (AS MODELED)
- 100-YR FEMA FLOODPLAIN (AS MAPPED)
- 500-YR FEMA FLOODPLAIN (AS MAPPED)
- CULTURAL RESOURCE BOUNDARY

NOTE: DRAINAGE AREAS DA2.01 - DA2.04 TO BE CONSTRUCTED IN PHASE TWO.

Hydrology Calculations: Leander Municipal Athletic Complex (Proposed Conditions)

D.A #	Area (acres)	Runoff Coefficient C2	Runoff Coefficient C10	Runoff Coefficient C25	Runoff Coefficient C100	tc (min)	I2 (in/hr)	I10 (in/hr)	I25 (in/hr)	I100 (in/hr)	Q2 (cfs)	Q10 (cfs)	Q25 (cfs)	Q100 (cfs)	NOTES
DA1.01	4.25	0.31	0.37	0.42	0.49	12.4	4.54	6.79	8.36	11.08	6.1	10.8	14.8	22.9	Drains to South Fork San Gabriel River
DA1.02	1.59	0.71	0.79	0.84	0.93	30.0	2.90	4.37	5.40	7.19	3.3	5.5	7.2	10.6	Drains to Main D
DA1.03	2.03	0.75	0.83	0.88	0.97	30.0	2.90	4.37	5.40	7.19	4.4	7.4	9.6	14.2	Drains to Main D
DA1.04	4.44	0.34	0.40	0.46	0.51	7.2	5.54	8.28	10.19	13.51	8.3	14.8	20.6	30.8	Drains to tributary of South Fork San Gabriel River
DA1.05	1.32	0.69	0.77	0.82	0.90	30.0	2.90	4.37	5.40	7.19	2.6	4.4	5.8	8.6	Drains to Main B
DA1.06	1.67	0.71	0.79	0.84	0.93	30.0	2.90	4.37	5.40	7.19	3.4	5.8	7.6	11.1	Drains to Main E, Channel "K"
DA1.07	0.21	0.55	0.62	0.67	0.75	5.1	6.12	9.16	11.26	14.94	0.7	1.2	1.6	2.4	Drains to Main B
DA1.08	1.86	0.53	0.60	0.65	0.73	7.3	5.53	8.26	10.16	13.47	5.5	9.3	12.3	18.3	Drains to Bioretention "A"
DA1.09	1.32	0.44	0.50	0.55	0.62	11.0	4.77	7.13	8.77	11.63	2.7	4.7	6.3	9.5	Drains to Culvert L, then to tributary of South Fork San Gabriel River
DA1.10	4.03	0.50	0.56	0.61	0.69	10.2	4.91	7.35	9.04	11.98	9.8	16.7	22.2	33.2	Drains to South Fork San Gabriel River
DA1.11	3.98	0.62	0.69	0.74	0.82	16.3	4.02	6.02	7.41	9.84	9.8	16.5	21.8	32.1	Drains to South Fork San Gabriel River
DA1.12	1.12	0.49	0.56	0.60	0.68	10.6	4.83	7.23	8.90	11.79	2.7	4.5	6.0	9.0	Drains to Bioretention "S"
DA1.13	1.60	0.47	0.53	0.58	0.65	8.9	5.16	7.72	9.50	12.59	3.8	6.6	8.8	13.2	Drains to Bioretention "R"
DA1.14	2.31	0.50	0.57	0.63	0.69	12.7	4.50	6.73	8.28	10.98	5.1	8.8	12.1	17.5	Drains to South Fork San Gabriel River
DA1.15	0.20	0.29	0.35	0.39	0.46	5.0	6.14	9.19	11.30	15.00	0.4	0.6	0.9	1.4	Drains to Culvert G
DA1.16	1.22	0.44	0.51	0.55	0.63	5.0	6.14	9.19	11.30	15.00	3.3	5.7	7.6	11.5	Drains to vegetative filter strip & tributary of South Fork San Gabriel River
DA1.17	0.10	0.29	0.35	0.39	0.46	5.0	6.14	9.19	11.30	15.00	0.2	0.3	0.4	0.7	Drains to Culvert "J"
DA1.18	1.12	0.39	0.45	0.50	0.57	10.0	4.95	7.40	9.11	12.07	2.2	3.8	5.0	7.7	Drains to Bioretention "L"
DA1.19	2.41	0.36	0.43	0.47	0.54	5.0	6.14	9.19	11.30	15.00	5.4	9.4	12.7	19.5	Drains to Channel "K"
DA2.01	8.68	0.50	0.57	0.62	0.69	10.2	4.91	7.35	9.04	11.98	21.1	36.1	48.7	71.6	Drains to South Fork San Gabriel River
DA2.02	7.83	0.31	0.37	0.41	0.48	25.6	3.18	4.78	5.89	7.84	7.6	13.8	18.9	29.5	Drains to Culvert "K" and Channel "K"
DA2.03	4.64	0.31	0.37	0.41	0.48	10.7	4.81	7.20	8.86	11.74	6.8	12.2	16.8	26.0	Drains to tributary of South Fork San Gabriel River
DA2.04	15.55	0.41	0.48	0.52	0.60	29.0	2.96	4.46	5.50	7.33	18.8	33.1	44.7	68.5	Drains to tributary of South Fork San Gabriel River
TOTAL	73.48										134.2	232.1	312.3	469.7	

Notes:
Intensities are from Leander Drainage Criteria Technical Memorandum No. 1.

CITY APPROVAL STAMP

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PROJECT NO.
11876.22

KEY PLAN

REVISIONS

#	DATE	DESCRIPTION
-	06/11/2024	TCEQ Contributing Zone Plan

SHEET

Post-Development Drainage Area Map

CH002

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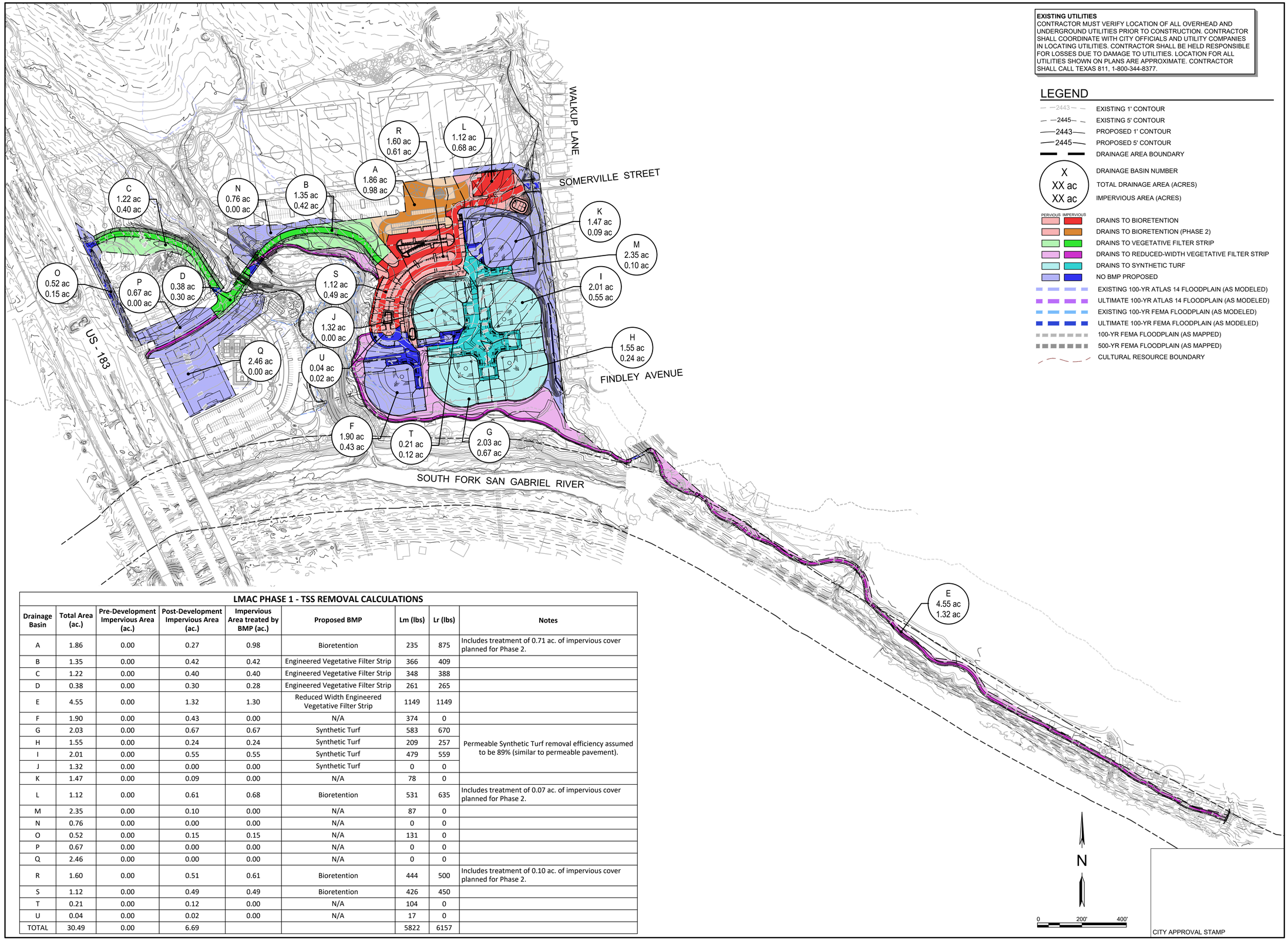

