TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

June 18, 2013

Mr. Benjamin Engelhardt, P.E., Area Engineer
San Antonio District
Texas Department of Transportation
4102 IH 35 South
New Braunfels, TX 78132

Re: Edwards Aquifer, Comal County
North Walnut Avenue; From Kerlick Lane to Landa Drive; New Braunfels, Texas
Request for Approval of a Water Pollution Abatement Plan (WPAP)
30 Texas Administrative Code (TAC) Chapter 213 Edwards Aquifer
Edwards Aquifer Protection Program ID No. 13-13050310

Dear Mr. Engelhardt:

The Texas Commission on Environmental Quality (TCEQ) has completed its review of the WPAP application for the referenced project submitted to the Austin Regional Office by the Texas Department of Transportation on May 3, 2013. As presented to the TCEQ, the Temporary and Permanent Best Management Practices (BMPs) and construction plans were prepared by a Texas licensed professional engineer to be in general compliance with the requirements of 30 TAC Chapter 213. These planning materials were sealed, signed, and dated by a Texas licensed professional engineer. Therefore, based on the engineer's concurrence of compliance, the planning materials for construction of the proposed project and pollution abatement measures are hereby approved subject to applicable state rules and the conditions in this letter. The applicant or a person affected may file with the chief clerk a motion for reconsideration of the executive director's final action on this WPAP. A motion for reconsideration must be filed no later than 23 days after the date of this approval letter. *This approval expires two (2) years from the date of this letter unless, prior to the expiration date, more than 10% of the construction has commenced on the project or an extension of time has been requested.*

PROJECT DESCRIPTION

The proposed alteration to the current roadway design consists of widening traffic to two travel lanes, a center turn lane, with curbs and sidewalks. The project right-of-way (ROW) is approximately 10.0 acres contained on the Recharge Zone. The project extends from Kerlick Lane to Landa Drive.

The project is within the Recharge Zone and into the Transition Zone and approves:

- Widening pavement to four lane widths,
- Adding bike lanes and sidewalks,
- Adding retaining walls and an intersection tie-in and extending culverts,
- Adding storm sewer and StormFilters (SF) to treat highway runoff, and including detention facilities,
- Re-stabilizing the ROW after construction,

- Exempting treating into the Transition zone where the project does not drain back to the Recharge zone.

In addition to the described activities, temporary erosion and sedimentation controls will be installed prior to commencing site disturbance and maintained during construction. No wastewater will be generated by this roadway project.

PERMANENT POLLUTION ABATEMENT MEASURES

To prevent the pollution of stormwater runoff originating on-site or upgradient of the site and potentially flowing across and off the site after construction a placement of StormFilter (SF) flow-through cartridge systems with detention facilities to assist, designed using the TCEQ technical guidance document, Complying with the Edwards Aquifer Rules: Technical Guidance on Best Management Practices (2005), will be constructed to treat stormwater runoff. The BMPs for placement on this project are as shown on the WPAP control sheets. A combination of sizes and volumes are utilized. The approved measures meet the required 80 percent removal of the increased load in total suspended solids caused by the project. Design calculations were sealed by Linda Cox P.E., on April 23, 2013 to demonstrate the total treatment load removal to exceed the required 2889 lbs. increase caused by the project by 982 lbs. in those watershed areas traversed by the roadway.

GEOLOGY

According to the geologic assessment included with the application, there is one sensitive karst related feature, the Comal Springs Fault (F18). The fault is however obscured in the streambed paralleling Walnut Avenue by stream alluvium and along the adjoining Floral Avenue and its location is inferred. The feature is one of the major faults and forms the boundary of the Recharge Zone. The Person formation and alluvial deposits of the Quaternary Age underlain by the Pecan Gap Chalk is prevalent on the site. The site visit generally confirms the description given in the assessment. The site slopes are to the south of the project at the streambed and near the fault where it flattens out.

SPECIAL CONDITIONS

I. Since this is a roadway construction project, deed recordation of this approval letter is not required.

STANDARD CONDITIONS

1. Pursuant to Chapter 7 Subchapter C of the Texas Water Code, any violations of the requirements in 30 TAC Chapter 213 may result in administrative penalties.

Prior to Commencement of Construction:

2. All contractors conducting regulated activities at the referenced project location shall be provided a copy of this notice of approval. At least one complete copy of the approved WPAP and this notice of approval shall be maintained at the project location until all regulated activities are completed.

3. Modification to the activities described in the referenced WPAP application following the date of approval may require the submittal of a plan to modify this approval, including the payment of appropriate fees and all information necessary for its review and approval prior to initiating construction of the modifications.

4. The applicant must provide written notification of intent to commence construction, replacement, or rehabilitation of the referenced project. Notification must be submitted to the Austin Regional Office no later than 48 hours prior to commencement of the regulated activity. Written notification must include the date on which the regulated activity will commence, the name of the approved plan and program ID number for the regulated activity, and the name of the prime contractor with the name and telephone number of the contact person. The executive director will use the notification to determine if the approved plan is eligible for an extension.

5. Temporary erosion and sedimentation (E&S) controls, i.e., silt fences, rock berms, stabilized construction entrances, or other controls described in the approved WPAP, must be installed prior to construction and maintained during construction. Temporary E&S controls may be removed when vegetation is established and the construction area is stabilized. The TCEQ may monitor stormwater discharges from the site to evaluate the adequacy of temporary E&S control measures. Additional controls may be necessary if excessive solids are being discharged from the site.

6. All borings with depths greater than or equal to 20 feet must be plugged with non-shrink grout from the bottom of the hole to within three (3) feet of the surface. The remainder of the hole must be backfilled with cuttings from the boring. All borings less than 20 feet must be backfilled with cuttings from the boring. All borings must be backfilled or plugged within four (4) days of completion of the drilling operation. Voids may be filled with gravel.

<u>During Construction</u>:

7. During the course of regulated activities related to this project, the applicant or agent shall comply with all applicable provisions of 30 TAC Chapter 213, Edwards Aquifer. The applicant shall remain responsible for the provisions and conditions of this approval until such responsibility is legally transferred to another person or entity.

8. This approval does not authorize the installation of temporary aboveground storage tanks on this project. If the contractor desires to install a temporary aboveground storage tank for use during construction, an application to modify this approval must be submitted and approved prior to installation. The application must include information related to tank location and spill containment.

9. If any sensitive feature (caves, solution cavities, sink holes, etc.) is discovered during construction, all regulated activities near the feature must be suspended immediately. The applicant or his agent must immediately notify the Austin Regional Office of the discovery of the feature. Regulated activities near the feature may not proceed until the executive director has reviewed and approved the methods proposed to protect the feature and the aquifer from potentially adverse impacts to water quality. The plan must be sealed, signed, and dated by a Texas licensed professional engineer.

10. If sediment escapes the construction site, the 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). Sediment must be removed from sediment traps or sedimentation ponds not later than when design capacity has been reduced by 50 percent. Litter, construction debris, and construction chemicals shall be prevented from becoming stormwater discharge pollutants.

11. Intentional discharges of sediment laden water are not allowed. If dewatering becomes necessary, the discharge will be filtered through appropriately selected best management practices. These may include vegetated filter strips, sediment traps, rock berms, silt fence rings, etc.

12. The following records shall be maintained and made available to the executive director upon request: 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.

13. Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, and construction activities will not resume within 21 days. When the initiation of stabilization measures by the 14th day is precluded by weather conditions, stabilization measures shall be initiated as soon as practicable.

After Completion of Construction:

14. 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 Austin Regional Office within 30 days of site completion.

15. The applicant shall be 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. The regulated entity shall then be responsible for maintenance until another entity assumes such obligations in writing or ownership is transferred. A copy of the transfer of responsibility must be filed with the executive director through Austin Regional Office within 30 days of the transfer.

16. Upon legal transfer of this property, the new owner(s) is required to comply with all terms of the approved Edwards Aquifer protection plan. If the new owner intends to commence any new regulated activity on the site, a new Edwards Aquifer protection plan that specifically addresses the new activity must be submitted to the executive director. Approval of the plan for the new regulated activity by the executive director is required prior to commencement of the new regulated activity.

17. An Edwards Aquifer protection plan approval or extension will expire and no extension will be granted if more than 50 percent of the total construction has not been completed within ten years from the initial approval of a plan. A new Edwards Aquifer protection plan must be submitted to the Austin Regional Office with the appropriate fees for review and approval by the executive director prior to commencing any additional regulated activities.

18. At project locations where construction is initiated and abandoned, or not completed, the site shall be returned to a condition such that the aquifer is protected from potential contamination.

This action is taken under authority delegated by the Executive Director of the Texas Commission on Environmental Quality. If you have any questions or require additional information, please contact Mr. Kevin Lee Smith, P.E. of the Edwards Aquifer Protection Program of the Austin Regional Office at 512-339-2929.

Sincerely,

Carolyn Runyon, Water Section Manager
Austin Region Office
Texas Commission on Environmental Quality

CDR/kls

cc: Mr. John Bryant, P.G., San Antonio District, Texas Department of Transportation
Ms. Lynn Bumgaurdner, Water Section Manager, San Antonio Regional Office
Mr. Jim Klein, City Engineer, City of New Braunfels
Mr. Thomas Hornseth, P.E., Comal County Engineer
Mr. Roland Ruiz, General Manager, Edwards Aquifer Authority
TCEQ Central Records, Building F, MC212

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

May 7, 2013

RECEIVED
MAY 13 2013
COUNTY ENGINEER

Mr. Thomas H. Hornseth, P.E.
Comal County Engineer
195 David Jonas Drive
New Braunfels, Texas 78132

Re: Edwards Aquifer, **Comal County**
PROJECT NAME: **North Walnut Avenue;** BS46-C, New Braunfels, Texas
PLAN TYPE: Application for Approval of a Water Pollution Abatement Plan (WPAP); 30 Texas Administrative Code (TAC) Chapter 213; Edwards Aquifer Protection Program ID No. 13-13050310

Dear Mr. Hornseth:

The enclosed WPAP application is being forwarded to you pursuant to the Edwards Aquifer Rules. The Texas Commission on Environmental Quality (TCEQ) is required by 30 TAC Chapter 213 to provide copies of all applications to affected incorporated cities, groundwater conservation districts, and counties in which the proposed regulated activity will be located.

Please forward any comments to this office by **June 6, 2013.**

Should you have any questions concerning this matter, please contact Mr. Kevin Smith, P.E. of the Edwards Aquifer Protection Program at the Austin Regional Office (512) 339-2929.

Sincerely,

Carolyn D. Runyon
Water Section Manager
Austin Regional Office

CDR/pc

Enclosure

Comal Co.

WATER POLLUTION ABATEMENT PLAN

BS 46-C (N. Walnut)
FROM KERLICK LANE TO LANDA STREET
NEW BRAUNFELS
COMAL COUNTY
(CSJ: 0215-02-048)

Texas Department of Transportation

April 2013

CONTENTS

Attachments

General Information Form
For Regulated Activities on the
Edwards Aquifer Recharge and Transition Zones
and Relating to 30 TAC §213.4(b) & §213.5(b)(2)(A), (B)
Effective June 1, 1999

REGULATED ENTITY NAME: BS 46-C from Kerlick Lane to Landa Drive
New Braunfels, Texas

COUNTY: Comal STREAM BASIN: Comal

EDWARDS AQUIFER: x RECHARGE ZONE
x TRANSITION ZONE

PLAN TYPE: x WPAP __ AST __ EXCEPTION
__ SCS __ UST __ MODIFICATION

CUSTOMER INFORMATION

1. Customer (Applicant):

Contact Person: John Bryant
Entity: TxDOT
Mailing Address: PO Box 29928
City, State: San Antonio Zip: 78229
Telephone: (210) 615 5838 FAX: _____

Agent/Representative (If any):

Contact Person: _____
Entity: _____
Mailing Address: _____
City, State: _____ Zip: _____
Telephone: _____ FAX: _____

2. x This project is inside the city limits of New Braunfels.
__ This project is outside the city limits but inside the ETJ (extra-territorial jurisdiction) of _____.
__ This project is not located within any city's limits or ETJ.

3. The location of the project site is described below. The description provides sufficient detail and clarity so that the TCEQ's Regional staff can easily locate the project and site boundaries for a field investigation.

See attached road map. The project is located on a section of BS 46-C known locally as North Walnut Avenue. BS 46-C is a TxDOT Road. The project would begin at Kerlick Lane and end at Landa Street.

4. x **ATTACHMENT A - ROAD MAP**. A road map showing directions to and the location of the project site is attached at the end of this form.

5. x **ATTACHMENT B - USGS / EDWARDS RECHARGE ZONE MAP**. A copy of the official 7 ½ minute USGS Quadrangle Map (Scale: 1" = 2000') of the Edwards Recharge Zone is attached behind this sheet. The map(s) should clearly show:

   x Project site.
   x USGS Quadrangle Name(s).
   x Boundaries of the Recharge Zone (and Transition Zone, if applicable).
   x Drainage path from the project to the boundary of the Recharge Zone.

6. x Sufficient survey staking is provided on the project to allow TCEQ regional staff to locate the boundaries and alignment of the regulated activities and the geologic or manmade features noted in the Geologic Assessment. **The TCEQ must be able to inspect the project site or the application will be returned.**

7. x **ATTACHMENT C - PROJECT DESCRIPTION**. Attached at the end of this form is a detailed narrative description of the proposed project.

8. Existing project site conditions are noted below:

   ___ Existing commercial site
   ___ Existing industrial site
   ___ Existing residential site
   x Existing paved and/or unpaved roads
   ___ Undeveloped (Cleared)
   ___ Undeveloped (Undisturbed/Uncleared)
   ___ Other: _____

PROHIBITED ACTIVITIES

9. x I am aware that the following activities are prohibited on the **Recharge Zone** and are not proposed for this project:

   (1) waste disposal wells regulated under 30 TAC Chapter 331 of this title (relating to Underground Injection Control);
   (2) new feedlot/concentrated animal feeding operations, as defined in 30 TAC §213.3;
   (3) land disposal of Class I wastes, as defined in 30 TAC §335.1;
   (4) the use of sewage holding tanks as parts of organized collection systems; and
   (5) new municipal solid waste landfill facilities required to meet and comply with Type I standards which are defined in §330.41(b), (c), and (d) of this title (relating to Types of Municipal Solid Waste Facilities).

10. x I am aware that the following activities are prohibited on the **Transition Zone** and are not proposed for this project:

   (1) waste disposal wells regulated under 30 TAC Chapter 331 (relating to Underground Injection Control);
   (2) land disposal of Class I wastes, as defined in 30 TAC §335.1; and
   (3) new municipal solid waste landfill facilities required to meet and comply with Type I standards which are defined in §330.41 (b), (c), and (d) of this title.

ADMINISTRATIVE INFORMATION

11. The fee for the plan(s) is based on:
    - _na_ For a Water Pollution Abatement Plan and Modifications, the total acreage of the site where regulated activities will occur.
    - _na_ For an Organized Sewage Collection System Plans and Modifications, the total linear footage of all collection system lines.
    - _na_ For a UST Facility Plan or an AST Facility Plan, the total number of tanks or piping systems.
    - _na_ A request for an exception to any substantive portion of the regulations related to the protection of water quality.
    - _na_ A request for an extension to a previously approved plan.

    Note: TxDOT fees are paid through interagency agreement.

12. Application fees are due and payable at the time the application is filed. If the correct fee is not submitted, the TCEQ is not required to consider the application until the correct fee is submitted. Both the fee and the Edwards Aquifer Fee Form have been sent to the Commission's:

    - _na_ TCEQ cashier
    - _na_ Austin Regional Office (for projects in Hays, Travis, and Williamson Counties)
    - _na_ San Antonio Regional Office (for projects in Bexar, Comal, Kinney, Medina, and Uvalde Counties)

13. _x_ 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. The copies must be submitted to the appropriate regional office.

14. _x_ No person shall commence any regulated activity until the Edwards Aquifer Protection Plan(s) for the activity has been filed with and approved by the Executive Director.

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 **GENERAL INFORMATION FORM** is hereby submitted for TCEQ review. The application was prepared by:

John Bryant
Print Name of Customer/Agent

Signature of Customer/Agent

4/30/13
Date

If you have questions on how to fill out this form or about the Edwards Aquifer protection program, please contact us at 210/490-3096 for projects located in the San Antonio Region or 512/339-2929 for projects located in the Austin Region.

GENERAL INFORMATION FORM

ATTACHMENT A - Road Map
See attached

ATTACHMENT B – Official Recharge Zone Map
See attached

ATTACHMENT C - Project Description

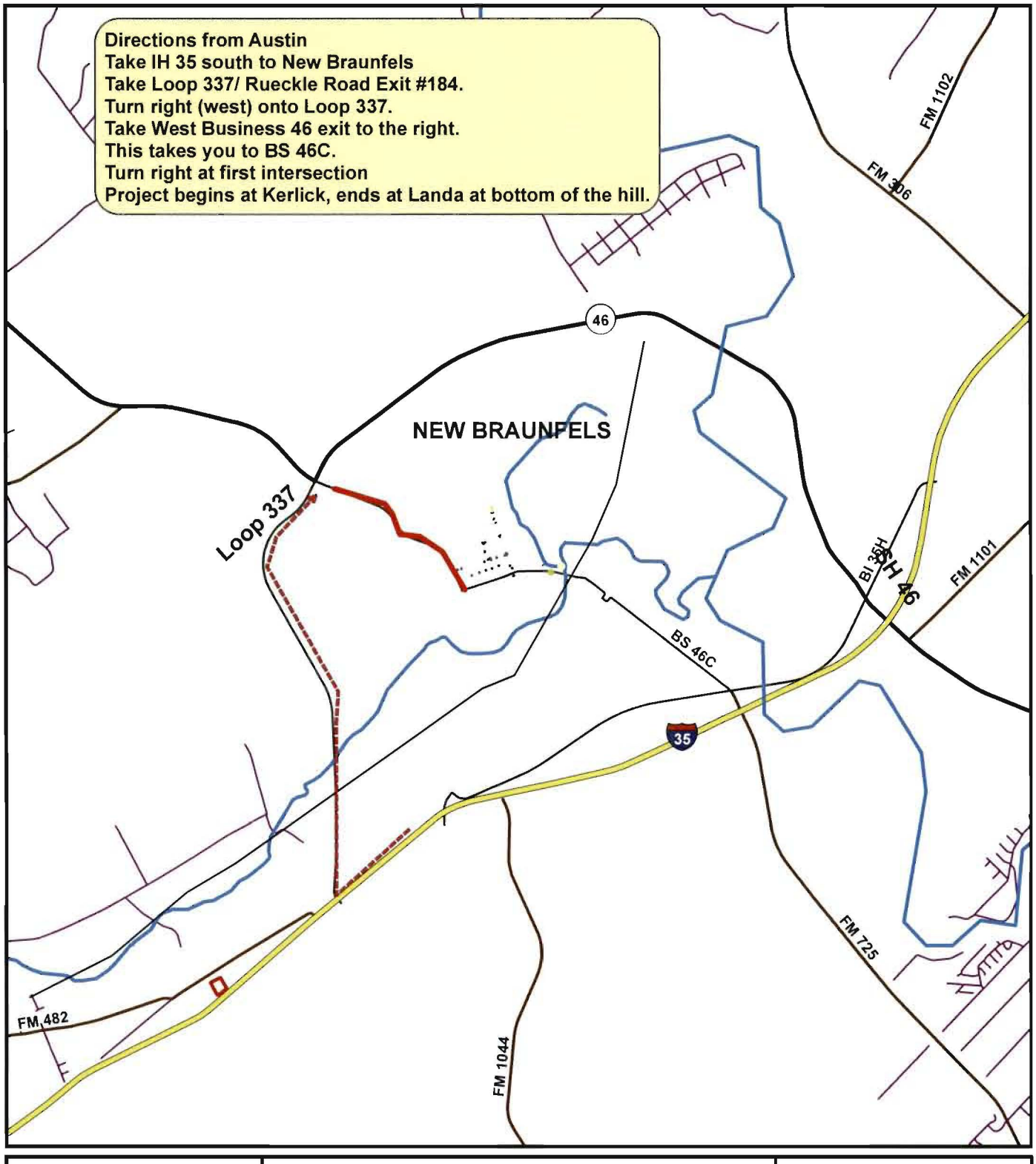
Existing Facility
From Kerlick Lane to just north of Wood Road, BS 46C is currently a two-lane roadway with one 12-foot-wide travel lane in each direction and 3-foot-wide shoulders. At the intersection with Wood Road, BS 46C consists of one 12-foot-wide travel lane in each direction divided by a 12- to 14-foot-wide center turn lane. South of Wood Road to Landa Street, BS 46C consists of two 12-foot-wide southbound travel lanes, one 12-foot-wide northbound travel lane, and a 14-foot-wide center turn lane. The existing right of way (ROW) width is typically100 feet. The existing facility does not include bicycle or pedestrian accommodations.

Runoff from most of the existing roadway drains via an open ditch system, but approximately 700 feet from Kerlick Lane south contains a storm drain system. The existing facility does not include catchment basins, hazardous materials traps, or other best management practices (BMPs) that treat storm water runoff before it leaves the ROW.