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LEGEND

- EXISTING 1' CONTOUR (2443)
- EXISTING 5' CONTOUR (2445)
- PROPOSED 1' CONTOUR (2443)
- PROPOSED 5' CONTOUR (2445)
- DRAINAGE AREA BOUNDARY
- DRAINAGE BASIN NUMBER (X)
- TOTAL DRAINAGE AREA (ACRES) (XX ac)
- IMPERVIOUS AREA (ACRES) (XX ac)

PERVIOUS	IMPERVIOUS	
		DRAINS TO BIORETENTION
		DRAINS TO BIORETENTION (PHASE 2)
		DRAINS TO VEGETATIVE FILTER STRIP
		DRAINS TO REDUCED-WIDTH VEGETATIVE FILTER STRIP
		DRAINS TO SYNTHETIC TURF
		NO BMP PROPOSED

- EXISTING 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- EXISTING 100-YR FEMA FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR FEMA FLOODPLAIN (AS MODELED)
- 100-YR FEMA FLOODPLAIN (AS MAPPED)
- 500-YR FEMA FLOODPLAIN (AS MAPPED)
- CULTURAL RESOURCE BOUNDARY

LMAC PHASE 1 - TSS REMOVAL CALCULATIONS

Drainage Basin	Total Area (ac.)	Pre-Development Impervious Area (ac.)	Post-Development Impervious Area (ac.)	Impervious Area treated by BMP (ac.)	Proposed BMP	Lm (lbs)	Lr (lbs)	Notes
A	1.86	0.00	0.27	0.98	Bioretention	235	875	Includes treatment of 0.71 ac. of impervious cover planned for Phase 2.
B	1.35	0.00	0.42	0.42	Engineered Vegetative Filter Strip	366	409	
C	1.22	0.00	0.40	0.40	Engineered Vegetative Filter Strip	348	388	
D	0.38	0.00	0.30	0.28	Engineered Vegetative Filter Strip	261	265	
E	4.55	0.00	1.32	1.30	Reduced Width Engineered Vegetative Filter Strip	1149	1149	
F	1.90	0.00	0.43	0.00	N/A	374	0	
G	2.03	0.00	0.67	0.67	Synthetic Turf	583	670	Permeable Synthetic Turf removal efficiency assumed to be 89% (similar to permeable pavement).
H	1.55	0.00	0.24	0.24	Synthetic Turf	209	257	
I	2.01	0.00	0.55	0.55	Synthetic Turf	479	559	
J	1.32	0.00	0.00	0.00	Synthetic Turf	0	0	
K	1.47	0.00	0.09	0.00	N/A	78	0	
L	1.12	0.00	0.61	0.68	Bioretention	531	635	Includes treatment of 0.07 ac. of impervious cover planned for Phase 2.
M	2.35	0.00	0.10	0.00	N/A	87	0	
N	0.76	0.00	0.00	0.00	N/A	0	0	
O	0.52	0.00	0.15	0.15	N/A	131	0	
P	0.67	0.00	0.00	0.00	N/A	0	0	
Q	2.46	0.00	0.00	0.00	N/A	0	0	
R	1.60	0.00	0.51	0.61	Bioretention	444	500	Includes treatment of 0.10 ac. of impervious cover planned for Phase 2.
S	1.12	0.00	0.49	0.49	Bioretention	426	450	
T	0.21	0.00	0.12	0.00	N/A	104	0	
U	0.04	0.00	0.02	0.00	N/A	17	0	
TOTAL	30.49	0.00	6.69			5822	6157	

CITY APPROVAL STAMP

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KEY PLAN

REVISIONS

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-	06/11/2024	TCEQ Contributing Zone Plan

SHEET

BMP Drainage Area Map

CH003

EXISTING UTILITIES
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LEGEND

- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- PROPOSED 1' CONTOUR
- PROPOSED 5' CONTOUR
- PROPOSED STORM DRAIN
- PROPERTY LINE
- EXISTING 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR ATLAS 14 FLOODPLAIN (AS MODELED)
- EXISTING 100-YR FEMA FLOODPLAIN (AS MODELED)
- ULTIMATE 100-YR FEMA FLOODPLAIN (AS MODELED)
- 100-YR FEMA FLOODPLAIN (AS MAPPED)
- 500-YR FEMA FLOODPLAIN (AS MAPPED)
- CULTURAL RESOURCE BOUNDARY

100-YR EXISTING ATLAS 14 FLOODPLAIN

100-YR FEMA FLOODPLAIN

PROPOSED BIORETENTION POND

MAIN A

STA 0+32 ~ MAIN A
INSTALL:
1 ~ 18"- 45° BEND
℄ 18" = 879.40
N: 10200764.38
E: 3075456.32

189 LF ~ 18" HDPE STORM DRAIN ON 1.80%

STA 2+21 ~ MAIN A
INSTALL:
1 ~ 3' x 3' GRATE INLET
(REF DETAIL C1 / CH502)
CONNECT TO UNDERDRAIN
TOP INLET ELEV = 889.50
℄ 6" = 882.96
℄ 18" = 882.80
N: 10200832.83; E: 3075633.37

32 LF ~ 18" HDPE STORM DRAIN ON 1.80%

STA 0+00 ~ MAIN A
INSTALL:
1 ~ 18" HEADWALL
(REF DETAIL A1 / CH501)
1~ HDPE HEADWALL CONNECTION
(REF DETAIL C4 / CH501)
10 LF ~ ROCK RIPRAP
TOP HEADWALL = 881.32
℄ 18" = 878.82
N: 10200735.58; E: 3075443.29

STA 0+21 ~ MAIN C
INSTALL:
1 ~ 18"- 11.25° BEND
℄ 18" = 876.92
N: 10200555.27
E: 3075458.64

21 LF ~ 18" HDPE STORM DRAIN ON 1.98%

MAIN C

STA 0+00 ~ MAIN C
INSTALL:
1 ~ 18" HEADWALL
(REF DETAIL A1 / CH501)
1 ~ HDPE HEADWALL CONNECTION
(REF DETAIL C4 / CH501)
10 LF ~ ROCK RIPRAP
TOP HEADWALL = 879.00
℄ 18" = 876.50
N: 10200554.00; E: 3075438.17

106 LF ~ 18" HDPE STORM DRAIN ON 1.98%

STA 1+27 ~ MAIN C
INSTALL:
1 ~ 3' x 3' GRATE INLET
(REF DETAIL C1 / CH502)
TOP ELEV = 882.50
℄ 18" = 879.00
N: 10200540.34; E: 3075563.91