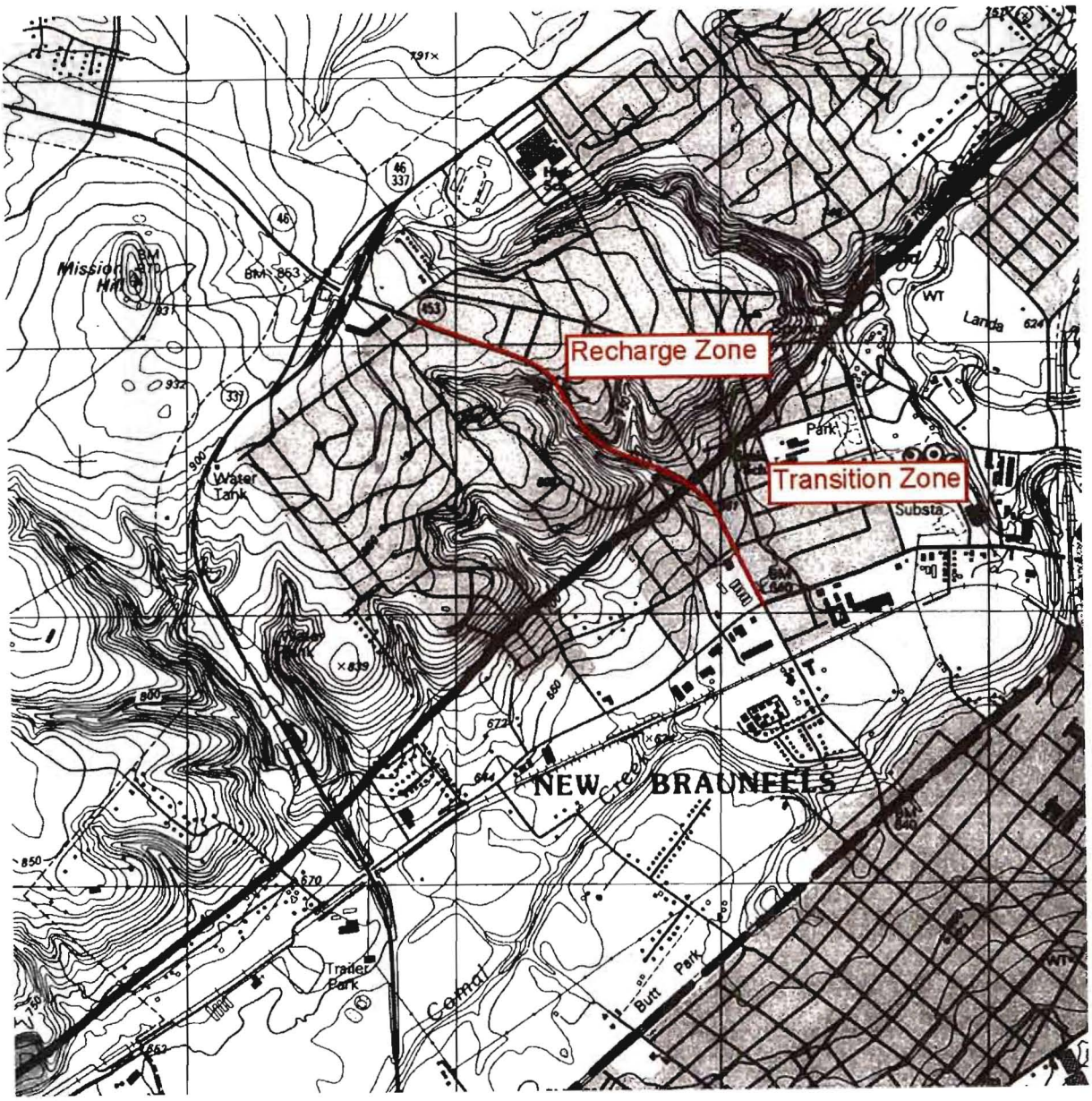
Proposed Facility
For most of the project length, the proposed four-lane facility would consist of two 11-foot-wide travel lanes in each direction, a 12-foot-wide center turn lane, 1-foot-wide curb offsets, and 8-foot-wide sidewalks on both sides of the roadway to accommodate pedestrians and bicycles. In a 1700-foot-long section beginning approximately 250 feet south of Grandview Avenue (referred to as the hill section of BS 46C), the proposed typical section would narrow to two 11-foot-wide travel lanes in each direction separated by a 4-foot-wide median, with 1-foot-wide curb offsets and 8-foot-wide sidewalks. A retaining wall would need to be constructed to accommodate the widening through the hill section while preserving the existing rock bluff as much as practicable. Two smaller retaining walls would help maintain access to adjoining property. Typical sections for the proposed facility are included herein.

The proposed improvements would replace, extend and/or upgrade six culverts. An underground storm sewer system would collect runoff and convey it to underground BMPs that would treat runoff before it is discharged from the ROW. These BMPs would be designed to meet or exceed the requirements of the Edwards Aquifer Rules [30Texas Administrative Code (TAC) 213]. The storm sewer system would also incorporate underground detention facilities to lessen the impact of runoff from the roadway.

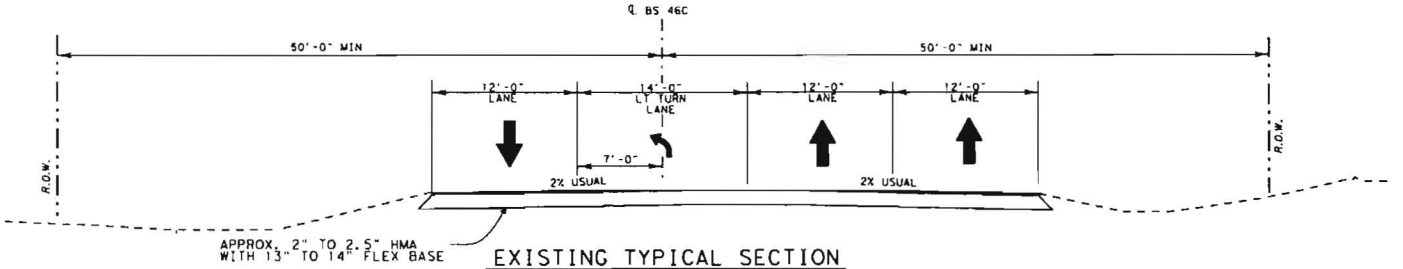
The proposed improvements would require approximately 1 acre of additional ROW, primarily in a narrow (20 feet wide) strip located on the west side of the existing roadway in the hill section.


Directions from Austin
Take IH 35 south to New Braunfels
Take Loop 337/ Rueckle Road Exit #184.
Turn right (west) onto Loop 337.
Take West Business 46 exit to the right.
This takes you to BS 46C.
Turn right at first intersection
Project begins at Kerlick, ends at Landa at bottom of the hill.
FM 1102
FM 306
46
NEW BRAUNFELS
Loop 337
BU 35H
SH 46
FM 1101
BS 46C
35
FM 725
FM 482
FM 1044
0
0.5
1 Miles

Road Map

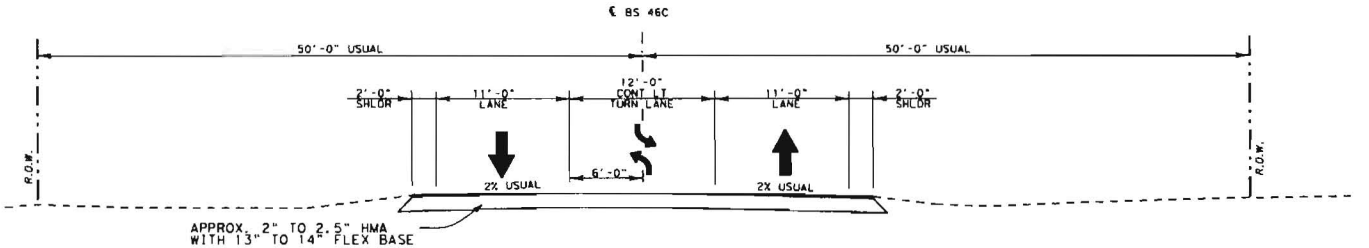


Cropped from official Recharge Zone Map, New Braunfels West, Tx



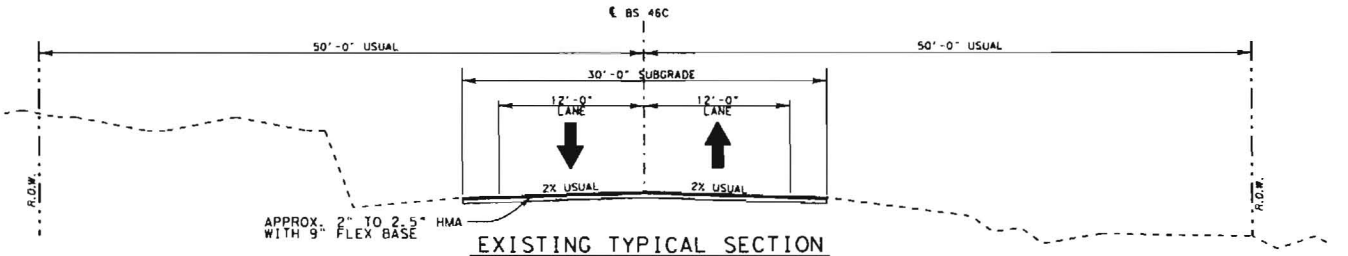
EXISTING TYPICAL SECTION

APPROX. STATION 2240+00 TO STATION 2244+63



EXISTING TYPICAL SECTION

APPROX. STATION 2227+00 TO STATION 2240+00



EXISTING TYPICAL SECTION

APPROX. STATION 2193+00 TO STATION 2227+00

April 18, 2013

P.E.

NTS

SHEET 1 OF 3

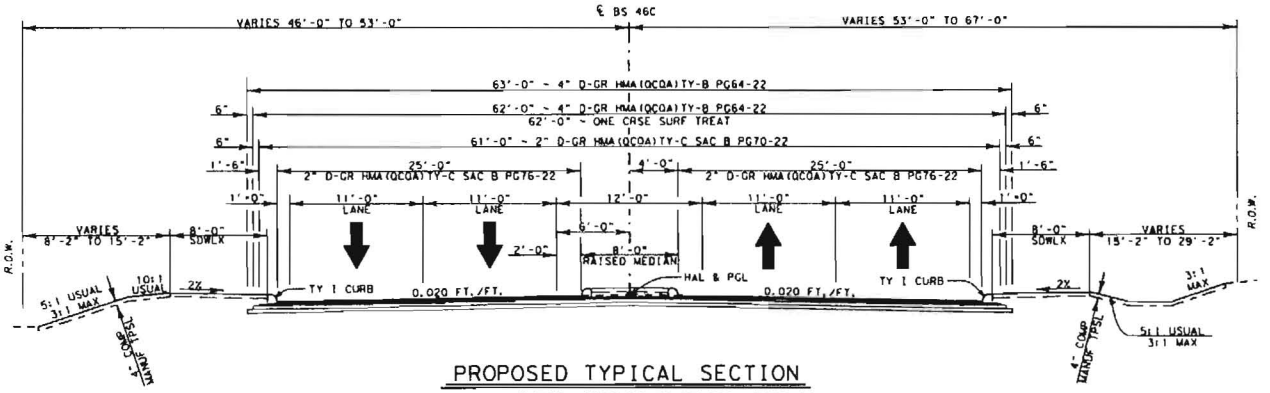
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
6		

STATE	STATE DIST. NO.	COUNTY
TEXAS	SAT	COMAL

CONT.	SECT.	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

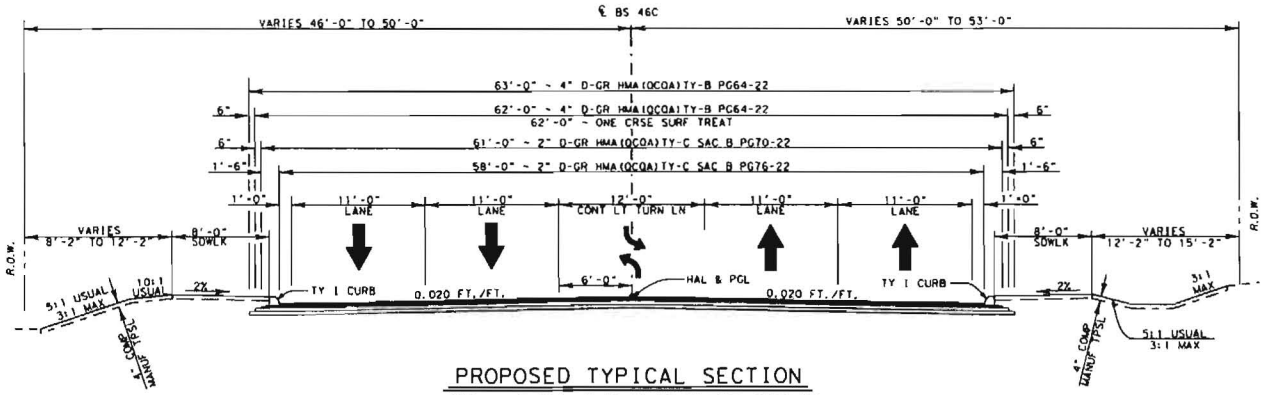
BS 46-C

TYPICAL SECTIONS



PROPOSED TYPICAL SECTION

APPROX. STATION 2206+50 TO STATION 2208+75



PROPOSED TYPICAL SECTION

APPROX. STATION 2188+00 TO STATION 2206+50
APPROX. STATION 2208+75 TO STATION 2210+00
APPROX. STATION 2227+50 TO STATION 2243+63

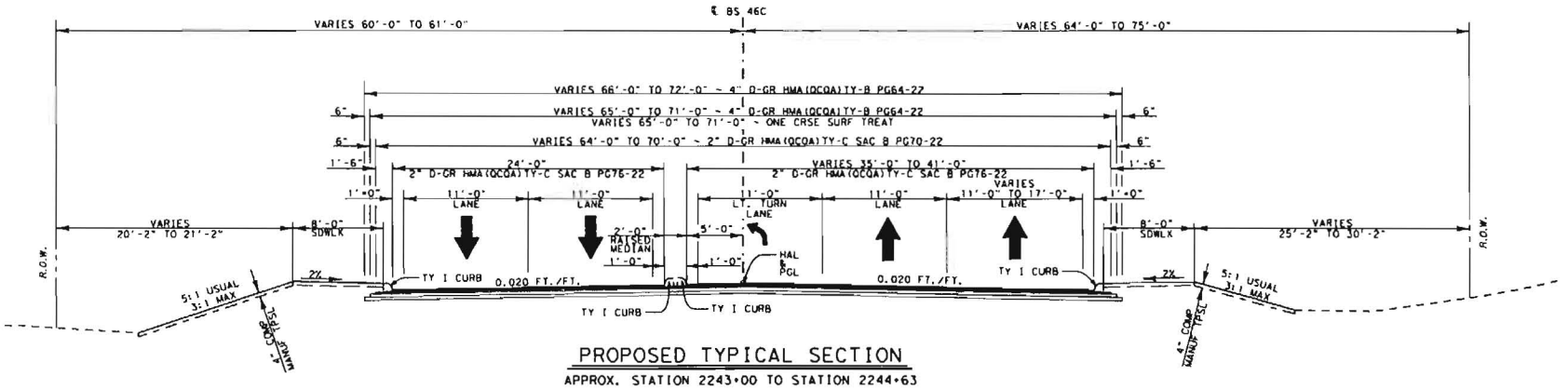
April 18, 2013
Linda Cox P.E.

NTS

SHEET 2 OF 3

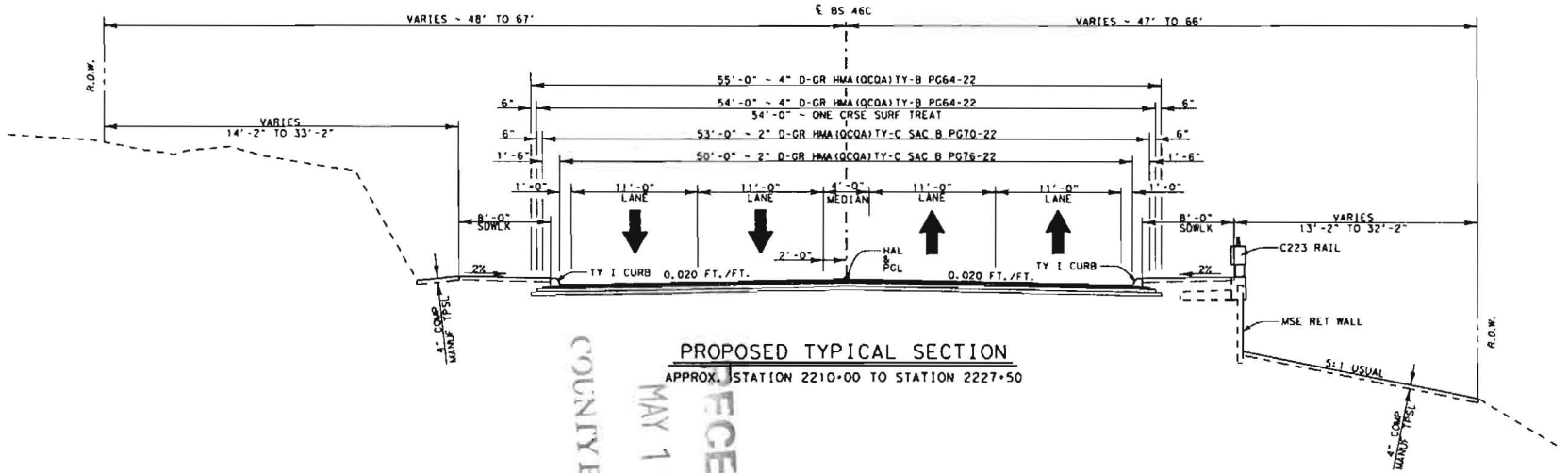
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			
STATE	DIST. / STATE NO.	COUNTY	
TEXAS	SAT	COMAL	
CONT.	SECT.	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

BS 46-C
TYPICAL SECTIONS



PROPOSED TYPICAL SECTION

APPROX. STATION 2243+00 TO STATION 2244+63



PROPOSED TYPICAL SECTION

APPROX. STATION 2210+00 TO STATION 2227+50

NTS

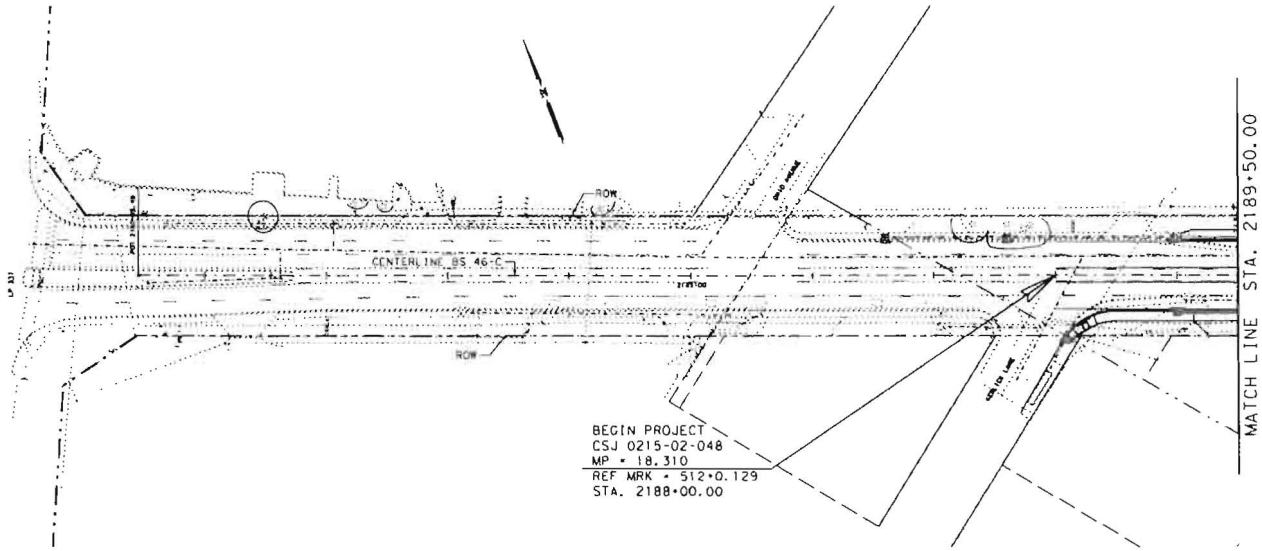
SHEET 3 OF 3

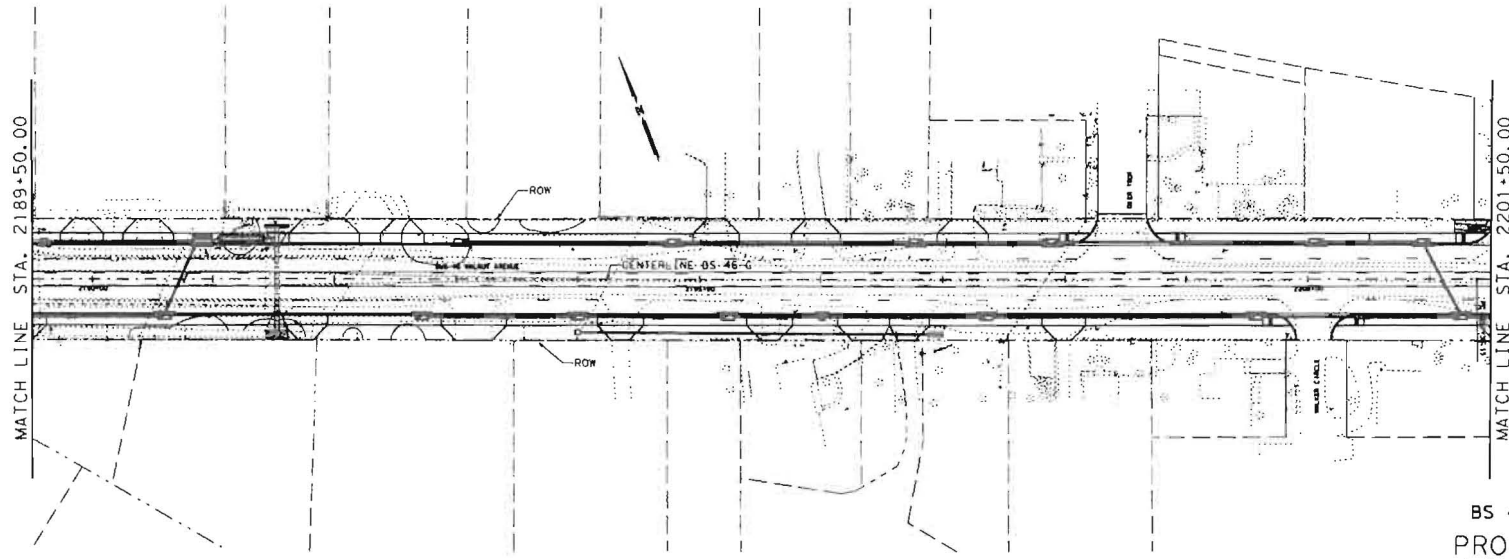
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
6		

STATE	STATE DIST. NO.	COUNTY
TEXAS	SAT	COMAL

CONT.	SECT.	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

BS 46-C
TYPICAL SECTIONS





FOR INTERIM REVIEW ONLY
NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES

LINDA COX, P.E.
SERIAL NUMBER 90090

DATED:

0 50 100
SCALE IN FEET

BS 46-C

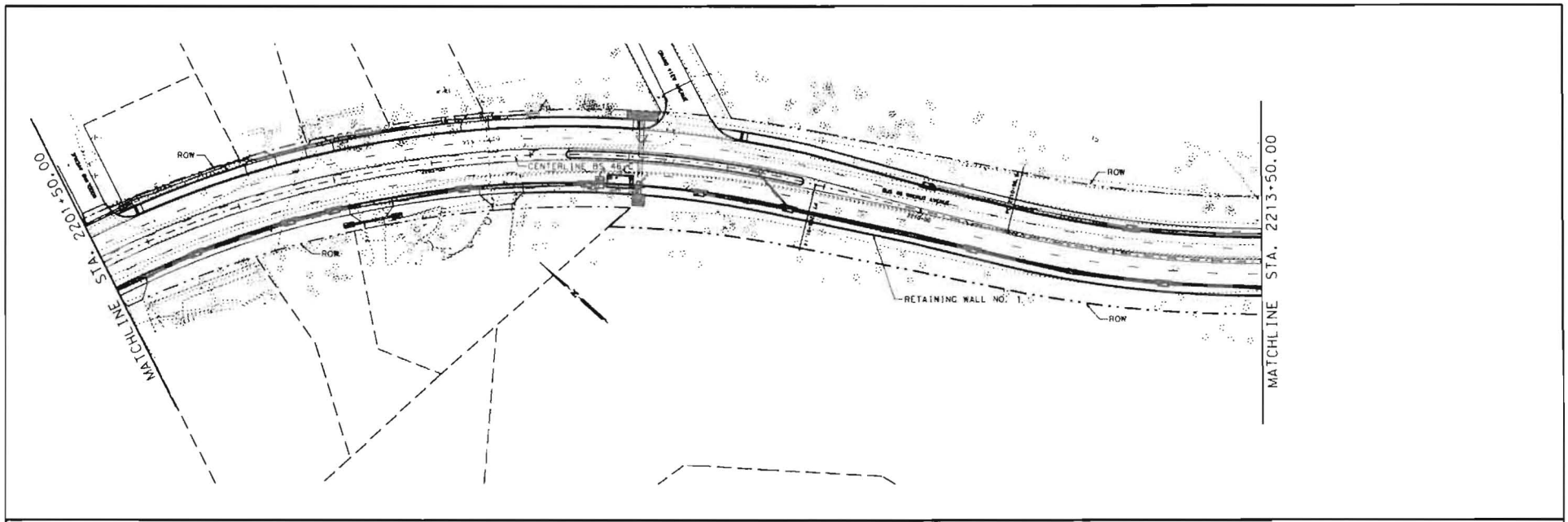
PROJECT LAYOUT

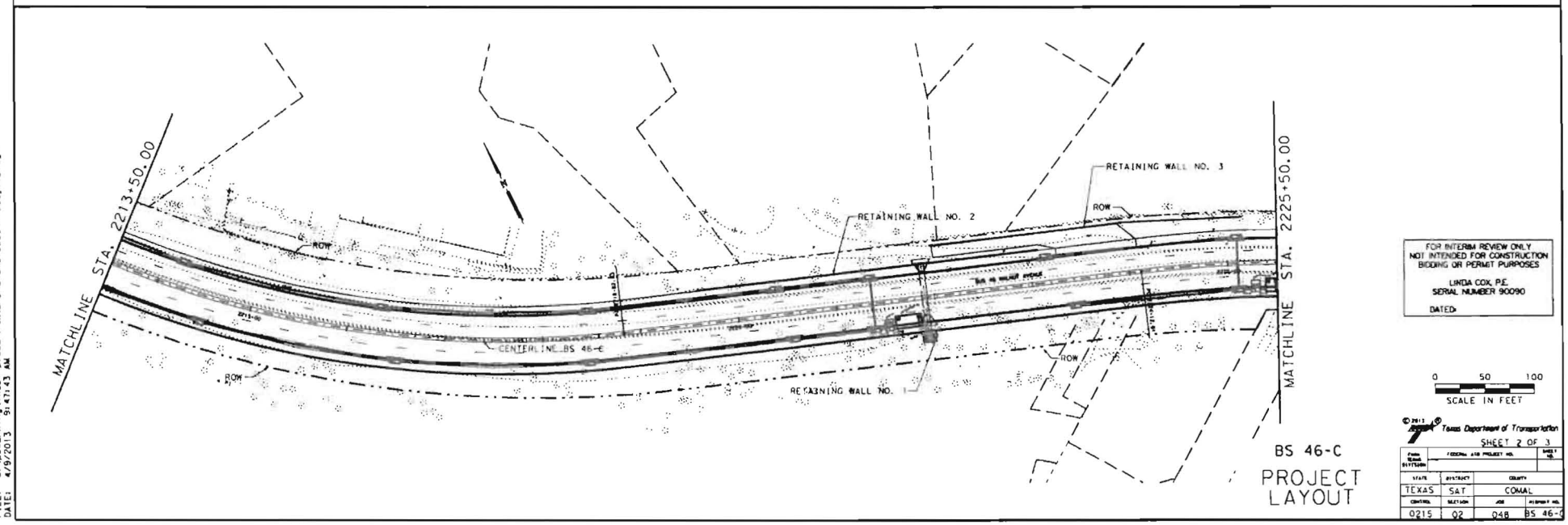
Texas Department of Transportation

SHEET 1 OF 3

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB / HIGHWAY NO.
0215	02	048 BS 46-C

FILE: c:\projects\ng\1x001\0x\south\maps-dgns\1883\Proloy001.dgn
DATE: 4/9/2013 9:47:21 AM





FOR INTERIM REVIEW ONLY
NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES

LINDA COX, P.E.
SERIAL NUMBER 90090
DATED:

0 50 100
SCALE IN FEET

Texas Department of Transportation

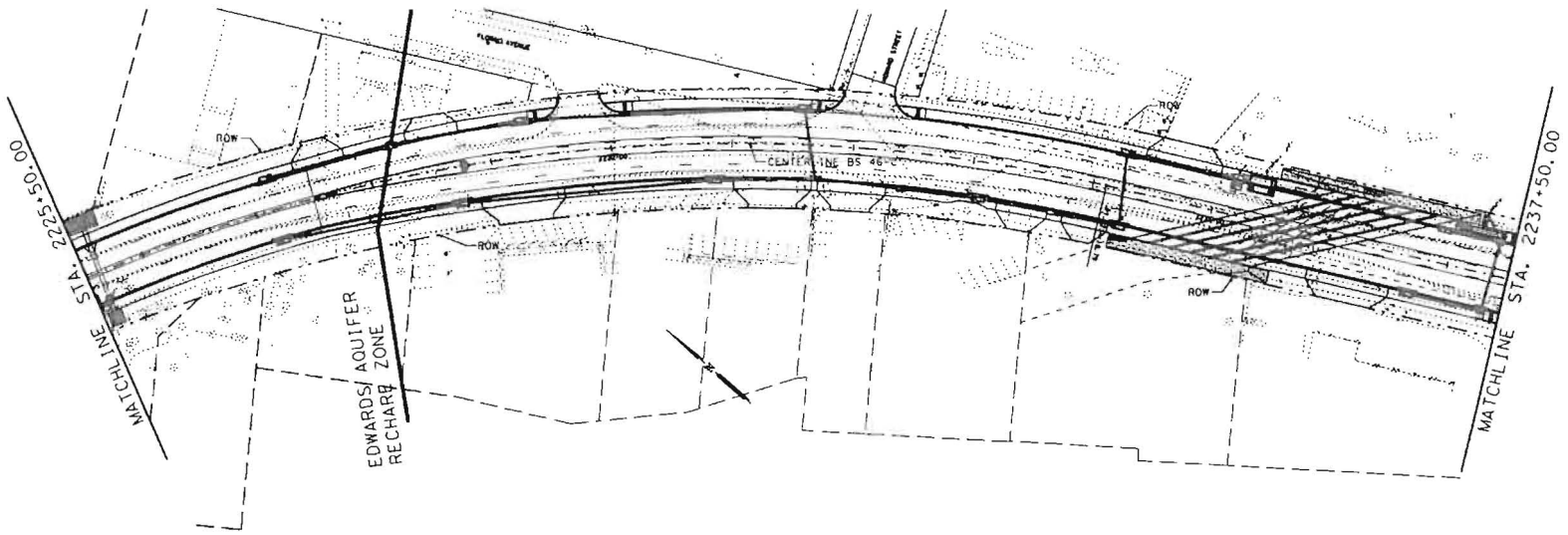
SHEET 2 OF 3

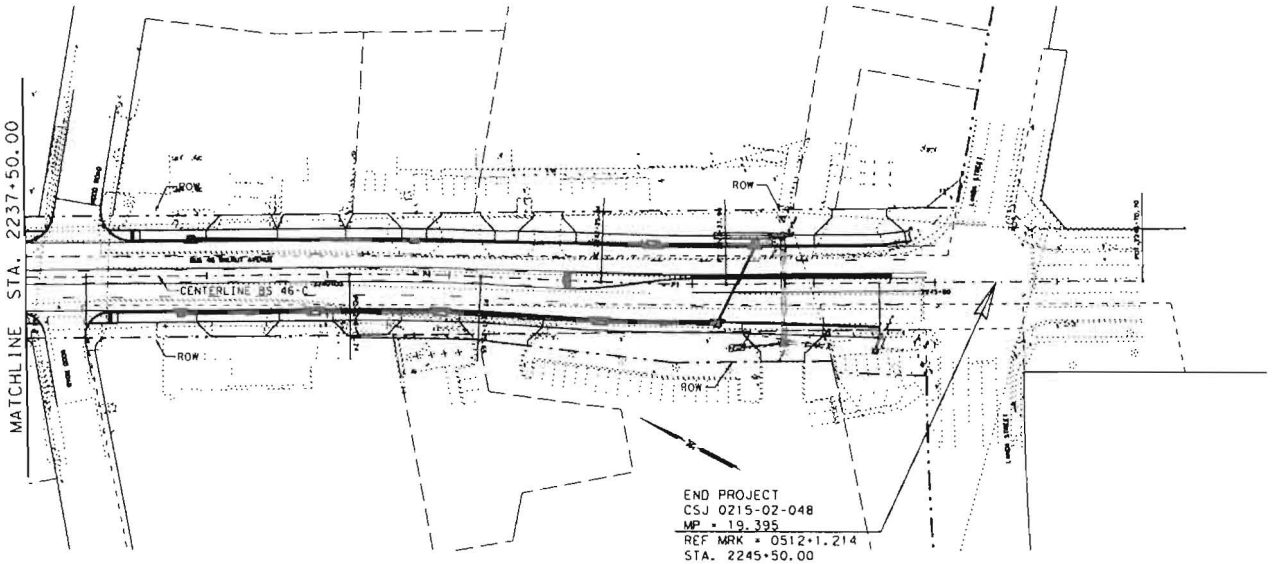
STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

BS 46-C

PROJECT LAYOUT

FILE: c:\pwworking\txdot\pwsouthmorenth\dms18883\Proloy002.dgn
DATE: 4/9/2013 9:47:43 AM





FOR INTERIM REVIEW ONLY
NOT INTENDED FOR CONSTRUCTION
BIDDING OR PERMIT PURPOSES

LINDA COX, P.E.
SERIAL NUMBER 90090

DATED:

0 50 100
SCALE IN FEET

SHEET 3 OF 3

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

BS 46-C

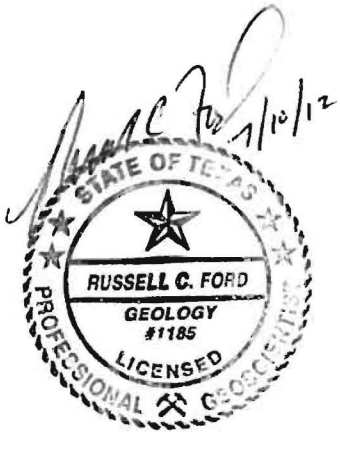
PROJECT LAYOUT

FILE: c:\pwwork\mg\txdot\pw$outh\mmarend\dms18883\Plot_oy003.dgn
DATE: 4/9/2013 9:48:06 AM

GEOLOGY AND SOILS TECHNICAL REPORT
BS 46C FROM KERLICK LANE TO LANDA STREET
COMAL COUNTY, TEXAS
CSJ: 0215-02-048

Texas Department of Transportation

Environmental Affairs Division and
San Antonio District



July 2012

Table of Contents

Appendices

Tables

1.0 INTRODUCTION

This Technical Report provides a background description of the geology and soils, as well as an evaluation of potential recharge features present within the immediate vicinity of the proposed improvements to Business Highway 46C (BS 46C) in Comal County, Texas. The Texas Department of Transportation (TxDOT) and the City of New Braunfels propose to widen BS 46C between Kerlick Lane and Landa Street within the City of New Braunfels. **Figures 1** and **2** (referenced figures are provided in **Appendix A**) show the project location on a county base map and U.S. Geological Survey (USGS) topographic map, respectively.

The proposed improvements would be 100 percent funded by state and local monies, and no federal permits that would cover the entire project are required. As a result, there is no significant federal involvement in the project, and this Technical Report focuses on pertinent regulations that apply to state-level projects and provides information that may be used in a state-level environmental document. Section 2.0 describes the proposed project, Section 3.0 lists the applicable regulatory requirements and memoranda, and Section 4.0 provides a description of the project area. Section 5.0 provides an overview of the regional geology, Section 6.0 describes the site-specific geology in the project area, and Section 7.0 discusses anticipated effects. (NOTE: all project related values and estimates included in this report are approximate.)

2.0 PROJECT DESCRIPTION

TxDOT and the City of New Braunfels propose to widen the existing two-lane BS 46C highway to a four-lane urban arterial from Kerlick Lane to Landa Street, a distance of approximately 1 mile. The purpose of the project is to improve mobility for existing and predicted future traffic demands. The following sections provide a description of the existing and proposed facilities.

2.1 Existing Facility

From Kerlick Lane to just north of Wood Road, BS 46C is currently a two-lane roadway with one 12-foot-wide travel lane in each direction and 3-foot-wide shoulders. At the intersection with Wood Road, BS 46C consists of one 12-foot-wide travel lane in each direction divided by a 12- to 14-foot-wide center turn lane. South of Wood Road to Landa Street, BS 46C consists of two 12-foot-wide southbound travel lanes, one 12-foot-wide northbound travel lane, and a 14-foot-wide center turn lane. The existing right-of-way (ROW) width is typically100 feet. **Figure 3** provides typical sections for the existing facility. Runoff from most of the existing roadway drains via an open ditch system, but approximately 700 feet from Kerlick Lane south contains a storm drain system. The existing facility does not include catchment basins, hazardous materials traps, or other best management practices (BMPs) that treat storm water runoff before it leaves the ROW.

2.2 Proposed Facility

For most of the project length, the proposed four-lane facility would consist of two 11-foot-wide travel lanes in each direction, a 12-foot-wide center turn lane, 1-foot-wide curb offsets, and 8-foot-wide

sidewalks on both sides of the roadway to accommodate pedestrians and bicycles. In a 1700-foot-long section beginning approximately 250 feet south of Grandview Avenue (referred to as the "hill section" of BS 46C), the proposed typical section would narrow to two 11-foot-wide travel lanes in each direction separated by a 4-foot-wide median, with 1-foot-wide curb offsets and 8-foot-wide sidewalks. A retaining wall would need to be constructed to accommodate the widening through the hill section while preserving the existing rock bluffs as much as practicable. **Figure 3** provides typical sections for the proposed facility. The proposed improvements would replace, extend and/or upgrade six culverts. An underground storm sewer system would collect runoff and convey it to underground BMPs that would treat runoff before it is discharged from the ROW.

The proposed improvements would require approximately 1.2 acre of additional ROW, primarily in a narrow (20 feet wide) strip located on the west side of the existing roadway in the hill section. **Figures 4.1** through **4.3** show the existing and proposed ROW on aerial photography.

3.0 APPLICABLE REGULATORY REQUIREMENTS AND MEMORANDA

There are no regulations directly related to protection of geology and soils that are applicable to the proposed project. Since there is no federal involvement in the proposed project, the Farmland Protection Policy Act, which regulates the conversion of prime farmlands (e.g., soils that are listed as prime farmland soils), does not apply to the project. To protect surface and groundwater quality, the Texas Commission on Environmental Quality (TCEQ) regulates development within the Edwards Aquifer Recharge Zone (EARZ) through rules contained in 30 Texas Administrative Code (TAC) §213. These regulations require the use of best management practices (BMPs), for both temporary and permanent conditions, to capture and treat stormwater runoff from areas of impervious cover. The regulations require the removal of 80 percent of total suspended solids (TSS) in runoff from an increase in impervious cover on a project. The TCEQ implements their rules by requiring the submittal of a Water Pollution Abatement Plan (WPAP) prior to conducting site activities.

The TCEQ also protects groundwater quality by assessing and determining how to handle karst and other potential recharge features when they are encountered during construction. The Edwards Aquifer Authority (EAA), which regulates pumping from the Edwards Aquifer and implements rules to protect water quality within the Edwards Aquifer, also reviews WPAPs and provides comments to the TCEQ for their consideration in review of the plans.

4.0 PROJECT AREA DESCRIPTION

The project area is situated near the boundary of the Edwards Plateau where it meets the Blackland Prairies Physiographic Region to the east (Jordan et al. 1984). The project is located in an urbanized area of the City of New Braunfels that has been largely developed with retail and/or commercial facilities along major roadways (BS 46C and Landa Street), and residential areas in surrounding developments. Undeveloped areas generally contain remnant woodland patches dominated by plateau live oak (*Quercus fusiformis*) and Ashe juniper (*Juniperus ashei*).

The topography of the area consists of rolling hills typical of the Texas Hill Country. The project area is drained primarily by an unnamed tributary of the Comal River that parallels BS 46C to the west. This drainage is an ephemeral feature characterized by rock outcrops, rocky rubble, and debris in the channel. Near the south end of the project, the tributary drains into a city storm sewer system, which conveys water eastward to the Comal River downstream of Landa Lake. *(Note that this unnamed tributary historically drained to Dry Comal Creek south of the project area but has been modified to drain into a storm sewer system that conveys water to the Comal River east of the project area; as such, the drainage is referenced as an unnamed tributary to the Comal River in this report).*

According to the New Braunfels Utility company (NBU), sanitary sewer lines run parallel to the BS 46C roadway within the project limits except for the "hill-section" of the roadway, generally located between Grandview Avenue and Floral Avenue. In addition to the underground sewer mains, NBU identified several manhole covers in the project vicinity. If necessary, the adjustment and relocation of any utilities would be handled by franchisees and the City of New Braunfels so that no substantial interruptions in service would occur while these adjustments are being made.

5.0 REGIONAL GEOLOGIC FRAMEWORK

5.1 Geologic Setting and Structure

The geology of the project area consists of predominantly Cretaceous age carbonate rocks and the Tertiary age Balcones Fault Zone (BFZ) (Collins 2000). The strata developed from the accumulation of a thick sequence of marine sediments deposited during Cretaceous times on the San Marcos Platform. Primary tectonic uplifting of the Edwards Plateau occurred during Miocene times along the BFZ (LBG-Guyton 2004). The faults in the BFZ are characterized as closely spaced, en echelon, normal faults, typically downthrown to the southeast, with displacements ranging from 100 to 850 feet (Collins 2000). The BFZ trends to the northeast, with most faults striking between N40°-70°E and dipping southeast. The primary fault in the project area, the Comal Springs fault, forms part of the Balcones Escarpment that defines the eastern margin of the Texas Hill Country (Edwards Plateau) and the western margin of the rolling Blackland Prairies of Central Texas. Approximately 750 feet of vertical displacement has been measured across the Comal Springs fault (LBG-Guyton 2004). **Figure 5** in **Appendix A** provides a regional cross-section depicting the geologic formations with respect to the BFZ, as provided in LBG-Guyton (2004). Land surface elevations increase abruptly at the escarpment, rising several hundred feet. The terrain consists of rolling uplands dissected by narrow drainageways. The elevations in the study area range from about 640 feet mean sea level (msl) near Landa Street on the southeast end of the project to about 840 feet msl near Kerlick Lane on the northwest end of the project. The project crosses the recharge zone of the Edwards Aquifer, and the Comal Springs fault forms the boundary of the Edwards Aquifer recharge zone to the northwest with the artesian zone southeast of the fault. The dissolution of the carbonate bedrock has formed karst terrain, characterized by sinkholes, caves, solution cavities, losing streams, and large spring complexes (LBG-Guyton 2004).

5.2 Stratigraphy

The strata that outcrop in the vicinity of the project are Lower and Upper Cretaceous age and Quaternary age. The Lower Cretaceous strata include the Kainer and Person Formations of the Edwards group and the Georgetown Formation. The Upper Cretaceous strata include the Del Rio Clay, Buda Limestone, Eagle Ford Group, Austin Group (chalk), and the Navarro and Taylor Groups, undivided (Small and Hanson 1994). A thin veneer (25 to 40 feet) of Quaternary age alluvium deposits overlies the Upper Cretaceous erosional surface, down-dip of the Comal Springs fault (LBG-Guyton 2004). The underlying Glen Rose Limestone of Lower Cretaceous age outcrops west and up-dip of the project area and therefore will not be described in any more detail in this report. **Table B-1** in **Appendix B** is a stratigraphic column depicting the various geologic units in the project area.

The Edwards Group is about 440 feet thick in Comal County and consists primarily of limestone with chert in the form of nodules, lenses, and thin discontinuous beds (Small and Hanson 1994). The Kainer (lower) and Person (upper) Formations of the Edwards Group have been divided into seven members (Rose 1972). The lowermost unit of the Kainer is the basal nodular member, which is about 50 feet thick and consists of a marly, nodular limestone with some grainstone. The next higher member is the dolomitic member, which is about 110 feet thick and consists of mostly dense, crystalline limestone with some layers of grainstone and mudstone. The Kirschberg evaporate member is about 50 feet thick and consists primarily of crystalline limestone and chalky mudstone with chert lenses. The uppermost member is the grainstone member, which is about 50 feet thick and is primarily dense, cemented, *miliolid* grainstone. The Person Formation consists of the lowermost regional dense member, which is about 20 feet thick and consists of a dense argillaceous mudstone. The leached and collapsed members overlie the regional dense member and consist of about 70 feet of burrowed mudstone and grainstone with intervals of hard, crystalline limestone and chert lenses. The collapsed zones form by the collapse of the overlying limestone into voids created by dissolution of thin evaporite layers and are more common in the lower 15 feet of the member (Small and Hanson 1994). The uppermost member is the cyclic and marine members, which are about 80 feet thick and consist of thick beds of mudstone and packstone along with lenses of chert and *miliolid* grainstone.

The Georgetown Formation is composed of thin interbeds of gray to tan, fossiliferous, fine-grained limestone, marly limestone, and marl. The formation is about 10 feet thick in the area. Small vugs (cavities) may occur but generally are not common. The Del Rio Clay overlies the Georgetown Formation and is about 50 feet thick. The unit is a dark green to gray, gypsiferous clay containing an abundance of the fossil oyster *Ilymatogyra arietina*, commonly referred to as "rams horn." The Buda Limestone is about 40 feet thick and is a dense, nodular, porcelaneous mudstone. The Eagle Ford Group overlies the Buda and is about 50 feet thick consisting of a calcareous, sandy shale unit. Some of the shale flags emit a petroliferous odor when fractured (Small and Hanson 1994). The Austin Group consists of about 225 feet of thin to thick-bedded light gray chalk, limestone, marly limestone, and marl and is generally referred to as the Austin Chalk. The overlying Taylor and Navarro group strata consist of about 600 feet of claystone and mud-mudstone. The Pecan Gap Formation is part of the Lower Taylor Group and is about 200 feet thick and consists of marly, argillaceous limestone. The Quaternary alluvium deposits include both

terrace and streambed alluvium, are about 20 feet thick in the area, and are mostly made up of sand and gravel with varying amounts of silt and clay.