STA 0+97 ~ LAT B2
INSTALL:
1 ~ 12" x 6" REDUCER
CONNECT TO FIELD UNDERDRAIN
℄ 6" = 876.50
℄ 12" = 876.00
N: 10200502.75; E: 3075573.60

LAT B2

70 LF ~ 12" HDPE STORM DRAIN ON 1.20%

291 LF ~ 24" HDPE STORM DRAIN ON 0.69%

LAT B1

STA 0+41 ~ LAT B1
INSTALL:
1 ~ 12" x 8" REDUCER
CONNECT TO FIELD UNDERDRAIN
℄ 8" = 877.33
℄ 12" = 877.00
N: 10200476.21; E: 3075702.81

41 LF ~ 12" HDPE STORM DRAIN ON 2.07%

PROPOSED 8" WATER LINE

MAIN B

STA 2+91 ~ MAIN B
INSTALL:
1 ~ 3' x 3' GRATE INLET
(REF DETAIL C1 / CH502)
CONNECT TO UNDERDRAIN
TOP INLET ELEV = 881.50
℄ 12" = 876.00
℄ 12" = 876.00
℄ 6" = 875.68
℄ 24" = 875.00
N: 10200444.45; E: 3075678.25

STA 1+54 ~ MAIN B
INSTALL:
1 ~ 24" x 6" - 45° WYE
℄ 6" = 874.80
℄ 24" = 874.05
N: 10200440.84
E: 3075540.23

STA 3+42 ~ MAIN B
INSTALL:
1 ~ 3' x 3' GRATE INLET
(REF DETAIL C1 / CH502)
TOP ELEV = 879.50
℄ 12" = 876.50
N: 10200420.95; E: 3075719.22

11 LF ~ 12" HDPE STORM DRAIN ON 0.98%

STA 0+00 ~ MAIN B
INSTALL:
1 ~ 24" HEADWALL
(REF DETAIL A1 / CH501)
1 ~ HDPE HEADWALL CONNECTION
(REF DETAIL C4 / CH501)
10 LF ~ ROCK RIPRAP
TOP HEADWALL = 875.99
℄ 18" = 872.99
N: 10200436.50; E: 3075385.85

40 LF ~ 12" HDPE STORM DRAIN ON 0.98%

STA 3+31 ~ MAIN B
INSTALL:
1 ~ 12" - 45° BEND
℄ 12" = 876.39
N: 10200419.73
E: 3075708.83

CULTURAL RESOURCE BOUNDARY

100-YR PRE-ATLAS 14 FLOODPLAIN

LAT D1

STA 0+81 ~ MAIN D
INSTALL:
1 ~ 18" x 8" REDUCER
CONNECT TO FIELD UNDERDRAIN
℄ 8" = 874.68
℄ 24" = 873.85
N: 10200149.45; E: 3076034.92

STA 0+69 ~ MAIN D
= STA 0+00 ~ LAT D1
INSTALL:
1 ~ 18" x 18" - 45° WYE
℄ 18" = 873.64
N: 10200136.85; E: 3076036.11

81 LF ~ 18" HDPE STORM DRAIN ON 1.70%

STA 0+00 ~ MAIN D
INSTALL:
1 ~ 18" HEADWALL
(REF DETAIL A1 / CH502)
HDPE HEADWALL CONNECTION
(REF DETAIL C4 / CH501)
10 LF ~ ROCK RIPRAP
TOP HEADWALL = 874.00
℄ 18" = 872.46
N: 10200069.58; E: 3076042.45

MAIN D

GRADE TO DRAIN @ 0.50% MINIMUM

STA 0+17 ~ LAT D1
INSTALL:
1 ~ 18" x 8" REDUCER
CONNECT TO FIELD UNDERDRAIN
℄ 8" = 874.54
℄ 18" = 873.71
N: 10200150.75; E: 3076045.85

2 LF ~ 18" HDPE STORM DRAIN ON 0.40%

STA 0+15 ~ LAT D1
INSTALL:
1 ~ 18" - 45° BEND
℄ 18" = 873.70
N: 10200148.67; E: 3076046.04

15 LF ~ 18" HDPE STORM DRAIN ON 0.40%

MAIN E

STA 0+30 ~ MAIN E
INSTALL:
1 ~ 18" x 8" REDUCER
CONNECT TO FIELD UNDERDRAIN
℄ 8" = 877.48
℄ 18" = 876.65
N: 10200515.32; E: 3076261.45

PROPOSED RESTROOM & CONCESSION BUILDING

FFE 882.34

PROPOSED 8" SANITARY SEWER

500-YR FEMA FLOODPLAIN

STA 0+19 ~ MAIN E
SANITARY SEWER CROSSING
℄ 8" SS = 874.42
℄ 18" SD = 876.59
N: 10200510.91; E: 3076271.62

30 LF ~ 18" ADS STORM DRAIN ON 0.50%

STA 0+00 ~ MAIN E
INSTALL:
1 ~ 18" HEADWALL
TOP HDWL = 879.00
℄ 18" = 876.50
N: 10200503.30; E: 3076289.16

500-YR FEMA FLOODPLAIN

N

0 40' 80'

CITY APPROVAL STAMP

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KEY PLAN

REVISIONS

#	DATE	DESCRIPTION
-	06/11/2024	TCEQ Contributing Zone Plan

SHEET

Storm Sewer Site Plan

CH101

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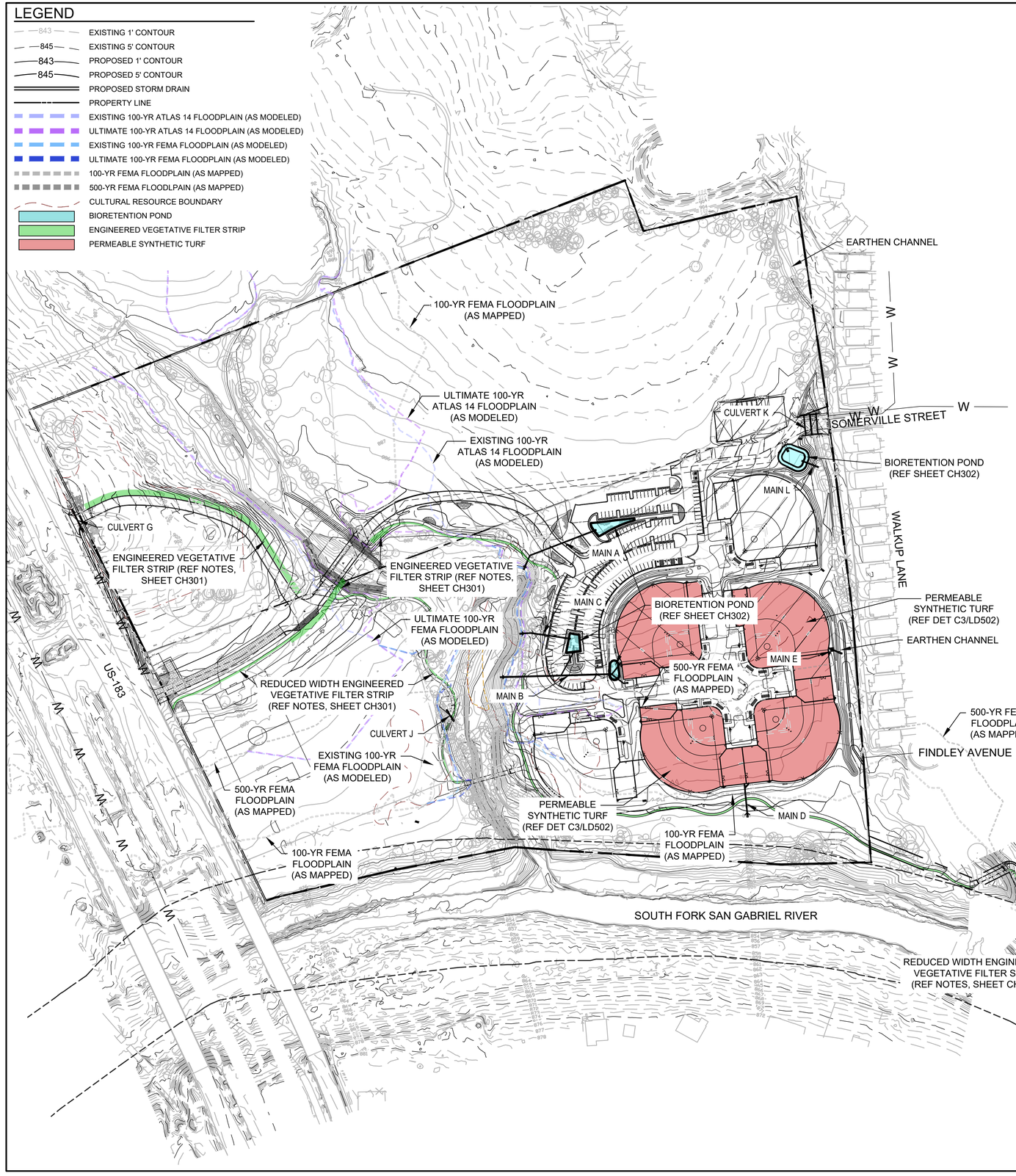
Parkhill