5.3 Aquifers

The BFZ Edwards Aquifer and the underlying Upper and Middle Trinity Aquifers are the commonly utilized aquifers in the project area. The Trinity aquifers are present west and up-dip of the site, while the BFZ Edwards is present under the western portion of the project site up to the Comal Springs fault. This portion of the aquifer receives local recharge directly through the outcrop, and the aquifer is considered to be under unconfined, or water table, conditions. Southeast and down-dip of the fault, the Edwards strata are covered with as much as 650 feet of upper confining strata, and the aquifer is considered to be under confined conditions.

The Upper Trinity Aquifer is comprised of the Glen Rose Formation. Since this aquifer outcrops west and up-dip of the project site, there will be no effects to this aquifer from the proposed roadway improvements. The Edwards Aquifer is comprised of the Kainer and Person Formations of the Edwards group and the overlying Georgetown Formation. Groundwater generally flows from the southwest to the northeast in a series of fault blocks associated with the BFZ (LBG-Guyton 2004). Groundwater then discharges from these blocks as springs, with the closest of these, Comal Springs, being located approximately 0.5 mile east of the project area. A separate Water Resources Technical Report contains a more detailed analysis of the Edwards Aquifer and potential effects from the proposed project.

5.4 Soils

Soils in the project area are mapped as Rumple-Comfort Association, undulating (RUD), Eckrant rock outcrop complex, steep (ErG), Purves clay, 1 to 5 percent slopes (PuC), Lewisville silty clay, 1 to 3 percent slopes (LeB), and Krum clay, 0 to 1 percent slopes (KrA) (USDA 1984). The locations of the mapped soils in the area are shown on **Figure 6** in **Appendix A.** The Comfort, Purves, Krum, and Eckrant soils are within the "D" classification of the hydrologic soil groups, which have a very slow infiltration rate (very high runoff potential) when thoroughly saturated. The Rumple soils are in the "C" hydrologic groups, which have a low rate of water transmission. The Lewisville soils are within the "B" hydrologic groups and have a moderate infiltration rate (USDA 1986). Most of these soils are relatively thin and are developed over fractured and marly limestone bedrock.

The RUD soils consist of shallow to moderately deep soils on upland areas within the Edwards Plateau region (USDA 1984). The soils are comprised of about 60 percent Rumple soils and about 20 percent Comfort soils. Typically the surface layer of the Rumple is dark, reddish-brown, loamy clay with numerous rounded chert and limestone cobbles and gravel on the surface extending to about 14 inches below the ground surface. Below this to a depth of about 28 inches is extremely stony clay that is made up of about 75 percent limestone fragments. The underlying material is fractured limestone. Permeability values for the Rumple soils range from 0.2 to 0.6 inch/hour, which would tend to impede water recharge to the underlying bedrock. The Comfort soils consist of a surficial layer, about 7 inches thick, of dark brown, stony clay. Below this to a depth of about 12 inches is reddish-brown, very stony clay overlying

fractured limestone bedrock. Permeability values for the Comfort soils range from 0.06 to 0.2 inch/hour, which would tend to impede water recharge to the underlying bedrock.

The PuC soils consist of shallow, gently sloping soils on upland areas (USDA 1984). Typically, the surface layer is dark gray clay to a depth of about 10 inches. This is underlain by grayish brown clay to a depth of about 19 inches. The underlying material is fractured limestone bedrock. The soil is well drained with permeability values ranging from 0.2 to 0.6 inch/hour, which would tend to impede water recharge to the underlying bedrock.

The LeB soils consist of a deep, soil found on gently sloping terrain and stream terraces (USDA 1984). The soils consist of a dark grayish-brown silty clay surface layer to a depth of about 15 inches. Below this to a depth of about 63 inches is a light brown to reddish-yellow silty clay. The soil is well drained with permeability values ranging from 0.6 to 2 inches/hour, which would result in a moderate amount of water recharge to the underlying bedrock.

The KrA soils consist of deep, nearly level soils found on stream terraces and valley fills (USDA 1984). Typically the surface layer is a dark brown clay to a depth of about 19 inches. This is underlain by brown to yellowish brown clay to a depth of 80 inches. The soil is well drained with permeability values ranging from 0.2 to 0.6 inch/hour, which would tend to impede water recharge to the underlying bedrock.

The ErG complex consists of shallow, clayey soil (Eckrant soil) and rock outcrop on upland areas within the Edwards Plateau region (USDA 1984). Slopes are complex and range up to 30 percent or more. Typically the surface layer of the Eckrant soil is very dark gray extremely stony clay about 10 inches thick. Stone and cobble content increases with depth, up to 75 percent by volume, and the underlying material is fractured limestone bedrock. Permeability values range from 0.2 to 0.6 inch/hour, which would tend to impede water recharge to the underlying bedrock.

6.0 SITE SPECIFIC GEOLOGY

6.1 Geologic Units

The geologic units mapped within the project site include the Cretaceous Age Person Formation of the upper Edwards Group and Quaternary Age alluvium terrace deposits, which are most likely underlain by the Cretaceous Age Pecan Gap Chalk of the Taylor group (Small and Hanson 1994). The members of the Person Formation mapped onsite include the leached and collapsed members and the cyclic and marine members. The Edwards Group deposits are separated from the younger alluvium and Pecan Gap Chalk deposits by the Comal Springs fault, which crosses the southeastern portion of the site. The Comal Springs fault is a major fault within the BFZ and juxtaposes Edwards strata against younger beds of the upper confining unit, which are thought to be barriers or partial barriers to groundwater flow (Small and Hanson 1994). The majority of the project site is located within the Recharge Zone of the Edwards Aquifer, with the southeastern end of the site located within the Transition Zone. The recharge zone boundary is formed by the Comal Springs fault. A stratigraphic column prepared for the site is included as **Table B-1** in **Appendix B**.

6.2 Methodology

A geologic reconnaissance of the site was conducted to identify potential recharge features as well as describe the site-specific geology. Survey methods followed protocols outlined in the TCEQ Instructions to Geologists for Geologic Assessments (TCEQ 2004). The assessment included an evaluation of any significant geologic or manmade features, as defined in 30 TAC §213, that are present within the site. The TCEQ only requires inspection of the existing and proposed ROW for features. However, in order to be conservative in protecting the springs in the vicinity of the site, it was determined to expand the reconnaissance to include the area immediately adjacent and downgradient of the proposed ROW (within the unnamed drainage). These features include closed depressions, sinkholes, caves, faults, fractures, wells, borings, and excavations. Particular attention was paid to any sensitive features, which are defined as features where rapid infiltration from the surface to the underlying Edwards Aquifer can occur. An initial survey was conducted by Carlos Swonke, P.G., of Blanton & Associates, Inc., on January 3, 2012, and a follow-up survey was conducted by Russell C. Ford, P.G., of Terracon Consultants, Inc., on February 8, 2012. The surveys were completed by walking parallel transects within and along the ROW and down-gradient to the bed of the unnamed tributary that parallels BS 46C, spaced approximately 50 feet apart, where practicable. Features that were discovered were located using a GPS unit (datum: NAD 83), assigned a unique number, and locations plotted on the attached geologic map (**Figures 4.1** through **4.3**). Each feature was evaluated and scored using the methods described in the TCEQ Instructions to Geologists for Geologic Assessments (TCEQ 2004), and the resulting scores are shown on the completed Geologic Assessment Table (TCEQ-0585-Table) in **Appendix B**. The completed Geologic Assessment Form (TCEQ-0585) is also included in **Appendix B**.

6.3 Geologic Feature Identification

The field reconnaissance of the project area revealed 19 geologic features and one obscured fault (Comal Springs fault) within or adjacent to the existing and/or proposed ROW (**Table 1**). Nine of these features (F2 through F8) are located just outside of the proposed ROW while the remaining features are located within the proposed ROW. None of the features identified were significant caves or sinkholes. The majority of the features are small solution cavities developed along bedding planes, solution-enlarged fractures, and vuggy, fractured rock outcrops within the paralleling streambed. None of the features were excavated to determine their recharge potential, but all were assumed to have some recharge function. Photographs of the individual features are included in **Appendix C**. The following table lists each feature followed by individual feature descriptions:

Table 1. Geologic Features Located in and adjacent to the Project Area

Feature ID	Feature Type	Setting
F1	Closed Depression/Animal Burrow	Hillside above streambed
F2	Solution Cavity Along Bedding Plane	Hillside above streambed (offsite)
F3	Solution Enlarged Vertical Fracture	Hillside above streambed (offsite)
F4	Solution Enlarged Vertical Fracture	Hillside above streambed (offsite)
F5	Vuggy Rock	Streambed (offsite)
F6	Vuggy Rock	Streambed (offsite)
F6A	Vuggy Rock	Streambed (offsite)
F7	Vuggy Rock	Streambed (offsite)

Table 1. Geologic Features Located in and adjacent to the Project Area

Feature ID	Feature Type	Setting
F7A	Solution Cavity	Hillside above streambed (offsite)
F8	Closed Depression/Animal Burrow	Hillside above streambed (offsite)
F9	Solution Enlarged Fracture	Roadcut
F10	Solution Enlarged Fracture	Roadcut
F11	Vuggy Rock and Solution Features	Roadcut
F12	Solution Cavity Along Bedding Plane	Roadcut
F13	Solution Cavity Along Bedding Plane	Roadcut
F14	Solution Cavity Along Bedding Plane	Roadcut
F15	Solution Enlarged Fracture	Roadcut
F16	Solution Enlarged Fracture	Roadcut
F17	Solution Cavity Along Bedding Plane	Roadcut
F18	Fault	Obscured in Creekbed

Feature F1 is a small, non-karst closed depression formed in the Person Formation, leached and collapsed member, measuring about 8 feet in diameter by 1.5 feet deep. Evidence of animal burrowing was observed, and no significant vertical openings were observed. The feature has a sensitivity score of 10 points.

Feature F2 is a small solution cavity formed along a horizontal bedding plane in the leached and collapsed member of the Person Formation. The feature is about 0.2 foot by 3 feet and extends into the streambank about 1.5 feet, where it pinches closed. No significant vertical openings were observed, and the feature has a sensitivity score of 25 points.

Feature F3 is a small solution-enlarged vertical fracture located in the leached and collapsed member of the Person Formation. The feature is about 1 foot by 2 feet and extends into the streambank about 0.2 foot, where it pinches closed. No significant vertical openings were observed, and the feature has a sensitivity score of 25 points.

Feature F4 is a small solution-enlarged vertical fracture located in the leached and collapsed member of the Person Formation. The feature is about 1 foot by 3 feet and extends into the streambank about 0.3 foot, where it pinches closed. No significant vertical openings were observed, and the feature has a sensitivity score of 25 points.

Feature F5 is a vuggy, solutioned outcrop of the leached and collapsed member of the Person Formation. The feature is located in the streambed and measures about 15 feet by 6 feet. No significant vertical openings were observed, and the feature has a sensitivity score of 15 points.

Feature F6 is a vuggy, solutioned outcrop of the leached and collapsed member of the Person Formation. The feature is located in the streambed and measures about 10 feet by 3 feet. No significant vertical openings were observed, and the feature has a sensitivity score of 15 points.

Feature F6A is a vuggy, solutioned outcrop of the leached and collapsed member of the Person Formation. The feature is located in the streambed and measures about 6 feet by 6 feet. No significant vertical openings were observed, and the feature has a sensitivity score of 15 points.

Feature F7 is a vuggy, solutioned outcrop of the leached and collapsed member of the Person Formation. The feature is located in the streambed and measures about 8 feet by 10 feet. No significant vertical openings were observed, and the feature has a sensitivity score of 15 points.

Feature F7A is a small solution cavity formed along a horizontal bedding plane in the leached and collapsed member of the Person Formation. The feature is about 1.5 feet by 1.5 feet and extends into the streambank about 0.5 foot, where it pinches closed. No significant vertical openings were observed and the feature has a sensitivity score of 25 points.

Feature F8 is a small, non-karst closed depression formed in the Person Formation, leached and collapsed member, measuring about 1.5 feet by 4 feet by 1 foot deep. Evidence of animal burrowing was observed, and no significant vertical openings were observed. The feature has a sensitivity score of 10 points.

Feature F9 is a small solution-enlarged fracture located in the leached and collapsed member of the Person Formation. The feature is located within a horizontal bedding plane in the road cut for the existing BS 46C and is about 3 to 4 feet above the existing road surface. The feature is about 4 feet by 2 feet and extends into the outcrop about 0.5 foot, where it pinches closed. No significant vertical openings were observed, and the feature has a sensitivity score of 25 points.

Feature F10 is a small solution-enlarged fracture located in the leached and collapsed member of the Person Formation. The feature is located within a horizontal bedding plane in the road cut for the existing BS 46C and is about 3 to 4 feet above the existing road surface. The feature is about 0.8 foot by 2 feet and extends into the outcrop about 0.5 foot, where it pinches closed. No significant vertical openings were observed, and the feature has a sensitivity score of 25 points.

Feature F11 is a vuggy solutioned outcrop located in the leached and collapsed member of the Person Formation. The feature is located within a horizontal bedding plane in the road cut for BS 46C and is about 3 to 4 feet above the existing road surface. The feature extends for about 50 feet and is about 4 feet from top to bottom. No significant openings were observed, and the feature has a sensitivity score of 10 points.

Feature F12 is a small solution cavity located in the leached and collapsed member of the Person Formation. The feature is located within a horizontal bedding plane in the road cut for BS 46C and is about 3 to 4 feet above the existing road surface. The feature is about 1.5 feet by 1 foot and extends into the outcrop about 1.5 feet, where it pinches closed. No significant vertical openings were observed, and the feature has a sensitivity score of 25 points.

Feature F13 is a small solution cavity located in the leached and collapsed member of the Person Formation. The feature is located within a horizontal bedding plane in the road cut for BS 46C and is about 3 to 4 feet above the existing road surface. The feature is about 8 feet by 3 feet and extends into the outcrop about 2 feet, where it pinches closed. No significant vertical openings were observed, and the feature has a sensitivity score of 25 points.

Feature F14 is a small solution cavity located in the leached and collapsed member of the Person Formation. The feature is located within a horizontal bedding plane in the road cut for BS 46C and is about 3 to 4 feet above the existing road surface. The feature is about 5 feet by 2 feet and extends into the outcrop about 1 foot, where it pinches closed. No significant vertical openings were observed, and the feature has a sensitivity score of 25 points.

Feature F15 is a small solution-enlarged fracture located in the leached and collapsed member of the Person Formation. The feature is located within a horizontal bedding plane in the road cut for BS 46C and is about 3 to 4 feet above the existing road surface. The feature is about 15 feet by 3 feet and extends into the outcrop about 1.5 feet, where it pinches closed. No significant vertical openings were observed and the feature has a sensitivity score of 25 points.

Feature F16 is a small solution-enlarged fracture located in the leached and collapsed member of the Person Formation. The feature is located within a horizontal bedding plane in the road cut for BS 46C and is about 3 to 4 feet above the existing road surface. The feature is about 25 feet by 5 feet and extends into the outcrop about 2 feet, where it pinches closed. No significant vertical openings were observed, and the feature has a sensitivity score of 25 points.

Feature F17 is a small solution cavity located in the leached and collapsed member of the Person Formation. The feature is located within a horizontal bedding plane in the road cut for BS 46C and is about 3 to 4 feet above the existing road surface. The feature is about 0.5 foot by 2 feet and extends into the outcrop about 0.8 foot, where it pinches closed. No significant vertical openings were observed, and the feature has a sensitivity score of 25 points.

Feature F18 is the approximate location of the Comal Springs fault, where it is mapped as crossing the project area. Evidence of the fault is obscured in the streambed paralleling BS 46C by the stream alluvium, and its location is inferred based on a review of available geologic maps and aerial photographs. The feature is one of the major faults in the BFZ and forms the boundary of the Edwards Aquifer recharge zone. The feature has a sensitivity score of 60 points.

6.4 Feature Recharge Potential Evaluation

As previously indicated, each feature was scored using the matrix presented in the TCEQ Instructions to Geologists for Geologic Assessments (TCEQ 2004) and these are shown on the completed Geologic Assessment Table (TCEQ-0585-Table) in **Appendix B**. A feature scoring in excess of 40 total points is considered a sensitive feature that might require protection in the form of a setback or an engineering control, such as BMP implementation. The relative infiltration rate for each feature identified in the project area and paralleling streambed was estimated based on the characteristics of the feature and its estimated catchment area. Since none of the features observed had any evidence of significant vertical openings present, they were generally considered to have a low infiltration potential and were scored accordingly. Additionally, features located along the vertical road cut or on the steep hillside above the dry streambed were also given relatively low infiltration rate scores due to the limited catchment area for these features. The few features present within the streambed were given slightly higher infiltration rates; however, due to the lack of any observable significant vertical portals at those locations that could readily

transmit surface water into the underlying aquifer, they were not scored as sensitive. The only feature that scored above a total of 40 points was the surface trace of the Comal Springs fault where it crosses the streambed. The fault scored a total of 60 points and is considered a sensitive recharge feature (per the scoring matrix in the Geologic Assessment Table). This feature probably discharges directly to Comal Springs since it appears to exert an important structural control preventing the movement of groundwater across the fault into the confined portion of the aquifer southeast of the project area (LBG-Guyton 2004). **Figure 7** depicts the boundary of the Edwards Aquifer recharge zone in relation to the proposed project.

7.0 EFFECTS ANALYSIS

The proposed project is not expected to have substantial effects on the geology or soils of the area. Although the project may impact geologic features identified in the existing and proposed ROW, potential impacts would be limited to features that have been determined to have low recharge potential and are not sensitive features (e.g. those features located in the steep road cut), except for the Comal fault trace (ranked as sensitive on the Geologic Assessment Table). The fault trace beneath the streambed is covered with an unknown thickness of alluvium as there is no surface expression observable. However, during project construction, particularly the construction of the storm sewer system, it is possible that the excavation may be deep enough to encounter the bedrock (and thus exposing the fault) beneath the streambed. According to TCEQ's WPAP guidelines, sensitive features should be identified and considered during design and construction. If development over a significant point recharge feature and its catchment are proposed, alternatives should be provided to make up for the loss of recharge to the aquifer. TxDOT has schematically designed (i.e., detailed engineering design has not yet begun) the project to minimize excavation and to maximize the buffer zone between construction and the underlying groundwater in the Edwards Aquifer. If karst or other potential recharge features are discovered during construction (including exposing the Comal fault within the streambed), they would be handled in accordance with applicable TCEQ regulations. These require that all regulated activity be stopped within 50 feet of a feature. The feature must then be evaluated by a professional geologist and reported to the TCEQ on appropriate notification forms. Finally, a proposed method of mitigation must be prepared and submitted to the TCEQ for approval prior to implementation.

Indirect and cumulative effects of the project have been assessed in a separate report entitled *Indirect and Cumulative Impacts Analysis, BS 46C from Kerlick Lane to Landa Street, Comal County, Texas, CSJ 0215-02-048*. Research, scoping, and the results of the analysis included herein indicate that the indirect and cumulative impacts of the proposed project on geology and soils would be minor.

8.0 REFERENCES

Collins, E. W. 2000. *Geologic Map of the New Braunfels, Texas 30 X 60 Minute Quadrangle: Geologic Framework of an Urban-Growth Corridor along the Edwards Aquifer, South–Central Texas.* Bureau of Economic Geology. The University of Texas at Austin Texas, MM No.39.

Edwards Aquifer Authority (EAA). 2009. *Edwards Aquifer Authority Hydrologic Data Report for 2008.*

Jordan, T., J. Bean Jr., and W. Holmes. 1984. *Texas: A Geography.* Westview Press, Boulder and London.

LGB-Guyton Associates. 2004. *Evaluation of Augmentation Methodologies in Support of In-Situ Refugia at Comal and San Marcos Springs, Texas.* Report prepared for Edwards Aquifer Authority.

Rose, P. R. 1972. *Edwards Group, Surface and Subsurface, Central Texas.* Bureau of Economic Geology, The University of Texas at Austin Texas, Report No 74.

Small, T. A. and J. A. Hanson. 1994. *Geologic framework and Hydrogeologic Characteristics of the Edwards Aquifer Outcrop, Comal County, Texas.* USGS Water-Resources Investigations Report 94-4117.

Texas Commission on Environmental Quality (TCEQ). 2004. *Instructions to Geologists for Geologic Assessments on the Edwards Aquifer Recharge/Transition Zone.* TCEQ RG-0508, 34 p., revised October 1, 2004.

TCEQ Edwards Aquifer Viewer: http://gis3.tceq.state.tx.us/website/iredwards2/viewer.htm, Accessed January 4, 2012.

U.S. Department of Agriculture, Soil Conservation Service. 1984. *Soil Survey of Comal and Hays Counties County.*

U.S. Department of Agriculture, Soil Conservation Service. 1986. *Urban Hydrology for Small Watersheds, Technical Release 55.*

Appendix A

Project Figures

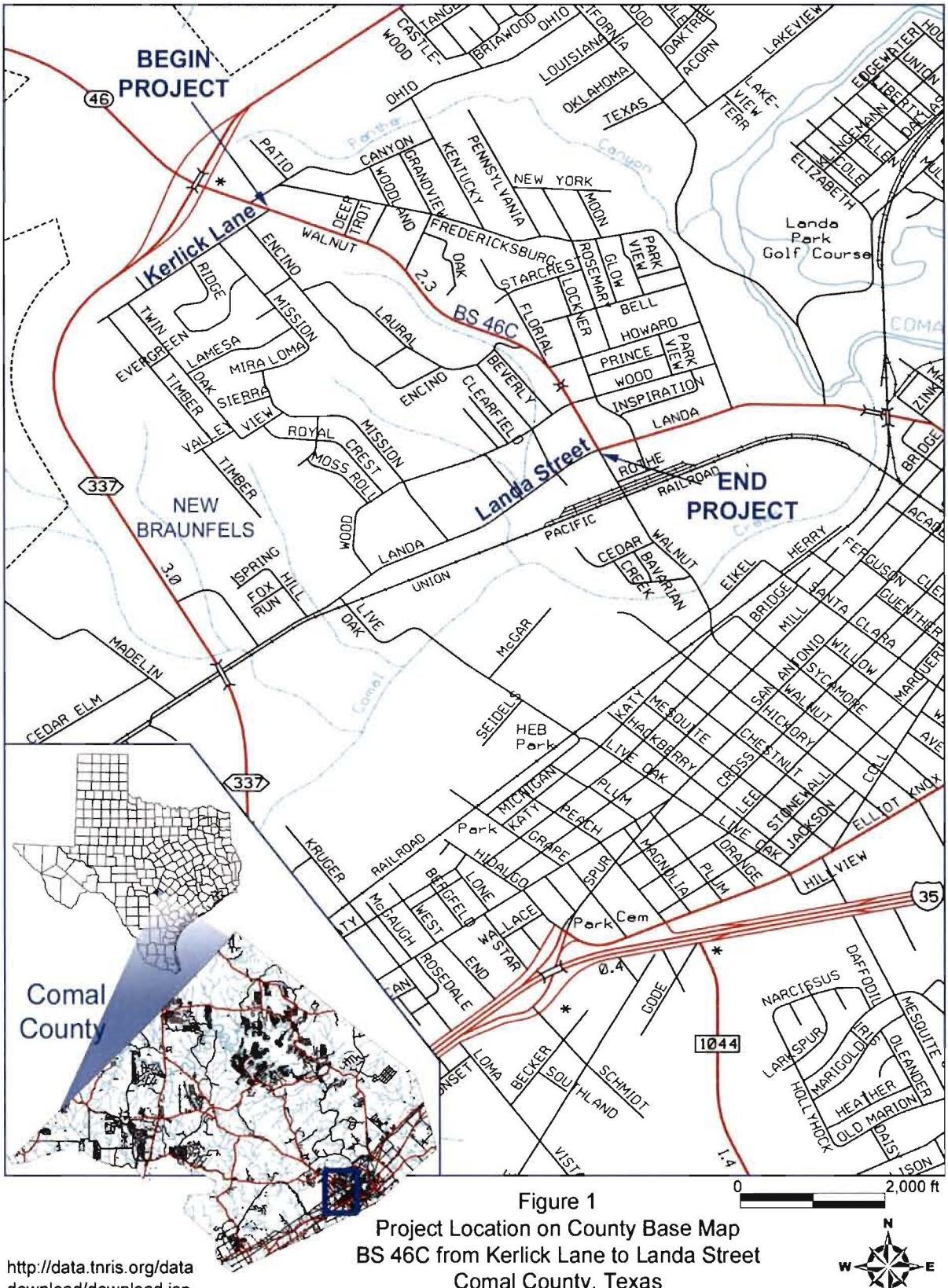
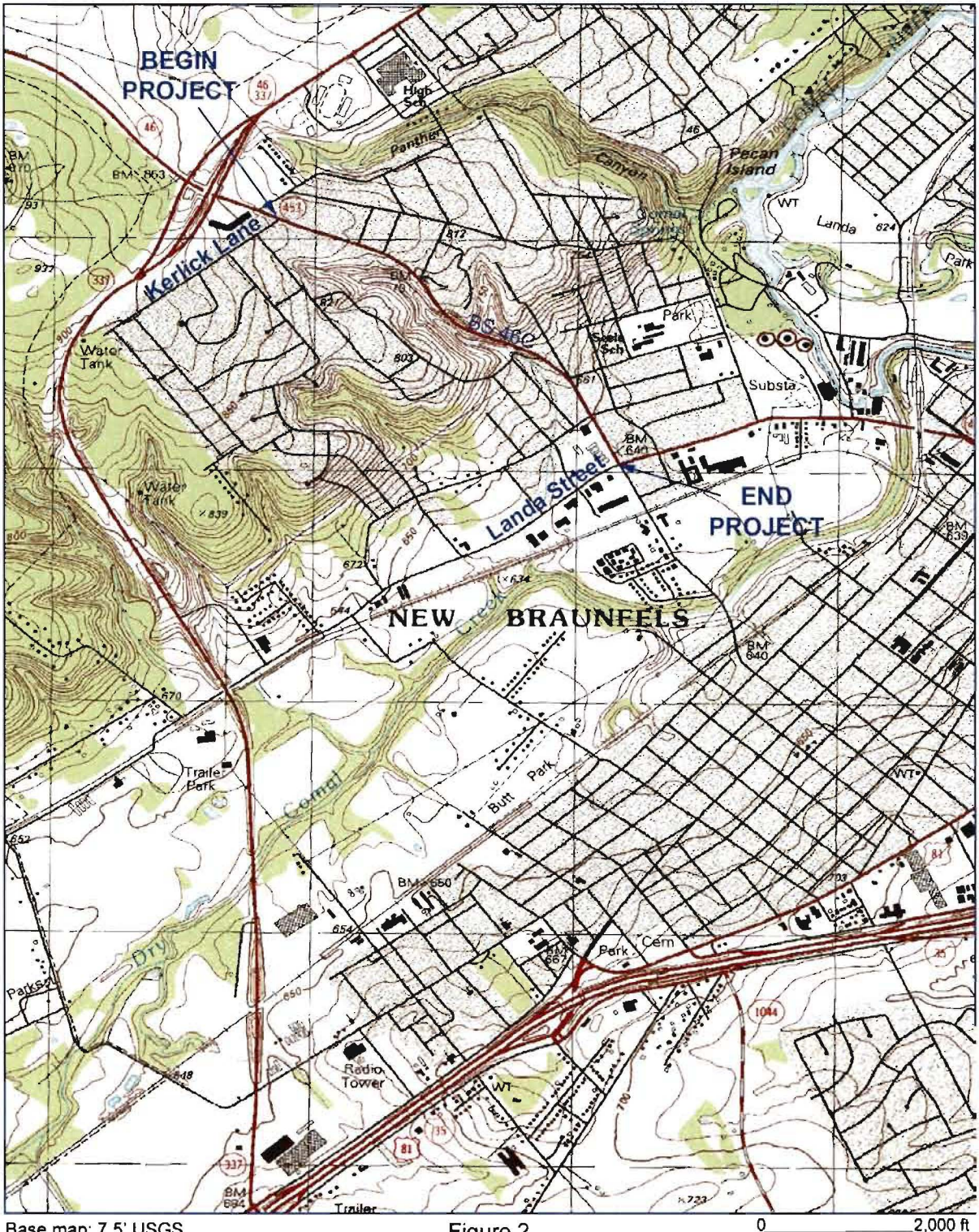


Figure 1
Project Location on County Base Map
BS 46C from Kerlick Lane to Landa Street
Comal County, Texas
CSJ: 0215-02-048

http://data.tnris.org/data download/download.jsp
Accessed 11/11



Base map: 7.5' USGS topographic quadrangle, New Braunfels West, Texas http://data.tnris.org/datadownload/download.jsp Accessed 11/11

Figure 2
Project Location on USGS Base Map
BS 46C from Kerlick Lane to Landa Street
Comal County, Texas
CSJ: 0215-02-048

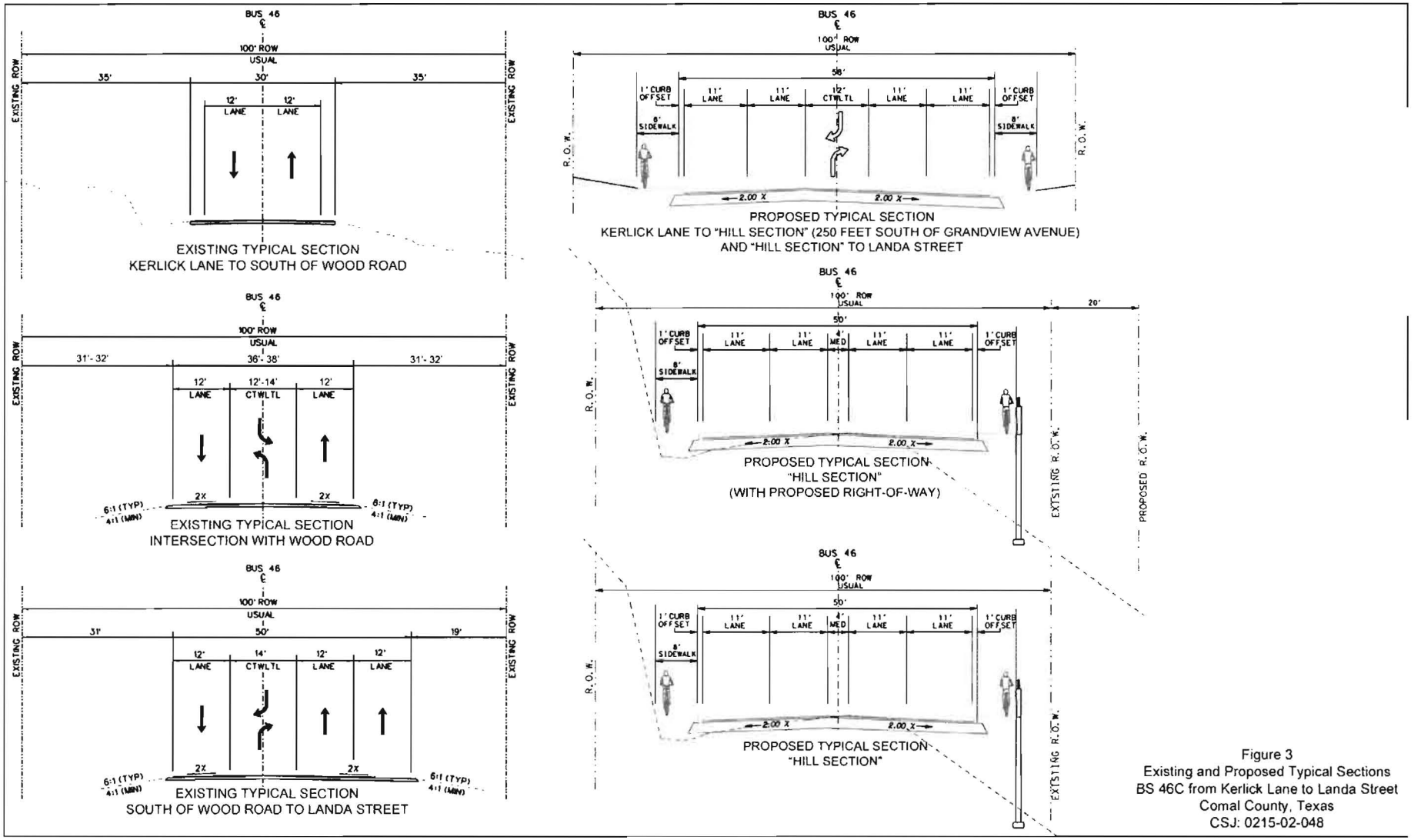


Figure 3
Existing and Proposed Typical Sections
BS 46C from Kerlick Lane to Landa Street
Comal County, Texas
CSJ: 0215-02-048

Base Map: Bing Aerial Imagery 2010 Comal County, Texas
Geology Source: Small and Henson, 1994

- Geologic Features
- Existing Right-of-way
- Proposed Right-of-way
- Approximate Location of the Comal Springs Fault
- Kep Person Formation
- Qt Quaternary Terrace
- U Up Thrown Side
- D Down Thrown Side

1:2,400

0 100 200 400

Feet

STATE OF TEXAS
RUSSELL C. FORD
GEOLOGY
#1186
LICENSED
PROFESSIONAL GEOSCIENTIST

Figure 4.1
Site Geologic Map
BS 46C from Kerlick Lane to Landa Street
Comal County
CSJ: 0215-02-048

Base Map: Bing Aerial Imagery 2010 Comal County, Texas
Geology Source: Small and Hanson, 1994

- Geologic Features
- Existing Right-of-way
- Proposed Right-of-way
- Approximate Location of the Comal Springs Fault
- Kep — Person Formation
- Qt — Quaternary Terrace
- U — Up Thrown Side
- D — Down Thrown Side

1:2,400

0 100 200 400
Feet

STATE OF TEXAS
RUSSELL C. FORD
GEOLOGY
#1185
LICENSED
PROFESSIONAL GEOLOGIST

Figure 4.2
Site Geologic Map
BS 46C from Kerlick Lane to Landa Street
Comal County
CSJ: 0215-02-048

Base Map: Bing Aerial Imagery 2010 Comal County, Texas
Geology Source: Small and Hanson, 1994

- Geologic Features
- Existing Right-of-way
- Proposed Right-of-way
- Approximate Location of the Comal Springs Fault
- Kep Person Formation
- Qt Quaternary Terrace
- U Up Thrown Side
- D Down Thrown Side

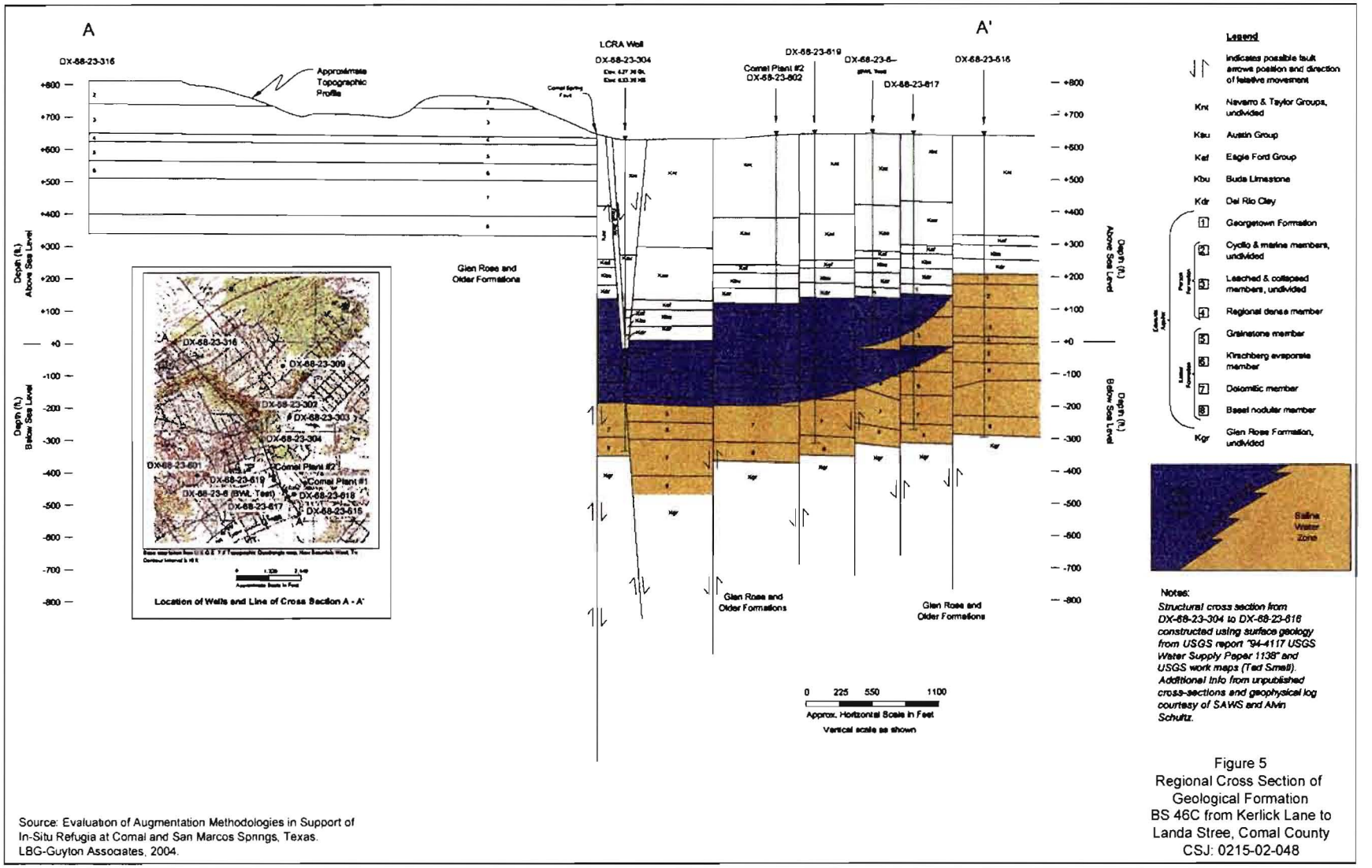
1:2,400

0 100 200 400
Feet

RUSSELL C. FORD
GEOLOGY
#1185
LICENSED
PROFESSIONAL

7/10/12

Figure 4.3
Site Geologic Map
BS 46C from Kerlick Lane to Landa Street
Comal County
CSJ: 0215-02-048



Notes:
Structural cross section from DX-68-23-304 to DX-68-23-616 constructed using surface geology from USGS report "94-4117 USGS Water Supply Paper 1138" and USGS work maps (Ted Small). Additional info from unpublished cross-sections and geophysical log courtesy of SAWS and Alvin Schultz.

Source: Evaluation of Augmentation Methodologies in Support of In-Situ Refugia at Comal and San Marcos Springs, Texas. LBG-Guyton Associates, 2004.

Figure 5
Regional Cross Section of Geological Formation
BS 46C from Kerlick Lane to Landa Stree, Comal County
CSJ: 0215-02-048

Base Map: Bing Aerial Imagery 2010 Comal County, Texas
Data Source: USDA, 1984

Existing Right-of-way
Proposed Right-of-way
USDA Soil Series

1:8,400
0 350 700 1,400
Feet

Figure 6
Site Soils Map
BS 46 from Kerlick Lane to Landa Street
Comal County
CSJ: 0215-02-048

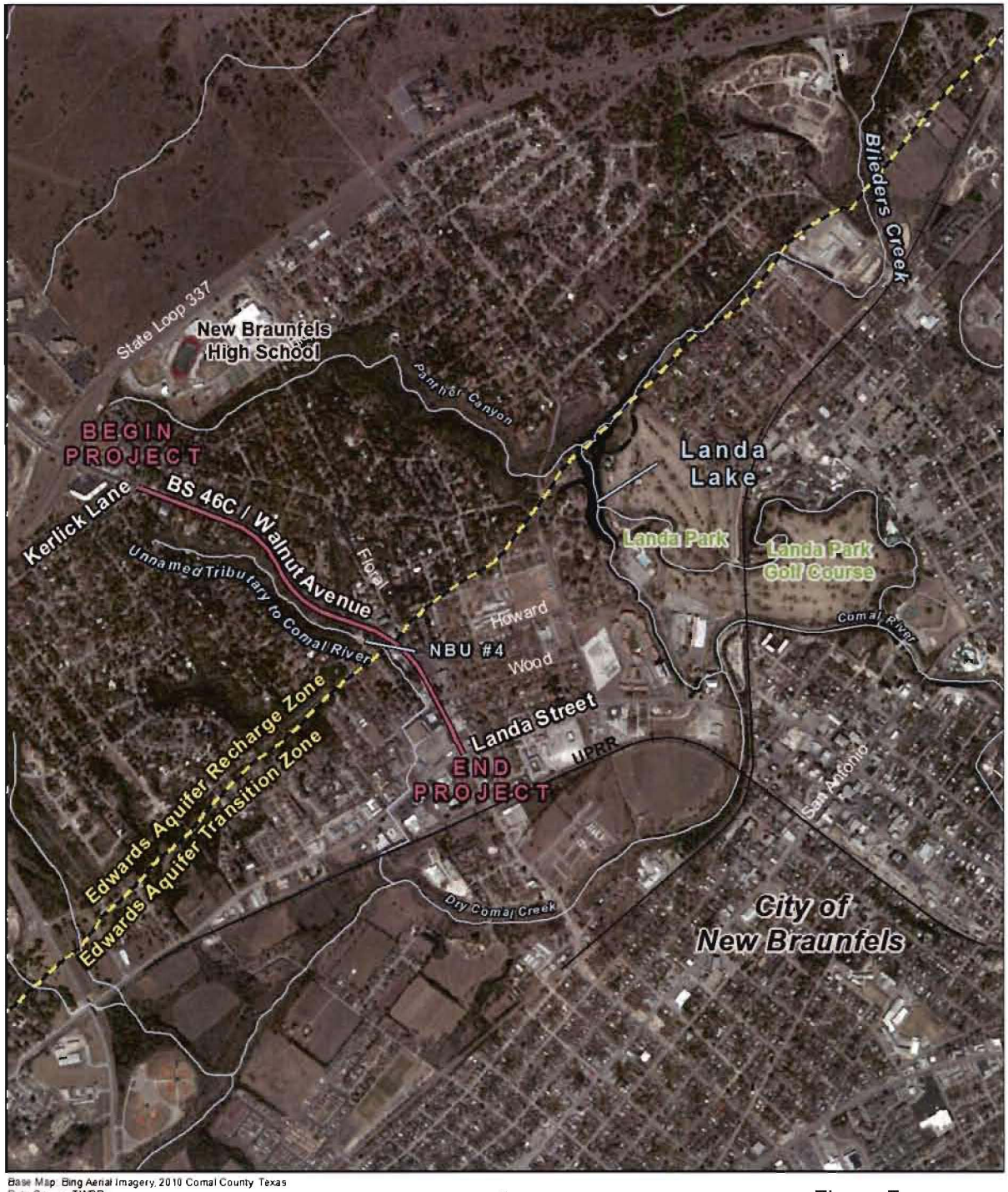


Figure 7
Edwards Aquifer Recharge Zone Boundary in Relation to Project Area
BS 46C from Kerlick Lane to Landa Street
Comal County
CSJ: 0215-02-048

Appendix B

Stratigraphic Column and TCEQ Geologic Assessment Forms

Table B-1
Stratigraphic Column

Period	Hydrogeologic Unit	Group / Formation			Thickness (ft)
Upper Cretaceous	Upper Confining Units	Pecan Gap Chalk			150-200
		Austin Chalk			200-225
		Eagle Ford Group			30-50
		Buda Limestone			40-50
		Del Rio Clay			40-50
Lower Cretaceous	Edwards Aquifer	Georgetown Formation			2-20
		Edwards Group	Person Formation	Cyclic and Marine members, undivided	80-90
				Leached and Collapsed members, undivided	70-90
				Regional Dense member	20-24
			Kainer Formation	Grainstone member	50-60
				Kirschberg Evaporite member	50-60
				Dolomitic member	110-130
				Basal Nodular member	50-60
	Lower Confining Unit	Trinity Group / Upper member of Glen Rose Limestone			350-500

Source: Modified from Small and Hanson 1994

GEOLOGIC ASSESSMENT TABLE

PROJECT NAME: BS 46 Improvements, Kerlick Lane to Landa Street, New Braunfels, TX