EXHIBIT 4

PERMANENT BMP CONSTRUCTION PLANS

255 N. Center Street, Suite 200, Arlington, Texas 76011 • Phone: (817) 633-0422 • Fax: (817) 649-7645 • www.parkhill.com



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
CONTRIBUTING ZONE PLAN
GENERAL CONSTRUCTION NOTES
(REV. JULY 15, 2015)

EDWARDS AQUIFER PROTECTION PROGRAM CONSTRUCTION NOTES – LEGAL DISCLAIMER

THE FOLLOWING/LISTED "CONSTRUCTION NOTES" ARE INTENDED TO BE ADVISORY IN NATURE ONLY AND DO NOT CONSTITUTE AN APPROVAL OR CONDITIONAL APPROVAL BY THE EXECUTIVE DIRECTOR (ED), NOR DO THEY CONSTITUTE A COMPREHENSIVE LISTING OF RULES OR CONDITIONS TO BE FOLLOWED DURING CONSTRUCTION. FURTHER ACTIONS MAY BE REQUIRED TO ACHIEVE COMPLIANCE WITH TCEQ REGULATIONS FOUND IN TITLE 30, TEXAS ADMINISTRATIVE CODE (TAC), CHAPTERS 213 AND 217, AS WELL AS LOCAL ORDINANCES AND REGULATIONS PROVIDING FOR THE PROTECTION OF WATER QUALITY. ADDITIONALLY, NOTHING CONTAINED IN THE FOLLOWING/LISTED "CONSTRUCTION NOTES" RESTRICTS THE POWERS OF THE ED, THE COMMISSION OR ANY OTHER GOVERNMENTAL ENTITY TO PREVENT, CORRECT, OR CURTAIL ACTIVITIES THAT RESULT OR MAY RESULT IN POLLUTION OF THE EDWARDS AQUIFER OR HYDROLOGICALLY CONNECTED SURFACE WATERS. THE HOLDER OF ANY EDWARDS AQUIFER PROTECTION PLAN CONTAINING "CONSTRUCTION NOTES" IS STILL RESPONSIBLE FOR COMPLIANCE WITH TITLE 30, TAC, CHAPTERS 213 OR ANY OTHER APPLICABLE TCEQ REGULATION, AS WELL AS ALL CONDITIONS OF AN EDWARDS AQUIFER PROTECTION PLAN THROUGH ALL PHASES OF PLAN IMPLEMENTATION. FAILURE TO COMPLY WITH ANY CONDITION OF THE ED'S APPROVAL, WHETHER OR NOT IN CONTRADICTION OF ANY "CONSTRUCTION NOTES," IS A VIOLATION OF TCEQ REGULATIONS AND ANY VIOLATION IS SUBJECT TO ADMINISTRATIVE RULES, ORDERS, AND PENALTIES AS PROVIDED UNDER TITLE 30, TAC § 213.10 (RELATING TO ENFORCEMENT). SUCH VIOLATIONS MAY ALSO BE SUBJECT TO CIVIL PENALTIES AND INJUNCTION. THE FOLLOWING/LISTED "CONSTRUCTION NOTES" IN NO WAY REPRESENT AN APPROVED EXCEPTION BY THE ED TO ANY PART OF TITLE 30 TAC, CHAPTERS 213 AND 217, OR ANY OTHER TCEQ APPLICABLE REGULATION.

1. A WRITTEN NOTICE OF CONSTRUCTION MUST BE SUBMITTED TO THE TCEQ REGIONAL OFFICE AT LEAST 48 HOURS PRIOR TO THE START OF ANY REGULATED ACTIVITIES. THIS NOTICE MUST INCLUDE:
   - 1.1. THE NAME OF THE APPROVED PROJECT;
   - 1.2. THE ACTIVITY START DATE; AND
   - 1.3. THE CONTACT INFORMATION OF THE PRIME CONTRACTOR.
2. ALL CONTRACTORS CONDUCTING REGULATED ACTIVITIES ASSOCIATED WITH THIS PROJECT SHOULD BE PROVIDED WITH COMPLETE COPIES OF THE APPROVED CONTRIBUTING ZONE PLAN (CZP) AND THE TCEQ LETTER INDICATING THE SPECIFIC CONDITIONS OF ITS APPROVAL. DURING THE COURSE OF THESE REGULATED ACTIVITIES, THE CONTRACTOR(S) SHOULD KEEP COPIES OF THE APPROVED PLAN AND APPROVAL LETTER ONSITE.
3. NO HAZARDOUS SUBSTANCE STORAGE TANK SHALL BE INSTALLED WITHIN 150 FEET OF A WATER SUPPLY SOURCE, DISTRIBUTION SYSTEM, WELL, OR SENSITIVE FEATURE.
4. PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITY, ALL TEMPORARY EROSION AND SEDIMENTATION (E&S) CONTROL MEASURES MUST BE PROPERLY INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS. IF INSPECTIONS INDICATE A CONTROL HAS BEEN USED INAPPROPRIATELY, OR INCORRECTLY, THE APPLICANT MUST REPLACE OR MODIFY THE CONTROL FOR SITE SITUATIONS. THESE CONTROLS MUST REMAIN IN PLACE UNTIL THE DISTURBED AREAS HAVE BEEN PERMANENTLY STABILIZED.
5. ANY SEDIMENT THAT ESCAPES THE CONSTRUCTION SITE MUST BE COLLECTED AND PROPERLY DISPOSED OF BEFORE THE NEXT RAIN EVENT TO ENSURE IT IS NOT WASHED INTO SURFACE STREAMS, SENSITIVE FEATURES, ETC.
6. SEDIMENT MUST BE REMOVED FROM THE SEDIMENT TRAPS OR SEDIMENTATION BASINS WHEN IT OCCUPIES 50% OF THE BASIN'S DESIGN CAPACITY.
7. LITTER, CONSTRUCTION DEBRIS, AND CONSTRUCTION CHEMICALS EXPOSED TO STORMWATER SHALL BE PREVENTED FROM BEING DISCHARGED OFFSITE.
8. ALL EXCAVATED MATERIAL THAT WILL BE STORED ON-SITE MUST HAVE PROPER E&S CONTROLS.
9. IF PORTIONS OF THE SITE WILL HAVE A CEASE IN CONSTRUCTION ACTIVITY LASTING LONGER THAN 14 DAYS, SOIL STABILIZATION IN THOSE AREAS SHALL BE INITIATED AS SOON AS POSSIBLE PRIOR TO THE 14TH DAY OF INACTIVITY. IF ACTIVITY WILL RESUME PRIOR TO THE 21ST DAY, STABILIZATION MEASURES ARE NOT REQUIRED. IF DROUGHT CONDITIONS OR INCLEMENT WEATHER PREVENT ACTION BY THE 14TH DAY, STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS POSSIBLE.
10. THE FOLLOWING RECORDS SHOULD BE MAINTAINED AND MADE AVAILABLE TO THE TCEQ UPON REQUEST:
    - 10.1. THE DATES WHEN MAJOR GRADING ACTIVITIES OCCUR;
    - 10.2. THE DATES WHEN CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON A PORTION OF THE SITE; AND
    - 10.3. THE DATES WHEN STABILIZATION MEASURES ARE INITIATED.
11. THE HOLDER OF ANY APPROVED CZP MUST NOTIFY THE APPROPRIATE REGIONAL OFFICE IN WRITING AND OBTAIN APPROVAL FROM THE EXECUTIVE DIRECTOR PRIOR TO INITIATING ANY OF THE FOLLOWING:
    - 11.A. ANY PHYSICAL OR OPERATIONAL MODIFICATION OF ANY BEST MANAGEMENT PRACTICES (BMPS) OR STRUCTURE(S), INCLUDING BUT NOT LIMITED TO TEMPORARY OR PERMANENT PONDS, DAMS, BERMS, SILT FENCES, AND DIVERSIONARY STRUCTURES;
    - 11.B. ANY CHANGE IN THE NATURE OR CHARACTER OF THE REGULATED ACTIVITY FROM THAT WHICH WAS ORIGINALLY APPROVED;
    - 11.C. ANY CHANGE THAT WOULD SIGNIFICANTLY IMPACT THE ABILITY TO PREVENT POLLUTION OF THE EDWARDS AQUIFER; OR
    - 11.D. ANY DEVELOPMENT OF LAND PREVIOUSLY IDENTIFIED AS UNDEVELOPED IN THE APPROVED CONTRIBUTING ZONE PLAN.

AUSTIN REGIONAL OFFICE	SAN ANTONIO REGIONAL OFFICE
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STATE OF TEXAS
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LEANDER MUNICIPAL ATHLETIC COMPLEX

At San Gabriel River Park

City of Leander

ADDRESS
2201 N US HWY 183
Leander, Texas 78641

CLIENT
City of Leander
201 N. Brushy St, Leander, TX 78641

PROJECT NO.
11876.22

KEY PLAN

REVISIONS

#	DATE	DESCRIPTION
-	06/11/2024	TCEQ Contributing Zone Plan

SHEET

Permanent BMP Construction Plans

CH300

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PERMANENT BMP CONSTRUCTION NOTES

ENGINEERED VEGETATIVE FILTER STRIP CONSTRUCTION NOTES

1. THE FILTER STRIP SHOULD EXTEND ALONG THE ENTIRE LENGTH OF THE CONTRIBUTING AREA AND THE SLOPE SHOULD NOT EXCEED 20%. THE MINIMUM DIMENSION OF THE FILTER STRIP (IN THE DIRECTION OF FLOW) SHOULD BE NO LESS THAN 15 FEET. THE MAXIMUM WIDTH (IN THE DIRECTION OF FLOW) OF THE CONTRIBUTING IMPERVIOUS AREA SHOULD NOT EXCEED 72 FEET. FOR ROADWAYS WITH A VEGETATED STRIP ALONG BOTH SIDES THE TOTAL WIDTH OF THE ROADWAY SHOULD NOT EXCEED 144 FEET (I.E., 72 FEET DRAINING TO EACH SIDE).
2. THE MINIMUM VEGETATED COVER FOR ENGINEERED STRIPS IS 80%.
3. THE AREA CONTRIBUTING RUNOFF TO A FILTER STRIP SHOULD BE RELATIVELY FLAT SO THAT THE RUNOFF IS DISTRIBUTED EVENLY TO THE VEGETATED AREA WITHOUT THE USE OF A LEVEL SPREADER.
4. THE AREA TO BE USED FOR THE STRIP SHOULD BE FREE OF GULLIES OR RILLS THAT CAN CONCENTRATE OVERLAND FLOW (SCHUELER, 1987).
5. THE TOP EDGE OF THE FILTER STRIP ALONG THE PAVEMENT WILL BE DESIGNED TO AVOID THE SITUATION WHERE RUNOFF WOULD TRAVEL ALONG THE TOP OF THE FILTER STRIP, RATHER THAN THROUGH IT.
6. TOP EDGE OF THE FILTER STRIP SHOULD BE LEVEL, OTHERWISE RUNOFF WILL TEND TO FORM A CHANNEL IN THE LOW SPOT. A LEVEL SPREADER SHOULD NOT BE USED TO DISTRIBUTE RUNOFF TO AN ENGINEERED FILTER STRIP.
7. FILTER STRIPS SHOULD BE LANDSCAPED AFTER OTHER PORTIONS OF THE PROJECT ARE COMPLETED.

REDUCED-WIDTH ENGINEERED VEGETATIVE FILTER STRIP CONSTRUCTION NOTES

1. THE FILTER STRIP SHOULD EXTEND ALONG THE ENTIRE LENGTH OF THE CONTRIBUTING AREA AND THE SLOPE SHOULD NOT EXCEED 20%. THE MINIMUM DIMENSION OF THE FILTER STRIP (IN THE DIRECTION OF FLOW) SHOULD BE NO LESS THAN 5.2 FEET. THE MAXIMUM WIDTH (IN THE DIRECTION OF FLOW) OF THE CONTRIBUTING IMPERVIOUS AREA SHOULD NOT EXCEED 72 FEET. FOR ROADWAYS WITH A VEGETATED STRIP ALONG BOTH SIDES THE TOTAL WIDTH OF THE ROADWAY SHOULD NOT EXCEED 144 FEET (I.E., 72 FEET DRAINING TO EACH SIDE).
2. THE MINIMUM VEGETATED COVER FOR ENGINEERED STRIPS IS 80%.
3. THE AREA CONTRIBUTING RUNOFF TO A FILTER STRIP SHOULD BE RELATIVELY FLAT SO THAT THE RUNOFF IS DISTRIBUTED EVENLY TO THE VEGETATED AREA WITHOUT THE USE OF A LEVEL SPREADER.
4. THE AREA TO BE USED FOR THE STRIP SHOULD BE FREE OF GULLIES OR RILLS THAT CAN CONCENTRATE OVERLAND FLOW (SCHUELER, 1987).
5. THE TOP EDGE OF THE FILTER STRIP ALONG THE PAVEMENT WILL BE DESIGNED TO AVOID THE SITUATION WHERE RUNOFF WOULD TRAVEL ALONG THE TOP OF THE FILTER STRIP, RATHER THAN THROUGH IT.
6. TOP EDGE OF THE FILTER STRIP SHOULD BE LEVEL, OTHERWISE RUNOFF WILL TEND TO FORM A CHANNEL IN THE LOW SPOT. A LEVEL SPREADER SHOULD NOT BE USED TO DISTRIBUTE RUNOFF TO AN ENGINEERED FILTER STRIP.
7. FILTER STRIPS SHOULD BE LANDSCAPED AFTER OTHER PORTIONS OF THE PROJECT ARE COMPLETED.