LOCATION			FEATURE CHARACTERISTICS												EVALUATION			PHYSICAL SETTING		
1A	1B *	1C*	2A	2B	3	4			5	5A	6	7	8A	8B	9	10		11		12
FEATUREID	LATITUDE	LONGITUDE	FEATURE TYPE	POINTS	FORMATION	DIMENSIONS (FEET)			TREND (DEGREES)	DENSITY (NO/FT)	APERTURE (FEET)		INFILL	RELATIVE INFILTRATION RATE	TOTAL	SENSITIVITY		CATCHMENT AREA (ACRES)		TOPOGRAPHY
						X	Y	Z		10						<40	≥40	<1.6	≥1.6	
F1	29° 42' 29.12"	98° 8' 42.84"	CD	5	Kep	8	8	1.5	na	0			C, O	5	10	X		X		Hillside
F2	29° 42' 29.66"	98° 8' 46.83"	SC	20	Kep	0.2	1.5	3	na	0			N	5	25	X		X		Hillside (offsite)
F3	29° 42' 31.48"	98° 8' 49.80"	SF	20	Kep	1	0.2	2	N85E	0			N	5	25	X		X		Hillside (offsite)
F4	29° 42' 31.91"	98° 8' 50.34"	SF	20	Kep	1	0.3	3	N60W	0			N	5	25	X		X		Hillside (offsite)
F5	29° 42' 33.03"	98° 8' 52.03"	O	5	Kep	15	6		na	0			N	10	15	X			X	Streambed (offsite)
F6	29° 42' 32.94"	98° 8' 52.75"	O	5	Kep	10	3		na	0			N	10	15	X			X	Streambed (offsite)
F6A	29° 42' 33.61"	98° 8' 53.54"	O	5	Kep	6	6		na	0			N	10	15	X			X	Streambed (offsite)
F7	29° 42' 34.34"	98° 8' 53.88"	O	5	Kep	8	10		na	0			N	10	15	X			X	Streambed (offsite)
F7A	29° 42' 34.26"	98° 8' 53.64"	SC	20	Kep	1.5	0.5	1.5	na	0			O	5	25	X		X		Hillside (offsite)
F8	29° 42' 37.13"	98° 8' 55.89"	CD	5	Kep	1.5	1	4	na	0			N, O	5	10	X		X		Hillside (offsite)
F9	29° 42' 36.21"	98° 8' 52.75"	SF	20	Kep	4	0.5	2	na	0			N	5	25	X		X		Cliff/Cut
F10	29° 42' 35.69"	98° 8' 52.56"	SF	20	Kep	0.8	0.5	2	NE	0			N	5	25	X		X		Cliff/Cut
F11	29° 42' 35.45"	98° 8' 52.37"	O	5	Kep	50	5		na	0			N	5	10	X		X		Cliff/Cut
F12	29° 42' 43.44"	98° 8' 51.51"	SC	20	Kep	1.5	1.5	1	na	0			N	5	25	X		X		Cliff/Cut
F13	29° 42' 33.60"	98° 8' 50.62"	SC	20	Kep	8	2	3	na	0			N	5	25	X		X		Cliff/Cut
F14	29° 42' 32.87"	98° 8' 50.34"	SC	20	Kep	5	1	2	na	0			N	5	25	X		X		Cliff/Cut
F15	29° 42' 32.23"	98° 8' 50.34"	SF	20	Kep	15	1.5	3	na	0			N	5	25	X		X		Cliff/Cut
F16	29° 42' 31.58"	98° 8' 50.34"	SF	20	Kep	25	2	5	na	0			N	5	25	X		X		Cliff/Cut
F17	29° 42' 31.11"	98° 8' 50.34"	SC	20	Kep	0.5	0.8	2	na	0			N	5	25	X		X		Cliff/Cut
F18	29° 42' 28.36"	98° 8' 39.07"	F	20	Kep-Kpg				N45E	10			F, V	30	60		X		X	Streambed

* DATUM NAD 83

2A TYPE	TYPE	2B POINTS
C	Cave	30
SC	Solution cavity	20
SF	Solution-enlarged fracture(s)	20
F	Fault	20
O	Other natural bedrock features	5
MB	Manmade feature in bedrock	30
SW	Swallow hole	30
SH	Sinkhole	20
CD	Non-karst closed depression	5
Z	Zone, clustered or aligned features	30

8A INFILLING	
N	None, exposed bedrock
C	Coarse - cobbles, breakdown, sand, gravel
O	Loose or soft mud or soil, organics, leaves, sticks, dark colors
F	Fines, compacted clay-rich sediment, soil profile, gray or red colors
V	Vegetation. Give details in narrative description
FS	Flowstone, cements, cave deposits
X	Other materials

12 TOPOGRAPHY
Cliff, Hilltop, Hillside, Drainage, Floodplain, Streambed

I have read, I understood, and I have followed the Texas Commission on Environmental Quality's instructions to Geologists. The information presented here complies with that document and is a true representation of the conditions observed in the field.

My signature certifies that I am qualified as a geologist as defined by 30 TAC Chapter 213.

Date 7/10/12

Sheet 2 of 2

TCEQ-0585-Table (Rev. 10-01-04)

Geologic Assessment
For Regulated Activities
on The Edwards Aquifer Recharge/transition Zones
and Relating to 30 TAC §213.5(b)(3), Effective June 1, 1999

REGULATED ENTITY NAME: Business 46 from Kerlick Lane to Landa Street, New Braunfels, TX

TYPE OF PROJECT: _X_ WPAP __ AST __ SCS __ UST

LOCATION OF PROJECT: _X_ Recharge Zone X Transition Zone __ Contributing Zone within the Transition Zone

PROJECT INFORMATION

1. _X_ Geologic or manmade features are described and evaluated using the attached **GEOLOGIC ASSESSMENT TABLE**.

2. Soil cover on the project site is summarized in the table below and uses the SCS Hydrologic Soil Groups* (*Urban Hydrology for Small Watersheds, Technical Release No. 55, Appendix A*, Soil Conservation Service, 1986). If there is more than one soil type on the project site, show each soil type on the site Geologic Map or a separate soils map.

Soil Units, Infiltration Characteristics & Thickness		
Soil Name	Group*	Thickness (feet)
Rumple-Comfort (RUD)	C-D	0-2.5
Purves Clay (PUC)	D	0-1.6
Eckrant-Rock Outcrop (ErG)	D	0-0.8
Lewisville Silty Clay (LeB)	B	0-5.2
Krum Clay (KrA)	D	0-6.5

* Soil Group Definitions (Abbreviated)

A. Soils having a high infiltration rate when thoroughly wetted.

B. Soils having a moderate infiltration rate when thoroughly wetted.

C. Soils having a slow infiltration rate when thoroughly wetted.

D. Soils having a very slow infiltration rate when thoroughly wetted.

3. _X_ A **STRATIGRAPHIC COLUMN** is attached at the end of this form that shows formations, members, and thicknesses. The outcropping unit should be at the top of the stratigraphic column.

4. _X_ A **NARRATIVE DESCRIPTION OF SITE SPECIFIC GEOLOGY** is attached at the end of this form. The description must include a discussion of the potential for fluid movement to the Edwards Aquifer, stratigraphy, structure, and karst characteristics of the site.

5. _X_ Appropriate **SITE GEOLOGIC MAP(S)** are attached:

The Site Geologic Map must be the same scale as the applicant's Site Plan. The minimum scale is 1" : 400'

Applicant's Site Plan Scale 1" = _200'

Site Geologic Map Scale 1" = 200'
Site Soils Map Scale (if more than 1 soil type) 1" = 700'

6. Method of collecting positional data:
   X Global Positioning System (GPS) technology.
   ___ Other method(s).

7. X The project site is shown and labeled on the Site Geologic Map.

8. X Surface geologic units are shown and labeled on the Site Geologic Map.

9. X Geologic or manmade features were discovered on the project site during the field investigation. They are shown and labeled on the Site Geologic Map and are described in the attached Geologic Assessment Table.
   ___ Geologic or manmade features were not discovered on the project site during the field investigation.

10. X The Recharge Zone boundary is shown and labeled, if appropriate.

11. All known wells (test holes, water, oil, unplugged, capped and/or abandoned, etc.):

   ___ There are ___(#) wells present on the project site and the locations are shown and labeled. (Check all of the following that apply.)
      ___ The wells are not in use and have been properly abandoned.
      ___ The wells are not in use and will be properly abandoned.
      ___ The wells are in use and comply with 16 TAC Chapter 76.
   X There are no wells or test holes of any kind known to exist on the project site.

ADMINISTRATIVE INFORMATION

12. X 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. The copies must be submitted to the appropriate regional office.

Date(s) Geologic Assessment was performed: February 8, 2012
Date(s)

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. My signature certifies that I am qualified as a geologist as defined by 30 TAC Chapter 213.

Russell C. Ford, P.G. (512) 442-1122
Print Name of Geologist Telephone
512) 442-1181
Fax

Signature of Geologist Date 7/10/12

Representing: Terracon
(Name of Company)

If you have questions on how to fill out this form or about the Edwards Aquifer protection program, please contact us at 210/490-3096 for projects located in the San Antonio Region or 512/339-2929 for projects located in the Austin Region.

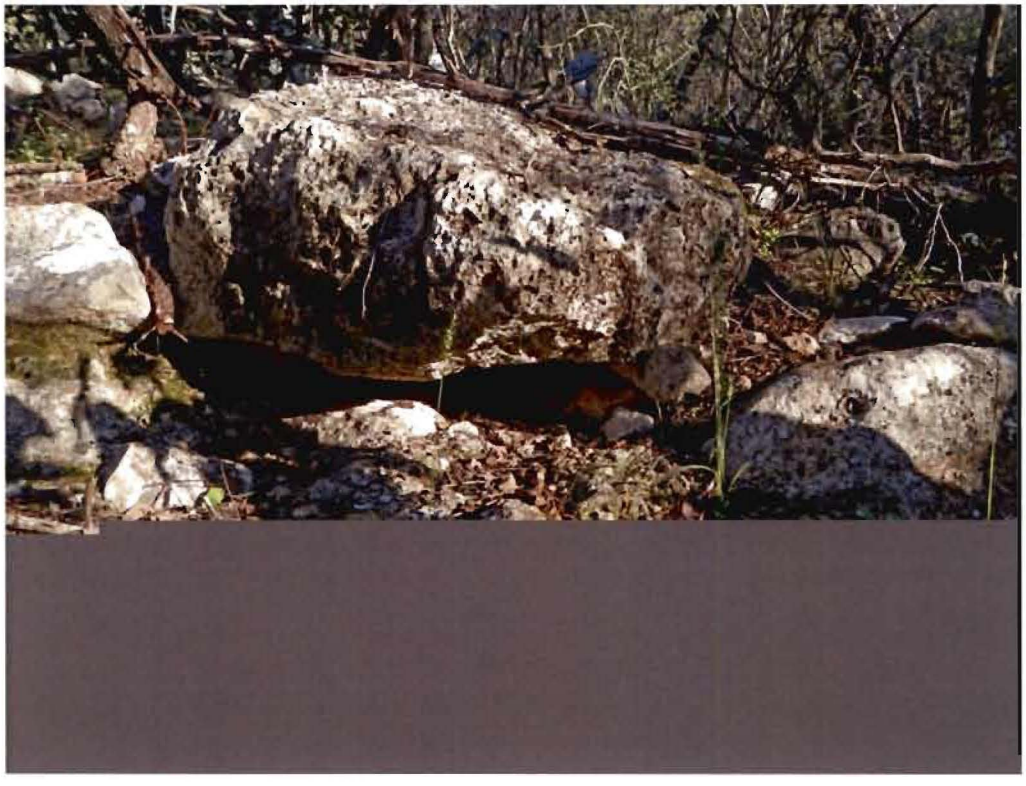
Individuals are entitled to request and review their personal information that the agency gathers on its forms. They may also have any errors in their information corrected. To review such information, contact us at 512/239-3282.

Appendix C

Geologic Feature Photographs

Feature 1

Feature 1



Feature 2

Feature 2

Feature 3

Feature 3

Feature 4

Feature 4

Feature 5

Feature 5

Feature 6

Feature 6

Feature 6A

Feature 7

Feature 7

Feature 7A

Feature 8

Feature 8

Feature 9

Feature 9

Feature 9

Feature 10

Feature 10

Feature 11

Feature 11

Feature 11

Feature 12

Feature 12

Feature 13

Feature 13

Feature 14

Feature 14

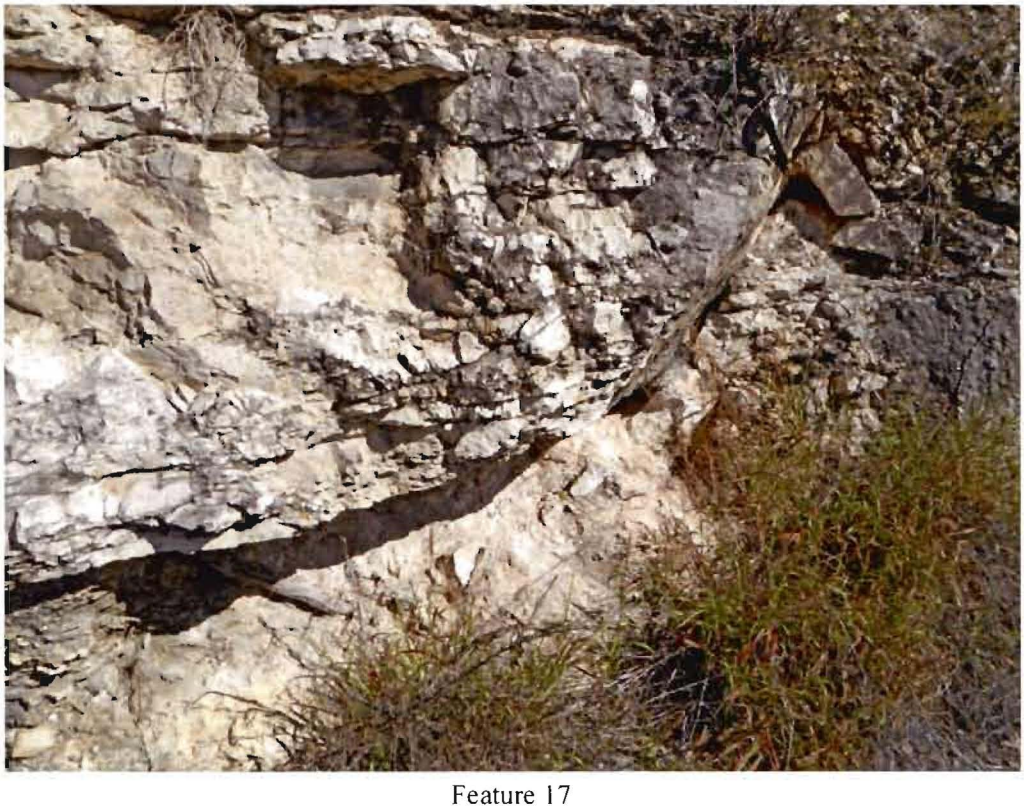
Feature 15

Feature 15

Feature 16

Feature 16

Feature 17



Feature 17

Water Pollution Abatement Plan Application
for Regulated Activities
on the Edwards Aquifer Recharge Zone
and Relating to 30 TAC §213.5(b), Effective June 1, 1999

REGULATED ENTITY NAME: BS 46-C from Kerlick Lane to Landa Drive, New Braunfels, Texas

REGULATED ENTITY INFORMATION

1. The type of project is:
   - ___ Residential: # of Lots: _____
   - ___ Residential: # of Living Unit Equivalents: _____
   - ___ Commercial
   - ___ Industrial
   - _x_ Other: TxDOT Road

2. Total site acreage (size of property): 10.01 acres

3. Projected population: 0

4. The amount and type of impervious cover expected after construction are shown below:

Impervious Cover of Proposed Project	Sq. Ft.	Sq. Ft./Acre	Acres
Structures/Rooftops	0	÷ 43,560 =	0
Parking	0	÷ 43,560 =	0
Other paved surfaces	Not calculated	÷ 43,560 =	6.98
Total Impervious Cover	Not calculated	÷ 43,560 =	6.98
Total Impervious Cover ÷ Total Acreage x 100 =			70%

Note: Above are proposed post-construction conditions.

5. _x_ **ATTACHMENT A - Factors Affecting Water Quality.** A description of any factors that could affect surface water and groundwater quality is provided at the end of this form.

6. _x_ Only inert materials as defined by 30 TAC §330.2 will be used as fill material.

FOR ROAD PROJECTS ONLY
Complete questions 7-12 if this application is exclusively for a road project.

7. Type of project:
   - _x_ 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.

8. Type of pavement or road surface to be used:
   - ___ Concrete

_x_ Asphaltic concrete pavement
__ Other: _____

9. Length of Right of Way (R.O.W.): ____ feet.
Width of R.O.W.: ____ feet.
L x W = _____ Ft^2 ÷ 43,560 Ft^2/Acre = ____ acres.

10. 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.

The overall TxDOT project is 14.25 acres. The portion on the Recharge Zone is 10.01 acres and the remaining 4.24 acres is on the Transition Zone. Runoff from the Transition Zone does not flow across the Recharge Zone.

Existing impervious cover (IC) in the Recharge Zone is 3.75 acres. The project would add 3.23 acres of IC for post construction total of 6.98 acres on the Recharge Zone. All values calculated in Microstation™.

11. __ A rest stop will be included in this project.
_x_ A rest stop will **not** be included in this project.

12. _na_ 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

13. _x_ **ATTACHMENT B - Volume and Character of Stormwater.** A description of the volume and character (quality) of the stormwater runoff which is expected to occur from the proposed project is provided at the end of this form. The estimates of stormwater runoff quality and quantity should be 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

14. The character and volume of wastewater is shown below:

__% Domestic	_____na_____ gallons/day
__% Industrial	_____na_____ gallons/day
__% Commingled	_____na_____ gallons/day
TOTAL	____na_____ gallons/day

15. Wastewater will be disposed of by:
_na_ **On-Site** Sewage Facility (OSSF/Septic Tank):
__ **ATTACHMENT C - Suitability Letter from Authorized Agent.** An on-site sewage facility will be used to treat and dispose of the wastewater. The appropriate licensing authority's (authorized agent) written approval is provided at the end of this form. It states that the land is suitable for the use of an on-site sewage facility or identifies areas that are not suitable.
__ 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.

_na_ Sewage Collection System (Sewer Lines):

__ Private service laterals from the wastewater generating facilities will be connected to an existing SCS.

__ Private service laterals from the wastewater generating facilities will be connected to a proposed SCS.

__ The SCS was previously submitted on _____.

__ The SCS was submitted with this application.

__ The SCS will be submitted at a later date. The owner is aware that the SCS may not be installed prior to Executive Director approval.

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

__ existing.

__ proposed.

16. _na_ All private service laterals will be inspected as required in 30 TAC §213.5.

SITE PLAN REQUIREMENTS

Items 17 through 27 must be included on the Site Plan.

17. The Site Plan must have a minimum scale of 1" = 400'.
Site Plan Scale: 1" = _50'_____'.

18. 100-year floodplain boundaries

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

_x_ 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):

_____

_____

19. _x_ The layout of the development is shown with existing and finished contours at appropriate, but not greater than ten-foot contour intervals. Show lots, recreation centers, buildings, roads, etc. **Please refer to Existing and Proposed Contour Layout sheets.**

__ The layout of the development is shown with existing contours. Finished topographic contours will not differ from the existing topographic configuration and are not shown.

20. All known wells (oil, water, unplugged, capped and/or abandoned, test holes, etc.):

_x_ There are _0_(#) wells present on the project site and the locations are shown and labeled. (Check all of the following that apply)

_na_ The wells are not in use and have been properly abandoned.

_na_ The wells are not in use and will be properly abandoned.

_na_ The wells are in use and comply with 16 TAC §76.

_na_ There are no wells or test holes of any kind known to exist on the project site.

21. Geologic or manmade features which are on the site:
   _x_ All **sensitive** geologic or manmade features identified in the Geologic Assessment are shown and labeled.
   __ No **sensitive** geologic or manmade features were identified in the Geologic Assessment.
   __ **ATTACHMENT D - Exception to the Required Geologic Assessment**. An exception to the Geologic Assessment requirement is requested and explained at the end of this form.

22. _x_ The drainage patterns and approximate slopes anticipated after major grading activities. **See Proposed Contour Layout Sheets for slopes; SW3P Sheets show flow patterns.**

23. _x_ Areas of soil disturbance and areas which will not be disturbed.

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

25. _x_ Locations where soil stabilization practices are expected to occur.

26. _x_ Surface waters (including wetlands). **The left bank of an ephemeral tributary to the new channel of the Comal River enters the ROW on the Recharge Zone between Sta 2221+70 and 2226+50 (see SW3P Layouts), and it crosses BS 46-C at Sta 2235+50 on the Transition Zone.**

27. _x_ Locations where stormwater discharges to surface water or sensitive features.
   __ There will be no discharges to surface water or sensitive features.

ADMINISTRATIVE INFORMATION

28. _x_ 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. The copies must be submitted to the appropriate regional office.

29. _x_ Any modification of this WPAP will require Executive Director approval, prior to construction, and may require submission of a revised application, with appropriate fees.

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 **WATER POLLUTION ABATEMENT PLAN APPLICATION FORM** is hereby submitted for TCEQ review and Executive Director approval. The form was prepared by:

John Bryant
Print Name of Customer/Agent

Bryant
Signature of Customer/Agent

4/30/13
Date

WATER POLLUTION ABATEMENT PLAN APPLICATION

ATTACHMENT A - Factors Affecting Surface Water Quality.

The project would excavate rock and soils in the State right of way and make them vulnerable to erosion. Materials used to widen the road, and construction equipment are potential sources of storm water pollutants. Construction materials include roadway base material, new topsoil, and asphalt products which are sprayed onto the widened pavement surface. Construction equipment would run on diesel or gasoline fuels and contain lubricating oils, engine coolants, and hydraulic oils. Incidental releases or accidents may cause construction material and equipment releases into soils, which could then be carried to receiving streams. Newly seeded or sodded soils may be fertilized. A storm water pollution prevention plan implemented per the TCEQ's Construction General Permit TXR150000 would minimize the incorporation of construction related pollutants into storm water runoff during the construction phase. Additional measures intended to reduce risks to water quality during construction are presented on the EPIC Plan sheet (included in back of application). After construction is complete, the additional impervious cover would generate an increase in total suspended solids (TSS) as calculated by TCEQ's technical guidance. However, the TSS would be treated with StormFilters to exceed TCEQ requirements.

ATTACHMENT B - Volume and Character of Stormwater

The runoff coefficient describes the ratio of runoff to rainfall. The pre-construction runoff coefficient is 0.74 and the post-construction coefficient would be 0.82 (whole project values). Storm water discharging from the project limits is a combination of runoff from the paved and unpaved portions of the State ROW. Runoff quality is influenced by numerous factors including natural soil chemistry, on-site land use (roadway) and area land use. The project would not cause any significant long term change in the character of the runoff. The project includes underground in-line detention facilities to slow the rate of runoff.

ATTACHMENT C - Suitability Letter from Authorized Agent

Not applicable because the project does not involve sewerage facilities.

ATTACHMENT D – Exception to the Required Geologic Assessment

Not applicable because no exception requested.

Temporary Stormwater Section
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

REGULATED ENTITY NAME: BS 46-C from Kerlick Lane to Landa Drive, New Braunfels, Texas

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:

   ___ Aboveground storage tanks with a cumulative storage capacity of less that 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.
   _x_ Fuels and hazardous substances will not be stored on-site.

2. _x_ **ATTACHMENT A - Spill Response Actions**. A description of the measures to be taken to contain any spill of hydrocarbons or hazardous substances is provided at the end of this form.

3. _x_ 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. _x_ **ATTACHMENT B - Potential Sources of Contamination.** Describe in an attachment at the end of this form any other activities or processes which may be a potential source of contamination.
   ___ There are no other potential sources of contamination.

SEQUENCE OF CONSTRUCTION

5. _x_ **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 provided at the end of this form. For each activity described, an estimate of the total area of the site to be disturbed by each activity is given.