PERMANENT BMP MAINTENANCE NOTES

ENGINEERED VEGETATIVE FILTER STRIP MAINTENANCE NOTES

ALL VEGETATED BMPS REQUIRE SOME BASIC MAINTENANCE TO ENSURE THE HEALTH OF THE PLANTS INCLUDING:

- *PEST MANAGEMENT*. AN INTEGRATED PEST MANAGEMENT (IPM) PLAN SHOULD BE DEVELOPED FOR VEGETATED AREAS. THIS PLAN SHOULD SPECIFY HOW PROBLEM INSECTS AND WEEDS WILL BE CONTROLLED WITH MINIMAL OR NO USE OF INSECTICIDES AND HERBICIDES.
- *SEASONAL MOWING AND LAWN CARE*. IF THE FILTER STRIP IS MADE UP OF TURF GRASS, IT SHOULD BE MOWED AS NEEDED TO LIMIT VEGETATION HEIGHT TO 18 INCHES, USING A MULCHING MOWER (OR REMOVAL OF CLIPPINGS). IF NATIVE GRASSES ARE USED, THE FILTER MAY REQUIRE LESS FREQUENT MOWING, BUT A MINIMUM OF TWICE ANNUALLY. GRASS CLIPPINGS AND BRUSH DEBRIS SHOULD NOT BE DEPOSITED ON VEGETATED FILTER STRIP AREAS. REGULAR MOWING SHOULD ALSO INCLUDE WEED CONTROL PRACTICES; HOWEVER, HERBICIDE USE SHOULD BE KEPT TO A MINIMUM. HEALTHY GRASS CAN BE MAINTAINED WITHOUT USING FERTILIZERS BECAUSE RUNOFF USUALLY CONTAINS SUFFICIENT NUTRIENTS. IRRIGATION OF THE SITE CAN HELP ASSURE A DENSE AND HEALTHY VEGETATIVE COVER.
- *INSPECTION*. INSPECT FILTER STRIPS AT LEAST TWICE ANNUALLY FOR EROSION OR DAMAGE TO VEGETATION; HOWEVER, ADDITIONAL INSPECTION AFTER PERIODS OF HEAVY RUNOFF IS MOST DESIRABLE. THE STRIP SHOULD BE CHECKED FOR UNIFORMITY OF GRASS COVER, DEBRIS AND LITTER, AND AREAS OF SEDIMENT ACCUMULATION. MORE FREQUENT INSPECTIONS OF THE GRASS COVER DURING THE FIRST FEW YEARS AFTER ESTABLISHMENT WILL HELP TO DETERMINE IF ANY PROBLEMS ARE DEVELOPING, AND TO PLAN FOR LONG-TERM RESTORATIVE MAINTENANCE NEEDS. BARE SPOTS AND AREAS OF EROSION IDENTIFIED DURING SEMI-ANNUAL INSPECTIONS MUST BE REPLANTED AND RESTORED TO MEET SPECIFICATIONS. CONSTRUCTION OF A LEVEL SPREADER DEVICE MAY BE NECESSARY TO REESTABLISH SHALLOW OVERLAND FLOW.
- *DEBRIS AND LITTER REMOVAL*. TRASH TENDS TO ACCUMULATE IN VEGETATED AREAS, PARTICULARLY ALONG HIGHWAYS. ANY FILTER STRIP STRUCTURES (I.E. LEVEL SPREADERS) SHOULD BE KEPT FREE OF OBSTRUCTIONS TO REDUCE FLOATABLES BEING FLUSHED DOWNSTREAM, AND FOR AESTHETIC REASONS. THE NEED FOR THIS PRACTICE IS DETERMINED THROUGH PERIODIC INSPECTION BUT SHOULD BE PERFORMED NO LESS THAN 4 TIMES PER YEAR.
- *SEDIMENT REMOVAL*. SEDIMENT REMOVAL IS NOT NORMALLY REQUIRED IN FILTER STRIPS SINCE THE VEGETATION NORMALLY GROWS THROUGH IT AND BINDS IT TO THE SOIL. HOWEVER, SEDIMENT MAY ACCUMULATE ALONG THE UPSTREAM BOUNDARY OF THE STRIP PREVENTING UNIFORM OVERLAND FLOW. EXCESS SEDIMENT SHOULD BE REMOVED BY HAND OR WITH FLAT-BOTTOMED SHOVELS.
- *GRASS RESEEDING AND MULCHING*. A HEALTHY DENSE GRASS SHOULD BE MAINTAINED ON THE FILTER STRIP. IF AREAS ARE ERODED, THEY SHOULD BE FILLED, COMPACTED, AND RESEEDED SO THAT THE FINAL GRADE IS LEVEL. GRASS DAMAGED DURING THE SEDIMENT REMOVAL PROCESS SHOULD BE PROMPTLY REPLACED USING THE SAME SEED MIX USED DURING FILTER STRIP ESTABLISHMENT. IF POSSIBLE, FLOW SHOULD BE DIVERTED FROM THE DAMAGED AREAS UNTIL THE GRASS IS FIRMLY ESTABLISHED. BARE SPOTS AND AREAS OF EROSION IDENTIFIED DURING SEMI-ANNUAL INSPECTIONS MUST BE REPLANTED AND RESTORED TO MEET SPECIFICATIONS. CORRECTIVE MAINTENANCE, SUCH AS WEEDING OR REPLANTING SHOULD BE DONE MORE FREQUENTLY IN THE FIRST TWO TO THREE YEARS AFTER INSTALLATION TO ENSURE STABILIZATION. DENSE VEGETATION MAY REQUIRE IRRIGATION IMMEDIATELY AFTER PLANTING, AND DURING PARTICULARLY DRY PERIODS, PARTICULARLY AS THE VEGETATION IS INITIALLY ESTABLISHED.

BIORETENTION MAINTENANCE NOTES

RECOMMENDED MAINTENANCE GUIDELINES INCLUDE:

- *INSPECTIONS*. BMP FACILITIES SHOULD BE INSPECTED AT LEAST TWICE A YEAR (ONCE DURING OR IMMEDIATELY FOLLOWING WET WEATHER) TO EVALUATE FACILITY OPERATION. DURING EACH INSPECTION, EROSION AREAS INSIDE AND DOWNSTREAM OF THE BMP MUST BE IDENTIFIED AND REPAIRED OR REVEGETATED IMMEDIATELY.
- *SEDIMENT REMOVAL*. REMOVE SEDIMENT FROM THE FACILITY WHEN SEDIMENT DEPTH REACHES 3 INCHES OR WHEN THE SEDIMENT INTERFERES WITH THE HEALTH OF VEGETATION OR ABILITY OF THE FACILITY TO MEET REQUIRED DRAWDOWN TIMES. SEDIMENT REMOVAL SHOULD BE PERFORMED AT LEAST EVERY 2 YEARS.
- *DRAIN TIME*. WHEN THE DRAIN TIME EXCEEDS 72 HOURS AS OBSERVED IN THE OBSERVATION WELL, THE FILTER MEDIA SHOULD BE REMOVED AND REPLACED WITH MORE PERMEABLE MATERIAL.
- *VEGETATION*. ALL DEAD AND DISEASED VEGETATION CONSIDERED BEYOND TREATMENT SHALL BE REMOVED AND REPLACED DURING SEMI-ANNUAL INSPECTIONS. DISEASED TREES AND SHRUBS SHOULD BE TREATED DURING INSPECTIONS. REMULCH ANY BARE AREAS BY HAND WHENEVER NEEDED. REPLACE MULCH ANNUALLY IN THE SPRING, OR MORE FREQUENTLY IF NEEDED, IN LANDSCAPED AREAS OF THE BASIN WHERE GRASS OR GROUNDCOVER IS NOT PLANTED. GRASS AREAS IN AND AROUND BIORETENTION FACILITIES MUST BE MOWED AT LEAST TWICE ANNUALLY TO LIMIT VEGETATION HEIGHT TO 18 INCHES. MORE FREQUENT MOWING TO MAINTAIN AESTHETIC APPEAL MAY BE NECESSARY IN LANDSCAPED AREAS.
- *DEBRIS AND LITTER REMOVAL*. DEBRIS AND LITTER WILL ACCUMULATE IN THE FACILITY AND SHOULD BE REMOVED DURING REGULAR MOWING OPERATIONS AND INSPECTIONS.
- *FILTER UNDERDRAIN*. CLEAN UNDERDRAIN PIPING NETWORK TO REMOVE ANY SEDIMENT BUILDUP EVERY 5 YEARS, OR AS NEEDED TO MAINTAIN DESIGN DRAWDOWN TIME.

SYNTHETIC TURF MAINTENANCE NOTES

RECOMMENDED MAINTENANCE GUIDELINES FOR SYNTHETIC TURF INCLUDE:

- *INSPECTIONS*. BMP FACILITIES SHOULD BE INSPECTED AT LEAST TWICE A YEAR (ONCE DURING OR IMMEDIATELY FOLLOWING WET WEATHER) TO EVALUATE FACILITY OPERATION. DURING EACH INSPECTION, EROSION AREAS INSIDE AND DOWNSTREAM OF THE BMP MUST BE IDENTIFIED AND REPAIRED IMMEDIATELY.
- *DEBRIS AND LITTER REMOVAL*. DEBRIS AND LITTER WILL ACCUMULATE IN THE FACILITY AND SHOULD BE REMOVED DURING REGULAR MOWING OPERATIONS AND INSPECTIONS.
- *BRUSH ARTIFICIAL TURF*. BRUSH THE SURFACE OF THE SYNTHETIC TURF FIELD EVERY 6 WEEKS TO REJUVENATE THE MATTED FIBERS AND LEVEL THE OP PORTION OF THE INFILL.
- *INFILL REPLACEMENT*. CHECK AND REPLENISH THE INFILL LEVEL ESPECIALLY IN HIGH USE AREAS, AT LEAST ONCE A YEAR.
- *FILTER UNDERDRAIN*. CLEAN UNDERDRAIN PIPING NETWORK TO REMOVE ANY SEDIMENT BUILDUP EVERY 5 YEARS, OR AS NEEDED TO MAINTAIN DESIGN DRAWDOWN TIME.

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casey a. hadsall
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LEANDER MUNICIPAL ATHLETIC COMPLEX

At San Gabriel River Park

City of Leander

ADDRESS
2201 N US HWY 183
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CLIENT
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201 N. Brushy St, Leander, TX 78641