6. _x_ 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: **The left bank of an ephemeral tributary to the new channel of the Comal River enters the ROW on the Recharge Zone between Sta 2221+70 and 2226+50 (see SW3P Layouts) and it crosses BS 46-C at Sta 2235+50 on the Transition Zone.**

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. _x_ **ATTACHMENT D - Temporary Best Management Practices and Measures.** A description of the TBMPs and measures that will be used during and after construction are provided at the end of this form. For each activity listed in the sequence of construction, include appropriate control measures and the general timing (or sequence) during the construction process that the measures will be implemented.

   _x_ 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 has been provided in the attachment at the end of this form

   a. 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.

   b. 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.

   c. A description of how BMPs and measures will prevent pollutants from entering surface streams, sensitive features, or the aquifer.

   d. 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 provided at the end of this form. The request includes justification as to why no reasonable and practicable alternative exists for each feature.

   _x_ There will be no temporary sealing of naturally-occurring sensitive features on the site.

9. _x_ **ATTACHMENT F - Structural Practices.** Describe 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. Placement of structural practices in floodplains has been avoided.

10. _x_ **ATTACHMENT G - Drainage Area Map**. A drainage area map is provided at the end of this form to support the following requirements.

    _na_ For areas that will have more than 10 acres within a common drainage area disturbed at one time, a sediment basin will be provided.

_na_ 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.

_na_ 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.

_na_ 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.

11. _na_ **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 has 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 provided as at the end of this form.

12. _x_ **ATTACHMENT I - Inspection and Maintenance for BMPs.** A plan for the inspection of temporary BMPs and measures and for their timely maintenance, repairs, and, if necessary, retrofit is provided at the end of this form. A description of documentation procedures and recordkeeping practices is included in the plan.

13. _x_ 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. _x_ 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. _x_ 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. _x_ 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. _x_ **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 at the end of this form.

18. _x_ 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. _x_ Stabilization practices must be initiated as soon as practicable where construction activities have temporarily or permanently ceased.

ADMINISTRATIVE INFORMATION

20. _x_ All structural controls will be inspected and maintained according to the submitted and approved operation and maintenance plan for the project.

21. _x_ 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. _x_ 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.

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:

John Bryant
Print Name of Customer/Agent

Signature of Customer/Agent

4/30/13
Date

TEMPORARY STORMWATER SECTION

ATTACHMENT A – Spill Response Actions
TxDOT's plans require the contractor to remediate any spills that they cause, and to report such spills as follows:

- To the National Response Center at (800) 424-8802,
- To the Edwards Aquifer Authority at (210) 222-2204,
- To the State Emergency Response Center (800) 832-8224 (if after hours), or
- To the TCEQ Regional Office (210) 490-3096. (if during business hours)
- Spills involving sanitary sewers shall be reported to New Braunfels Utilities at 830 608-8800.

Spills shall be reported within 24 hours unless regulations require more expedient notification.

Refer to the EPIC Plan Sheet and SW3P Narrative Sheet for additional information.

ATTACHMENT B – Potential Sources of Contamination
Potential pollutants include disturbed soil/rock and plant matter; fuel and oil from construction equipment; concrete products including curing compounds; asphalt products, and aggregates such as road base and gravel. Sanitary sewer lines are a potential source of pollutants. The 24 hour dispatch phone number for New Braunfels Utilities (NBU), the sanitary sewer owner and operator, is included on TxDOT's EPIC Plan sheet in case of emergency. NBU operates the sanitary sewer lines, public potable water supply lines and nearby Edwards aquifer well NBU #4.

ATTACHMENT C – Sequence of Major Activities
See attached sequence of work (1 sheet)

ATTACHMENT D – Temporary BMPs
Please refer to the TxDOT Storm Water Pollution Prevention Plan (SW3P) narrative sheet, SW3P layouts, and EC sheets which describe the structural practices in detail.

ATTACHMENT E – Request to Temporarily Seal a Feature
Not applicable – no temporary sealing is proposed.

ATTACHMENT F – Structural Practices
Structural practices for this project include silt containment fence and rock filter dams to promote sedimentation and soil retention blankets to minimize erosion.

ATTACHMENT G – Drainage Area Map
The total area of the project limits is approximately 14.25 acres. Approximately 10.01 acres of this lies within the Recharge zone and approximately 4.24 acres is in the Transition Zone. The portion in the Transition Zone does not drain to the Recharge Zone.

Most of drainage in the portion of the project limits within the Recharge Zone outfalls from the State right of way at four (4) cross drainage culverts. These internal drainage areas correspond to BMP basin areas B-1 through B-4, as shown on the WPAP Layouts. The largest of these four drainage areas is 2.56 acres. Thus, 10 acre threshold would not be met. The total estimated soil disturbance for the whole project limits is approximately 9.98 acres. No temporary sediment basins or traps are proposed.

ATTACHMENT H – Temporary Sediment Ponds and Calculations
Not applicable – no temporary ponds are proposed.

ATTACHMENT I – Inspection and Maintenance for BMPs - See attached

ATTACHMENT J – Schedule of Interim and Permanent Soil Stabilization
All areas not planned for impervious cover (asphalt/concrete) would be permanently stabilized prior to completion of the project. The Landscape Layouts show the project's re-vegetation plans. Attachment C (Sequence of Major Activities) addressed the stabilization task relative to other tasks.

SEQUENCE OF WORK

PHASE I

STAGE I

A) CONSTRUCT THE BRIDGE CLASS CULVERT AT STA. 2235+69.60 IN TWO STEPS AS FOLLOWS:

1) CONSTRUCT DOWNSTREAM SECTION:
   a) CONSTRUCT DETOUR WIDENING FOR DETOURS DIECBST01 AND DICNBST01 AS SHOWN ON THE TCP LAYOUTS.
   b) MOVE TRAFFIC TO DETOUR AND PLACE LP CTB AS SHOWN ON THE TCP LAYOUTS.
   c) REMOVE SECTION OF EXISTING STRUCTURE AND CONSTRUCT DOWNSTREAM SECTION OF PROPOSED STRUCTURE AS SHOWN ON THE TCP LAYOUTS.

2) CONSTRUCT UPSTREAM SECTION:
   a) CONSTRUCT DETOUR WIDENING FOR DETOURS DIECBST02 AND DICNBST02 AS SHOWN ON THE TCP LAYOUTS.
   b) MOVE TRAFFIC TO DETOUR AND PLACE LP CTB AS SHOWN ON THE TCP LAYOUTS. (NOTE: BOTH ENDS OF THE DETOUR WIDENING NEED TO BE CONSTRUCTED TO A THE WIDTH THAT WILL BE USED FOR THIS DETOUR AS WELL AS FOR DETOUR DIPH1ST01.)
   c) REMOVE REMAINING SECTION OF EXISTING STRUCTURE AND CONSTRUCT REMAINING UPSTREAM SECTION OF THE PROPOSED STRUCTURE AS SHOWN ON THE TCP LAYOUTS.

B) CONSTRUCT THE DETOUR WIDENING ON THE LEFT SIDE FOR DETOUR DIPH1ST01 AS SHOWN ON THE TCP LAYOUT INCLUDING CONSTRUCTION OF THE FOLLOWING:

1) LEFT SIDE WIDENING CROSS DRAINAGE STRUCTURE STA. 2191+53.

2) LEFT SIDE WIDENING CROSS DRAINAGE STRUCTURE STA. 2207+11.78.

3) LEFT SIDE WIDENING CROSS DRAINAGE STRUCTURE STA. 2221+90.11.

4) LEFT SIDE WIDENING CROSS DRAINAGE STRUCTURE STA. 2225+61.41.

C) UPON COMPLETION OF THE DETOUR AND STRUCTURE WIDENINGS ABOVE, PLACE DETOUR PAVEMENT MARKINGS, MOVE TRAFFIC TO THE DETOUR AND PLACE LP PCTB AS SHOWN ON THE TCP LAYOUTS.

D) CONSTRUCT THE RIGHT/OUTSIDE HALF OF THE RIGHT SIDE OF THE ROADWAY FROM THE BEGINNING OF PROJECT TO THE END OF THE PROJECT COMPLETE THRU FIRST MAT OF HMA TY C, INCLUDING CURB, SIDEWALK, DRIVEWAYS, COMPOST MANUFACTURED TOPSOIL, SODDING AND SIGNING AS APPROVED/DIRECTED BY THE ENGINEER

1) RIGHT SIDE WIDENING CROSS DRAINAGE STRUCTURE STA. 2191+53.

2) RIGHT SIDE WIDENING CROSS DRAINAGE STRUCTURE STA. 2207+11.78

3) RIGHT SIDE WIDENING CROSS DRAINAGE STRUCTURE STA. 2221+90.11

4) RIGHT SIDE WIDENING CROSS DRAINAGE STRUCTURE STA. 2225+61.41

5) REMOVAL ON RIGHT SIDE OF CROSS DRAINAGE STRUCTURE STA. 2243+75.04

6) LOCATION NO. 1 OF TY C CURB.

7) LOCATION NO. 1 OF TY F CURB.

8) RETAINING WALL NO. 1

9) STORM DRAIN LINE B - INLET SD-18 THRU INLET SD-19

10) STORM DRAIN LINE D - INLET SD-20 THRU OUTFALL2

11) STORM DRAIN LINE F - INLET SD-15 THRU OUTFALL3

12) STORM DRAIN LINE I - INLET SD-42 THRU OUTFALL4

13) STORM DRAIN LINE K - INLET SD-49 THRU OUTLET4

14) STORM DRAIN LINE M - INLET SD-61 AND INLET SD-62

15) STORM DRAIN LINE O - INLET SD-63 THRU INLET SD-67

16) STORM DRAIN LINE P

SEQUENCE OF WORK (CONT)

STAGE II

A) UPON COMPLETION OF PHASE I - STAGE I CONSTRUCTION, PLACE DETOUR PAVEMENT MARKINGS, PLACE LP PCTB AND MOVE TRAFFIC TO DETOUR AS SHOWN ON TCP LAYOUTS.

B) CONSTRUCT THE INSIDE SECTION OF THE RIGHT SIDE OF THE ROADWAY FROM THE BEGINNING OF THE PROJECT TO THE END OF THE PROJECT COMPLET THRU THE FIRST MAT OF HMA TY C.

PHASE II

STAGE I

A) UPON COMPLETION OF PHASE I - STAGE II CONSTRUCTION, MOVE LP PCTB, PLACE DETOUR PAVEMENT MARKINGS AND MOVE TRAFFIC TO DETOUR AS SHOWN ON TCP LAYOUTS.

B) CONSTRUCT THE LEFT SIDE OF THE ROADWAY FROM BEGINNING OF THE PROJECT TO THE END OF PROJECT COMPLETE THRU FIRST MAT OF HMA TY C, INCLUDING CURB, SIDEWALK, DRIVEWAYS, COMPOST MANUFACTURED TOPSOIL, SODDING AND SIGNING AS APPROVED/DIRECTED BY THE ENGINEER.

1) LOCATION NO. 2 OF TY C CURB

2) LOCATION NO. 3 OF TY C CURB

3) LOCATION NO. 2 OF TY F CURB

4) RETAINING WALL NO. 2

5) LEFT SIDE OF CROSS DRAINAGE STRUCTURE STA. 2243+75.04

6) STORM DRAIN LINE A

7) STORM DRAIN LINE C

8) STORM DRAIN LINE G

9) STORM DRAIN LINE H

10) STORM DRAIN LINE J

11) STORM DRAIN INLET SD-48

12) STORM DRAIN LINE L

13) STORM DRAIN LINE N

STAGE II

A) UPON COMPLETION OF PHASE II - STAGE I CONSTRUCTION, PLACE FINAL MAT OF HMA TY C OVER ENTIRE PROJECT LIMITS.

B) PLACE PERMANENT PAVEMENT MARKINGS

C) CLEAN-UP.

STATE OF TEXAS
LINDA COX
90283
LICENSED PROFESSIONAL ENGINEER

P.E.

FINAL PLANS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO. 10 - 6
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

BS 46-C

SEQUENCE OF WORK

Form 2118
(Rev. 5/2005)
(GSD-EPC)

CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN
FIELD INSPECTION AND MAINTENANCE REPORT

Project Information:

Controlling CSJ:		Inspection Cycle Option:	☐ 1. At least every 14 calendar days and within 24 hours after 0.5 inches or more of rainfall.	Inspection Date:	
Controlling Project:			☐ 2. At least every 7 calendar days.	TCEQ Authorization Number: (If Applicable)	
Controlling Highway:			☐ 3. At least monthly [Engineer approved revision to SWP3 required.]	Date of Last Rainfall:	
Controlling County:				Amount of Last Rainfall:	

Areas Inspected:

Area:	Inspected? (Y/NA)	Area:	Inspected? (Y/NA)	Area:	Inspected? (Y/NA)
Disturbed Soil Areas		Structural Controls		Entrance(s) & Exit(s)	
Material Storage Areas		Sediment & Erosion Controls		Other:	

Describe how the inspection was conducted:

Best Management Practices (BMPs) Inspected:

Except those listed below, all BMPs have been inspected and found to be functioning as intended and do not require maintenance, upgrading or additional controls? (If multiple highways or project locations are involved, identify the highway or project location for the BMP requiring maintenance or improvement.)

BMP Type	Approximate Station		Lt or Rt of Centerline	BMP Required Maintenance or Improvement (Describe required corrective actions needed and taken or directions given to the contractor.)
	From:	To:		

Additional BMPs Needed (Any BMPs not shown on the SWP3 must be approved by the Engineer. If multiple highways or project locations are involved, identify the highway or project location for the additional BMP.):

Approximate Station		Lt or Rt of Centerline	BMP to be Installed (Describe required corrective actions needed and taken or directions given to the contractor.)
From:	To:		

Attachment I

Form 2118
(Rev. 5/2005)
(GSD-EPC)

CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN
FIELD INSPECTION AND MAINTENANCE REPORT

Temporarily or Permanently Ceased Construction Activities: Where construction activities (grading, excavating, embankment, or other land disturbing activities) have temporarily or permanently ceased, describe why stabilization measures were not initiated within 14 days of when the construction activities ceased or if additional construction activities will not occur within 21 days of when construction activities were temporarily ceased. (Include the general location of the area involved if it is only part of the site)

Actions to be taken as a result of this inspection.

Furnish a copy of this inspection report to the contractor so necessary maintenance or improvement actions can be taken. Document all changes to the SWP3 after the Engineer has approved them.

Contractor's Representative Name:	Title:	Date:

Compliance Certification *(Check only one)* **:**

☐ With the maintenance and improvements actions noted, the site is in compliance with the SWP3 and the CGP regulations.

☐ The site is in potential non-compliance with the SWP3 or the CGP regulations. Complete the following "Potential Non-Compliance Issues" section of this inspection report.

TxDOT's Representative Name:	Title.	Date.

TxDOT's Representative Signature:

Potential Non-Compliance Issues:

Describe potential non-compliance issues (repeated failure of a BMP, failure to install a required BMP, off-site discharges [silt, gravel, sand, oily water, other pollutant], potential off-site discharges, etc.)	Location on-site where discharge occurred

Forward this inspection report to your Supervisor immediately if any potential non-compliance issues are listed.

Inspection Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

TxDOT's Certifying Representative Name:	Title:	Date:

Signature:

1. Buffer Zone	9. Excess Dirt removed from Rdwy Daily	17. Rock Bed at Construction Exit	25 Storm Sewers
2. Channel Liner	10. Haul Roads Dampened for Dust Control	18. Rock Berm	26. Temporary Seeding
3. Cleanup of Possible Contaminants	11 Hay Bales	19. Sediment Basin	27. Timber Mat at Construction Exit
4. Compost Materials	12 Mulch	20. Sediment Trap	28. Velocity Control Devices
5 Curbs and gutters	13. Paved Flume	21. Silt Fence	29
6. Diversion Dike	14. Permanent Plant, Sod or Seed	22 Soil Retention Blanket	30
7 Diversion Dike/Swale	15 Pipe Slope Drain	23. Stone Outlet Structure	31
8 Diversion Swale	16. Preserve Natural Resource	24. Storm Inlet Sediment Trap	32

Permanent Stormwater Section
for Regulated Activities
on the Edwards Aquifer Recharge Zone
and Relating to 30 TAC §213.5(b)(4)(C), (D)(li), (E), and (5), Effective June 1, 1999

REGULATED ENTITY NAME: BS 46-C from Kerlick Lane to Landa Drive, New Braunfels, Texas

Permanent best management practices (BMPs) and measures that will be used during and after construction is completed.

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

2. x 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.

   x 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 provided below:

   _____

   _____

3. x 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.

4. na 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.

   __ This site will be used for low density single-family residential development and has 20% or less impervious cover.

   __ This site will be used for low density single-family residential development but has more than 20% impervious cover.

   __ This site will not be used for low density single-family residential development.

5. na 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 A - 20% or Less Impervious Cover Waiver.** This 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 found at the end of this form.

__ This site will be used for multi-family residential developments, schools, or small business sites but has more than 20% impervious cover.

__ This site will not be used for multi-family residential developments, schools, or small business sites.

6. **ATTACHMENT B - BMPs for Upgradient Stormwater.**

_x_ 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 identified as **ATTACHMENT B** at the end of this form.

__ If no surface water, groundwater or stormwater originates upgradient from the site and flows across the site, an explanation is provided as **ATTACHMENT B** at the end of this form.

__ If 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, an explanation is provided as **ATTACHMENT B** at the end of this form.

7. **ATTACHMENT C - BMPs for On-site Stormwater.**

_x_ 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 identified as **ATTACHMENT C** at the end of this form.

__ If 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, an explanation is provided as **ATTACHMENT C** at the end of this form.

8. _x_ **ATTACHMENT D - BMPs for Surface Streams.** A description of the BMPs and measures that prevent pollutants from entering surface streams, sensitive features, or the aquifer is provided at the end of this form. Each feature identified in the Geologic Assessment as "sensitive" has been addressed.

9. _x_ The applicant understands that to the extent practicable, BMPs and measures must maintain flow to naturally occurring sensitive features identified in either the geologic assessment, executive director review, or during excavation, blasting, or construction.

__ The permanent sealing of or diversion of flow from a naturally-occurring "sensitive" or "possibly sensitive" feature that accepts recharge to the Edwards Aquifer as a permanent pollution abatement measure has not been proposed for any naturally-occurring "sensitive" or "possibly sensitive" features on this site.

_x_ **ATTACHMENT E - Request to Seal Features.** A request to seal a naturally-occurring "sensitive" or "possibly sensitive" feature, that includes a justification as to why no reasonable and practicable alternative exists, is found at the end of this form. A request and justification has been provided for each feature.

10. _x_ **ATTACHMENT F - 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. All construction plans and design information have been signed, sealed, and dated by the Texas Licensed Professional Engineer. Construction plans for the proposed permanent BMPs and measures are provided at the end of this form. Design Calculations, TCEQ Construction Notes, all man-made or naturally occurring geologic features, all

proposed structural measures, and appropriate details must be shown on the construction plans.

11. _x_ **ATTACHMENT G - Inspection, Maintenance, Repair and Retrofit Plan.** A plan for the inspection, maintenance, repair, and, if necessary, retrofit of the permanent BMPs and measures is provided at the end of this form. The plan has been prepared and certified by the engineer designing the permanent BMPs and measures. The plan has been signed by the owner or responsible party. The plan includes procedures for documenting inspections, maintenance, repairs, and, if necessary, retrofits as well as a discussion of record keeping procedures.

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

__ Pilot-scale field testing (including water quality monitoring) may be required for BMPs that are not contained in technical guidance recognized by or prepared by the executive director.

__ **ATTACHMENT H - Pilot-Scale Field Testing Plan.** A plan for pilot-scale field testing is provided at the end of this form.

13. _x_ **ATTACHMENT I -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 provided at the end of this form. 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 results in water quality degradation.

Responsibility for maintenance of permanent BMPs and measures after construction is complete.

14. _x_ 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.

15. _x_ 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.

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 **PERMANENT STORMWATER SECTION** is hereby submitted for TCEQ review and executive director approval. The application was prepared by:

John Bryant
Print Name of Customer/Agent

Signature of Customer/Agent

4/30/13
Date

PERMANENT STORM WATER

ATTACHMENT A - 20% or Less Impervious Cover Waiver
Not applicable because this threshold is exceeded.

ATTACHMENT B - BMPs for Upgradient Stormwater
The project does not include features to provide post-construction treatment of runoff from upgradient locations.

ATTACHMENT C - BMPs for On-site Stormwater
StormFilters would be used to remove TSS from on-site stormwater. The treatment is designed to exceed TCEQ requirements. Basins B-1 through B-4 would be located on the Recharge Zone as shown on the WPAP Layouts. The WPAP Layout sheets show each BMP and its corresponding drainage area.

Details on BMPs on the Recharge Zone These BMPs are intended for compliance with 30 TAC 213		
WPAP Basin ID	**TSS Removed/yr (lbs)**	**Number of Cartridges**
B-1	316	6
B-2	1,613	27
B-3	1,569	27
B-4	383	7
Total TSS removal on Recharge Zone	**3,881 lbs**	

Compliance with Edwards Rules would require removal of 2,899 lbs/yr of total suspended solids (TSS) from the Recharge Zone. The proposed project would remove 3,881 lbs/yr of TSS from the Recharge Zone, thereby exceeding the minimum requirement necessary for compliance with 30 TAC 213.

Additional Information
The following information is included for informational purposes. Due to the presence of a nearby public water supply well (NBU #4) and Comal Springs, this project included a voluntary goal to remove more than 100% of the net increase in TSS resulting from the project's increases in impervious cover on the Recharge Zone. Thus, the project's goal was a design that would remove more than 3,624 lbs/yr of TSS, and based on this design, this goal would be met.

The WPAP Layout sheets also show Basins B-5 through B-7A/B-7B. These are located off the Recharge Zone and these would be included in the project for environmental benefits not required by 30 TAC 213.

Details on BMPs located off the Recharge Zone These BMPs are not intended for compliance with 30 TAC 213.		
WPAP Basin ID	**TSS Removed/yr (lbs)**	**Number of Cartridges**
B-5 – see note below	882	15
B-6	294	5
B-7A	293	5
B-7B	320	6
TSS removal off the Recharge Zone	**1,789 lbs**	
The drainage area for Basin B-5 includes portions of the Recharge Zone and the Transition Zone. The water captured from the Recharge Zone portion of B-5's drainage area could not be treated and released to the Recharge Zone – it can only be released to the Transition Zone. However, the increased TSS resulting from additional impervious cover to the Recharge Zone in B-5's drainage area was accounted for in Basins B-1 through B-4.		

ATTACHMENT D - BMPs for Surface Streams (and sensitive features)
An un-named tributary parallels the road and briefly enters the right of way near the base of the hill in the Recharge Zone, and it later crosses underneath BS 46-C on the Transition Zone. Silt fences and rock filter dams would be used to protect the unnamed tributary from pollutant runoff during construction. Stormfilters would be used to protect the unnamed tributary after construction is complete.