PROJECT NO.
11876.22

KEY PLAN

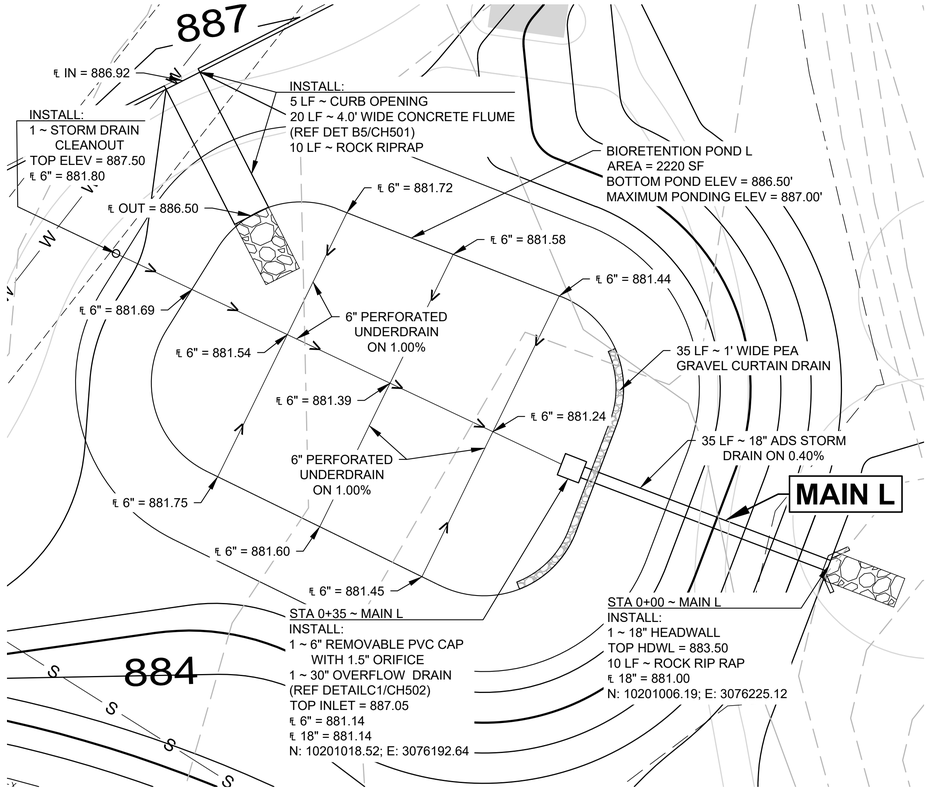
REVISIONS

#	DATE	DESCRIPTION
-	06/11/2024	TCEQ Contributing Zone Plan

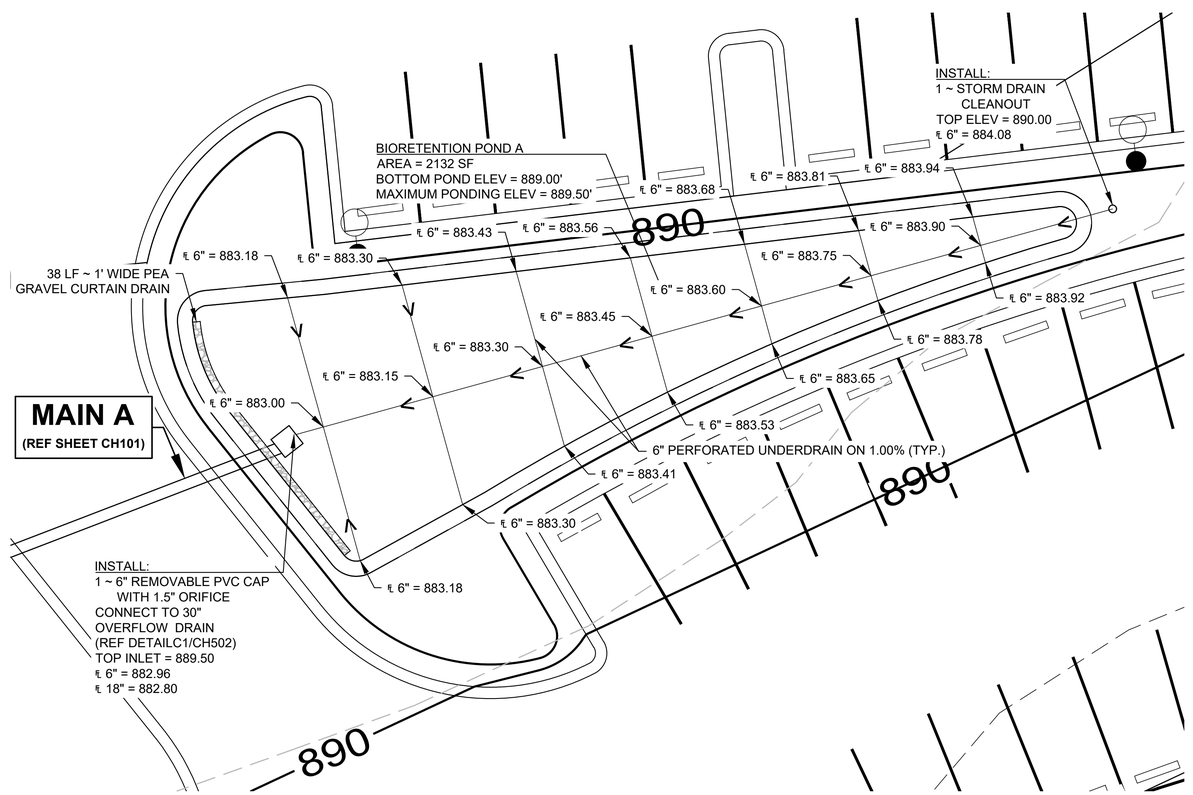
SHEET

Permanant BMP Constr. Notes

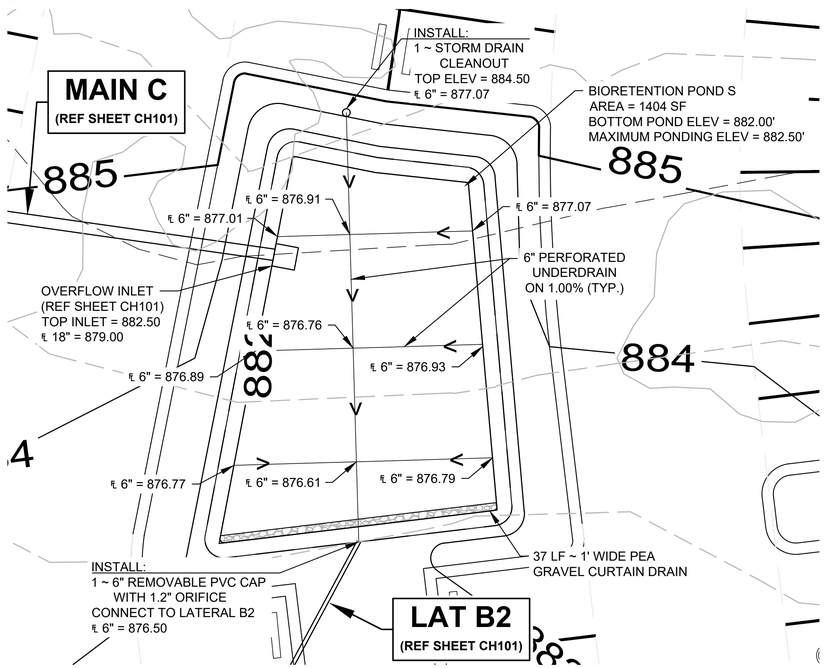
CH301



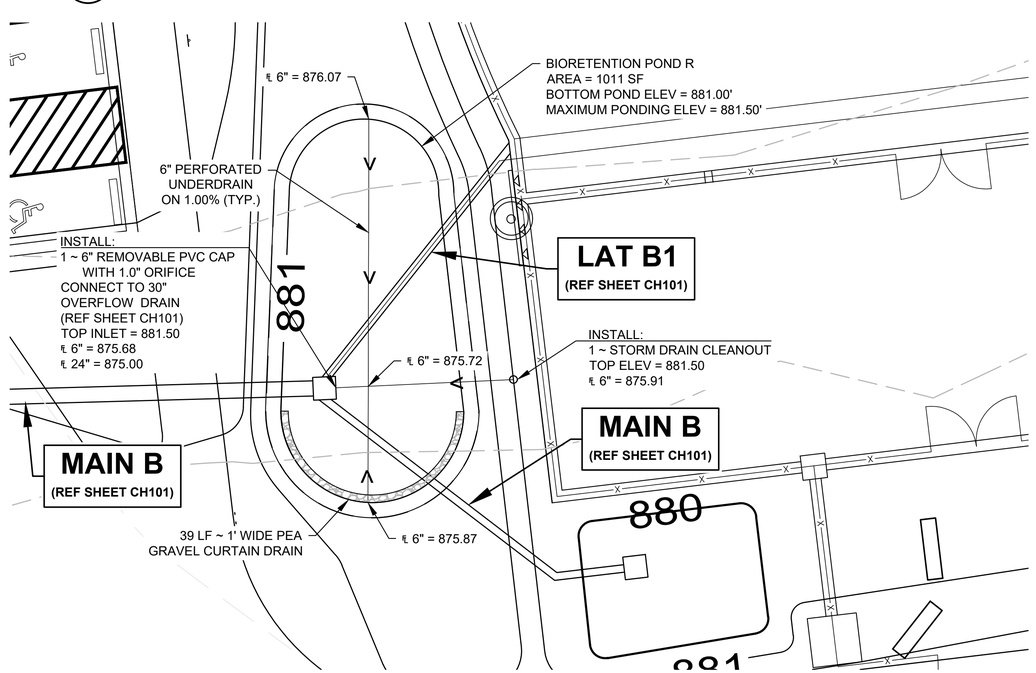
C1 BIORETENTION POND L
1" = 10'



C3 BIORETENTION POND A
1" = 10'



A1 BIORETENTION POND S
1" = 10'



A3 BIORETENTION POND R
1" = 10'

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SHEET

Bioretention Pond Details

CH302

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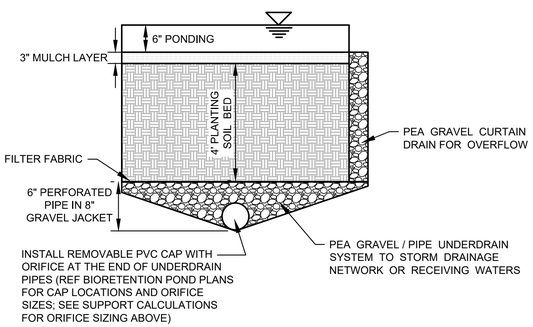
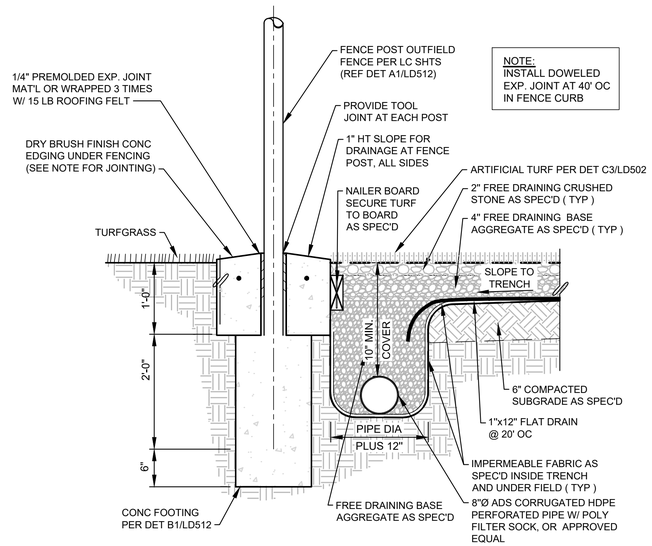
ORIFICE OUTLET CALCULATIONS

$Q_{avg} = WQv / t_d$
$A_O = Q_{avg} / [C*(2*g*H_{avg})^{0.5}]$
$d_o = [(4*Ao) / \Pi]^{0.5}$
WQv: WATER QUALITY VOLUME OF BIORETENTION POND
t_d: DRAWDOWN TIME OF FULL BASIN
Q_{avg}: AVERAGE DISCHARGE RATE
C: ORIFICE COEFFICIENT
g: ACCELERATION OF GRAVITY
H_{avg} = AVERAGE HYDRAULIC HEAD ($H_{max}/2$)
A_O: AREA OF ORIFICE
d_o = DIAMETER OF ORIFICE

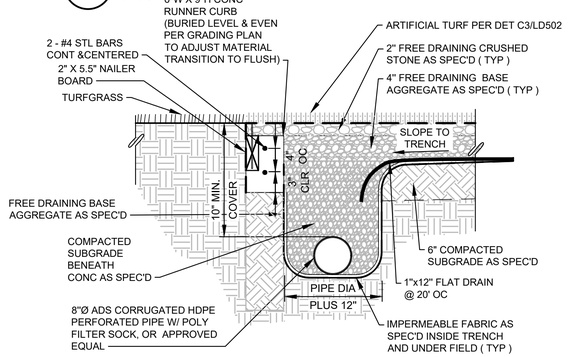
POND A	POND L	POND R	POND S
WQv = 5013 CF	WQv = 5217 CF	WQv = 2376 CF	WQv = 3300 CF
t_d = 48 HOURS	t_d = 48 HOURS	t_d = 48 HOURS	t_d = 48 HOURS
Q_{avg} = 0.029 CFS	Q_{avg} = 0.030 CFS	Q_{avg} = 0.014 CFS	Q_{avg} = 0.019 CFS
C = 0.6	C = 0.6	C = 0.6	C = 0.6
g = 32.2 ft/s^2	g = 32.2 ft/s^2	g = 32.2 ft/s^2	g = 32.2 ft/s^2
H_{avg} = 0.25 FT	H_{avg} = 0.25 FT	H_{avg} = 0.25 FT	H_{avg} = 0.25 FT
A_o = .0120 SF	A_o = .0125 SF	A_o = .006 SF	A_o = .008 SF
d_o = 1.5 in.	d_o = 1.5 in.	d_o = 1.0 in.	d_o = 1.2 in.



A1 BIORETENTION POND SECTION
NOT TO SCALE



B3 FLAT DRAIN DETAIL (ADJ. TO OUTFIELD CONC. EDGE BASE BID)
1"=1'-0"
L_SYN_TRF_HDPE_DRN



A3 FLAT DRAIN DETAIL (ADJ. TO NATURAL - ALT. BID NO. 1)
1"=1'-0"
L_SYN_TRF_HDPE_DRN

CITY APPROVAL STAMP

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