F-18	The Comal Springs Fault, which coincides with the Recharge Zone-Transition Zone boundary, is the only feature in the project limits that ranked as sensitive by the geologist (See Geological Assessment). However, the fault is not visible within the project limits. It is covered by Quaternary deposits, including soil and fill. There are no bedrock exposures or visible voids in bedrock at the mapped fault location.

ATTACHMENT E – Request to Seal Features
No sensitive features would be sealed.

ATTACHMENT F - Construction Plans
See attached plans

ATTACHMENT G - Inspection, Maintenance, Repair and Retrofit Plan
See attached plan

ATTACHMENT H - Pilot-Scale Field Testing Plan. – Not applicable

ATTACHMENT I - Measures for Minimizing Surface Stream Contamination.
In addition to StormFilters, which will filter runoff from the pavement, the project includes additional detention devices to minimize the impacts of the project on stream flows. As a result, the project represents only a minor change from existing conditions and would not substantially impact stream flashing, the creation of stronger flows and in-stream velocities.

IMPERVIOUS COVER CALCULATIONS - INSIDE EDWARDS AQUIFER RECHARGE ZONE

PROJECT NAME ***BS 46-C FROM KERLICK LANE TO LANDA STREET***
CSJ: 0215-02-048

Length of Project =	1.09 miles	5,749.92 feet	
EXISTING ROW (Area calculated in microstation) =		435,926.00 ft^2	10.01 acres
EXISTING ROADWAY (Area calculated in microstation) =		163,382.00 ft^2	3.75 acres
EXISTING DRIVEWAYS & PARKING AREAS (Area calculated in microstation) =		0.00 ft^2	0.00 acres
EXISTING RIP-RAP (Area calculated in microstation) =		0.00 ft^2	0.00 acres
TOTAL EXISTING IMPERVIOUS COVER		163,382.00 ft^2	3.75 acres
PROPOSED ROW (Same as existing)		435,926.00 ft^2	10.01 acres
PROPOSED ROADWAY (Area calculated in microstation) =		304,115.00 ft^2	6.98 acres
PROPOSED DRIVEWAYS (Area calculated in microstation) =		0.00 ft^2	0.00 acres
PROPOSED RIP-RAP (Area calculated in microstation) =		0.00 ft^2	0.00 acres
TOTAL PROPOSED IMPERVIOUS COVER		304,115.00 ft^2	6.98 acres
Pre-Construction Fraction of Impervious Cover (IC)			37.48 %
Post-Construction Fraction of Impervious Cover (IC)			69.76 %
Net increase in Impervious Area (An)		140,733.00 ft^2	3.23 acres

Runoff Coefficient Calculations:

Pre-Construction Runoff

$Rv = 1.72x(IC)^3 - 1.97x(IC)^2 + 1.23x(IC) + 0.02$

$Rv = 1.72x(0.3444)^3 - 1.97x(0.3444)^2 + 1.23x(0.3444) + 0.02$

$Rv = 0.29$

Post-Construction Runoff

$Rv = 1.72x(IC)^3 - 1.97x(IC)^2 + 1.23x(IC) + 0.02$

$Rv = 1.72x(0.4318)^3 - 1.97x(0.4318)^2 + 1.23x(0.4318) + 0.02$

$Rv = 0.50$

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

Linda Cox, PE
April 18, 2013

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Area Within Edwards Aquifer Recharge Zone

Project Name: BS 46-C

Date Prepared: 4/18/2013

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

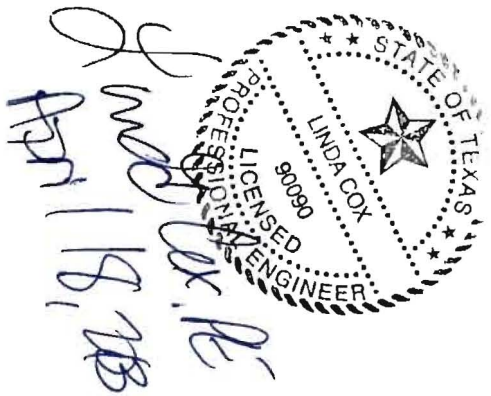
A_N = Net increase in impervious area for the project

P = Average annual precipitation, inches

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

County =	**Comal**	
Total project area included in plan * =	**10.01**	acres
Predevelopment impervious area within the limits of the plan * =	**3.75**	acres
Total post-development impervious area within the limits of the plan* =	**6.98**	acres
Total post-development impervious cover fraction * =	**0.70**	
P =	**33**	inches

$L_{M\ (80\%)TOTAL\ PROJECT}$ =	**2899**	lbs.
$L_{M\ (100\%)TOTAL\ PROJECT}$ =	**3624**	lbs.



IMPERVIOUS COVER CALCULATIONS - OUTSIDE EDWARDS AQUIFER RECHARGE ZONE

PROJECT NAME ***BS 46-C FROM KERLICK LANE TO LANDA STREET***
CSJ: 0215-02-048

Length of Project =	1.09 miles	5,749.92 feet	
EXISTING ROW (Area calculated in microstation) =		184,574.00 ft^2	4.24 acres
EXISTING ROADWAY (Area calculated in microstation) =		125,117.00 ft^2	2.87 acres
EXISTING DRIVEWAYS & PARKING AREAS (Area calculated in microstation) =		0.00 ft^2	0.00 acres
EXISTING RIP-RAP (Area calculated in microstation) =		0.00 ft^2	0.00 acres
TOTAL EXISTING IMPERVIOUS COVER		125,117.00 ft^2	2.87 acres
PROPOSED ROW (Same as existing)		184,574.00 ft^2	4.24 acres
PROPOSED ROADWAY (Area calculated in microstation) =		153,398.00 ft^2	3.52 acres
PROPOSED DRIVEWAYS (Area calculated in microstation) =		0.00 ft^2	0.00 acres
PROPOSED RIP-RAP (Area calculated in microstation) =		0.00 ft^2	0.00 acres
TOTAL PROPOSED IMPERVIOUS COVER		153,398.00 ft^2	3.52 acres

Pre-Construction Fraction of Impervious Cover (IC)	67.79 %
Post-Construction Fraction of Impervious Cover (IC)	83.11 %

Net increase in Impervious Area (An)	28,281.00 ft^2	0.65 acres

Runoff Coefficient Calculations:

Pre-Construction Runoff

$Rv = 1.72x(IC)^3 - 1.97x(IC)^2 + 1.23x(IC) + 0.02$

$Rv = 1.72x(0.3444)^3 - 1.97x(0.3444)^2 + 1.23x(0.3444) + 0.02$

$Rv = 0.48$

Post-Construction Runoff

$Rv = 1.72x(IC)^3 - 1.97x(IC)^2 + 1.23x(IC) + 0.02$

$Rv = 1.72x(0.4318)^3 - 1.97x(0.4318)^2 + 1.23x(0.4318) + 0.02$

$Rv = 0.67$

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

Linda Cox, PE
April 18, 2013

Texas Commission on Environmental Quality

TSS Removal Calculations 04-20-2009

Area Outside of Edwards Aquifer Recharge Zone

Project Name: BS 46-C

Date Prepared: 4/18/2013

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 =	**Comal**	
Total project area included in plan * =	**4.24**	acres
Predevelopment impervious area within the limits of the plan * =	**2.87**	acres
Total post-development impervious area within the limits of the plan* =	**3.52**	acres
Total post-development impervious cover fraction * =	**0.83**	
P =	**33**	inches

$L_{M\ (80\%)TOTAL\ PROJECT}$ =	**583**	lbs.
$L_{M\ (100\%)TOTAL\ PROJECT}$ =	**729**	lbs.

RDWY: BS 46C
CSJ: 0215-02-048
LIMITS: FROM KERLICH LN. TO LANDA ST.
COUNTY: COMAL

GENERAL NOTE IN PLANS CALLING OUT TY 5 ROCK FILTER DAM.

--Item 1122--
Rock Filter Dam (Ty 5) (reinforced) constructed as follows:

Height:	6" to 12", as directed by the Engineer, measured vertically from the existing ground to the top of the filter dam, with wire mesh
Top Width:	24"
Slopes:	2:1 maximum (outside clear zone) 6:1 maximum (within clear zone)
Aggregate:	Gradation shall be 3 to 6 inches.

PERMANENT STORM WATER
ATTACHMENT G

INSPECTION, MAINTENANCE, REPAIR AND RETROFIT PLAN
BS 46-C (N. Walnut) from Kerlick Lane to Landa Street
New Braunfels, Comal County, Texas
CSJ: 0215-02-048

These maintenance guidelines were prepared at the request of the Texas Commission on Environmental Quality (TCEQ) with regard to their approval of an Edwards Aquifer Protection Plan for the above referenced project. These guidelines apply to the permanent storm water controls constructed for this project.

StormFilter® Maintenance Guidelines
The primary purpose of the Volume StormFilter® is to provide both storage and treatment of a design storm. The storage component of the system provides settling of particulates and capture of trash and debris, while the filtration component uses media filled filter cartridges to remove pollutants, including finer particles, nutrients, total and dissolved metals, organics, and oil and grease. The StormFilter® requires regular routine maintenance. Typical designs are intended for an annual maintenance cycle.

Recommended maintenance guidelines include:
☐ Inspections. Inspection of the storage component (and sedimentation manhole, if appropriate) should occur at a minimum of twice a year. It is recommended to wait 7 – 14 days after the last storm event, prior to making an inspection. This should allow for improved water clarity for observations in the storage facility. Sediment depth can be measured with a rod or other means. If sediment depth is greater than 1 foot, sediment removal in the storage facility is warranted.

☐ Cartridge Replacement. Cartridges should initially be replaced annually. If inspection of the removed cartridges indicates that their life expectancy exceeds one year, a modified maintenance plan should be provided to TCEQ specifying the new replacement schedule. Cartridge replacement also may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms.

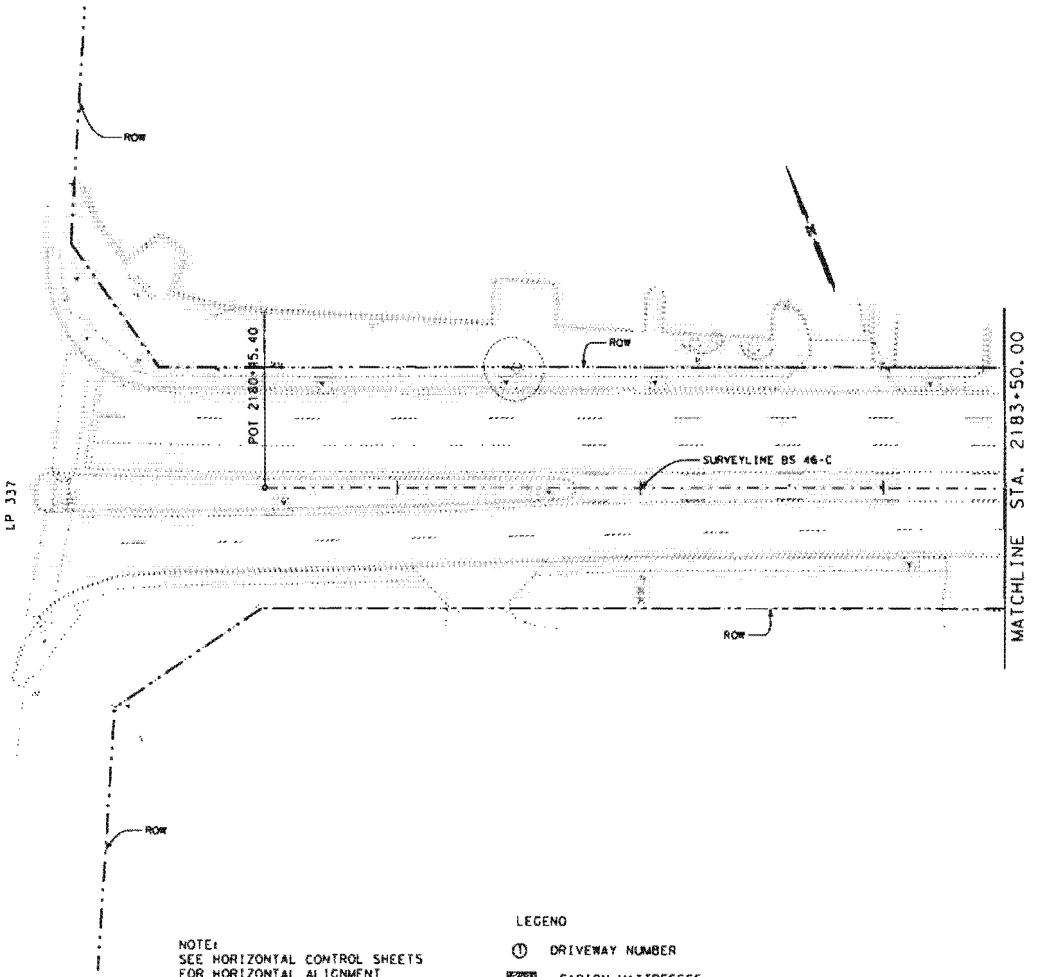
☐ Sediment Removal. Sediment removal should occur before the accumulated sediment occupies 20% of the settling chamber. Typically includes cartridge replacement and sediment removal from the vault.

☐ Debris and Litter Removal. Debris and litter must be removed when its presence threatens the proper operation of the system.

Maintenance Contact: The Maintenance Supervisor may be contacted for questions or concerns pertaining to maintenance of the facility.

Mr. James Browne
TxDOT Department of Transportation
4102 IH 35 South
New Braunfels, Texas
Tel: (830) 609-0707

Signature



NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE DRIVEWAY TYPICAL SECTION AND SUMMARY SHEET FOR DRIVEWAY DETAILS AND QUANTITIES.

SEE INTERSECTION LAYOUTS FOR INTERSECTION DETAILS.

LEGEND

① DRIVEWAY NUMBER

GABION MATTRESSES

CONC RIPRAP

LANDSCAPE PAVERS

WIDENING AREA

EXISTING ACP TO REMAIN

BS 46-C
PLAN SHEETS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LYNDA COX
90090
PROFESSIONAL ENGINEER

April 18, 2013
Lynda Cox P.E.

0 50 100
SCALE IN FEET

© 2013 Texas Department of Transportation

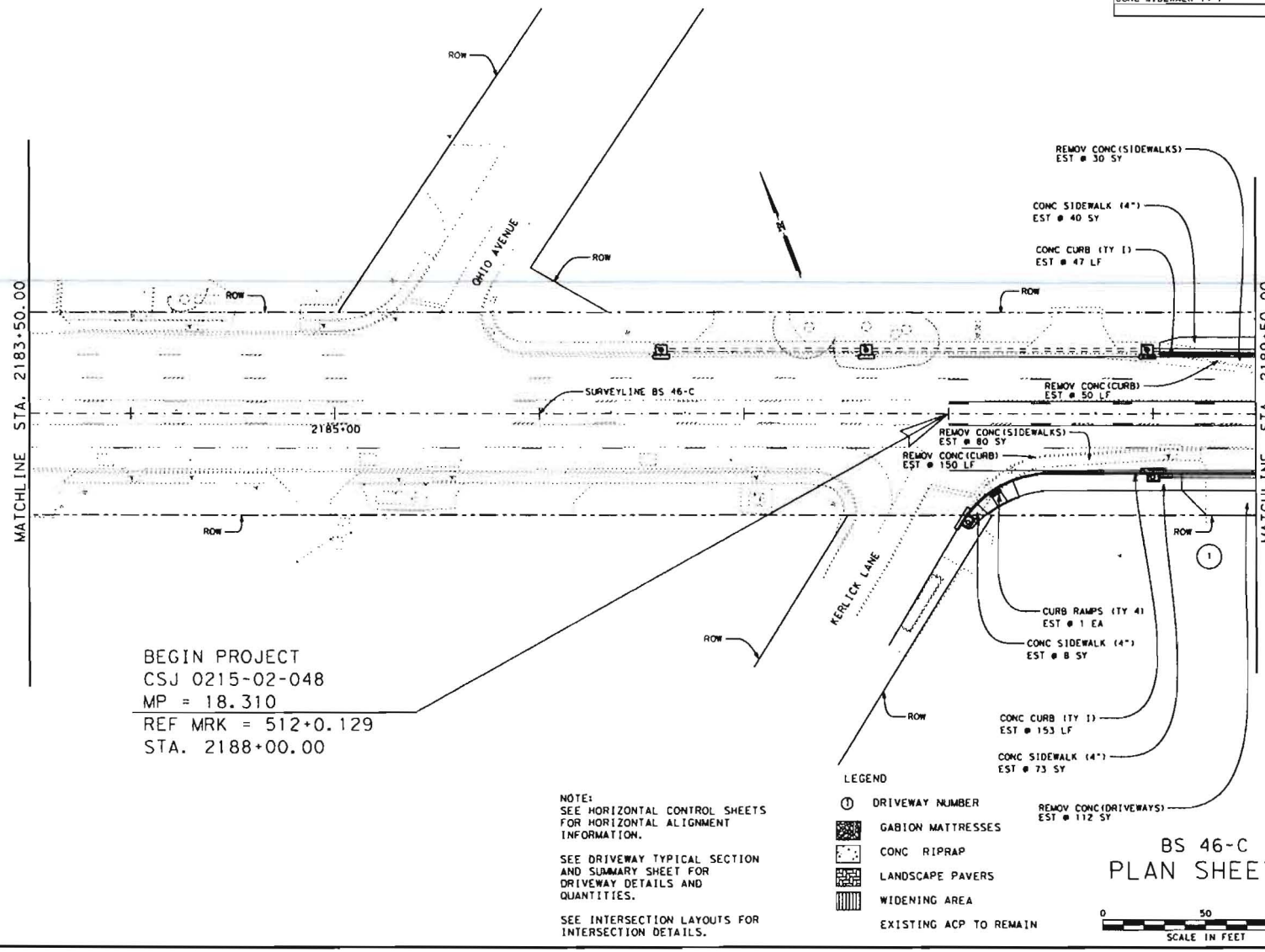
SHEET 1 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

HIGHWAY NO. BS 46-C

FILE: c:\projects\hg\txdot\sathouth\minor end\dgn\18994\PLN001.dgn
DATE: 4/18/2013 9:46:09 AM

ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
PREPARING ROW	1.5	STA
REMOV CONC (SIDEWALKS)	110	SY
REMOV CONC (DRIVEWAYS)	112	SY
REMOV CONC (CURB)	200	LF
CONC CURB (TY I)	200	LF
CURB RAMPS (TY 4)	1	EA
CONC SIDEWALK (4")	121	SY



NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE DRIVEWAY TYPICAL SECTION AND SUMMARY SHEET FOR DRIVEWAY DETAILS AND QUANTITIES.

SEE INTERSECTION LAYOUTS FOR INTERSECTION DETAILS.

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 16 2013
Linda Cox P.E.

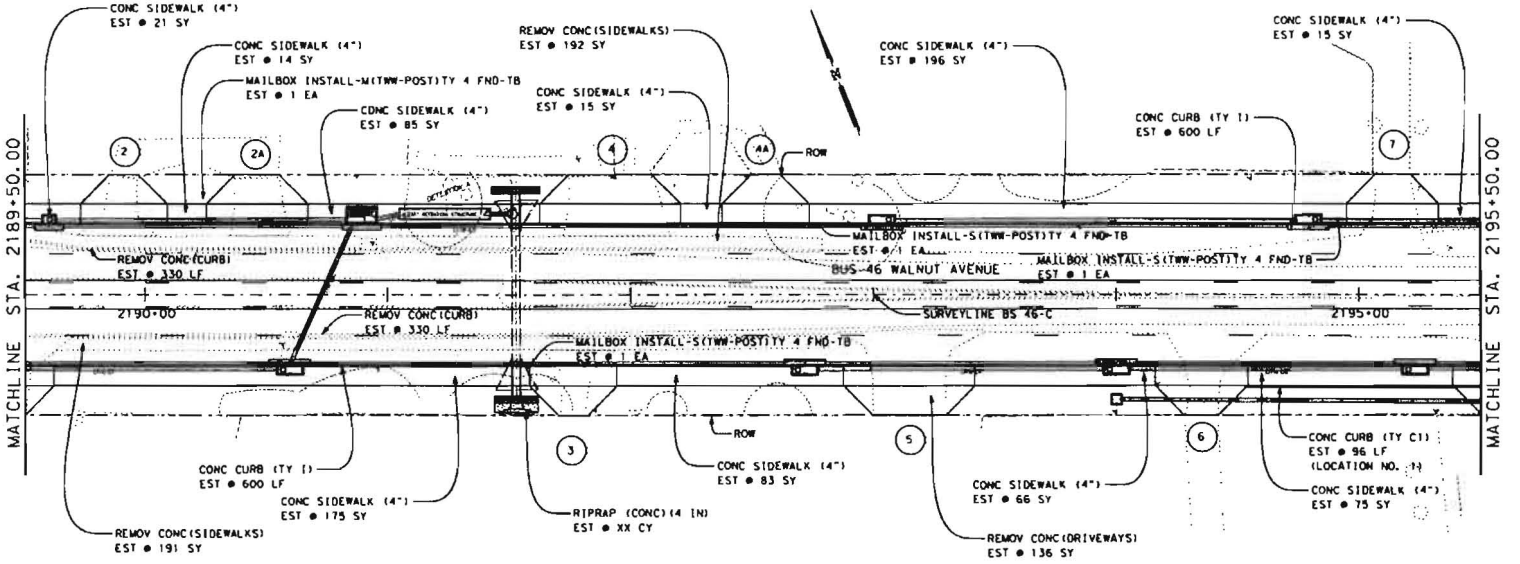
BS 46-C
PLAN SHEETS

Texas Department of Transportation
SHEET 2 OF 12

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\projects\roy\rdon\bexbsouth\environ\cmal8994\PLN002.dgn
DATE: 4/16/2013 9:46:25 AM

ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
PREPARING ROW	6	STA
REMOV CONC (SIDEWALKS)	383	SY
REMOV CONC (DRIVEWAYS)	136	SY
REMOV CONC (CURB)	660	LF
CONC CURB (TY I)	1200	LF
CONC CURB (TY C1)	96	LF
CONC SIDEWALK (4")	745	SY
MAILBOX INSTALL-M(TWW-POST)TY 4 FND-TB	1	EA
MAILBOX INSTALL-S(TWW-POST)TY 4 FND-TB	3	EA



NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE DRIVEWAY TYPICAL SECTION AND SUMMARY SHEET FOR DRIVEWAY DETAILS AND QUANTITIES.

SEE INTERSECTION LAYOUTS FOR INTERSECTION DETAILS.

LEGEND

① DRIVEWAY NUMBER

GABION MATTRESSES

CONC RIPRAP

LANDSCAPE PAVERS

WIDENING AREA

EXISTING ACP TO REMAIN

0 50 100
SCALE IN FEET

BS 46-C
PLAN SHEETS

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

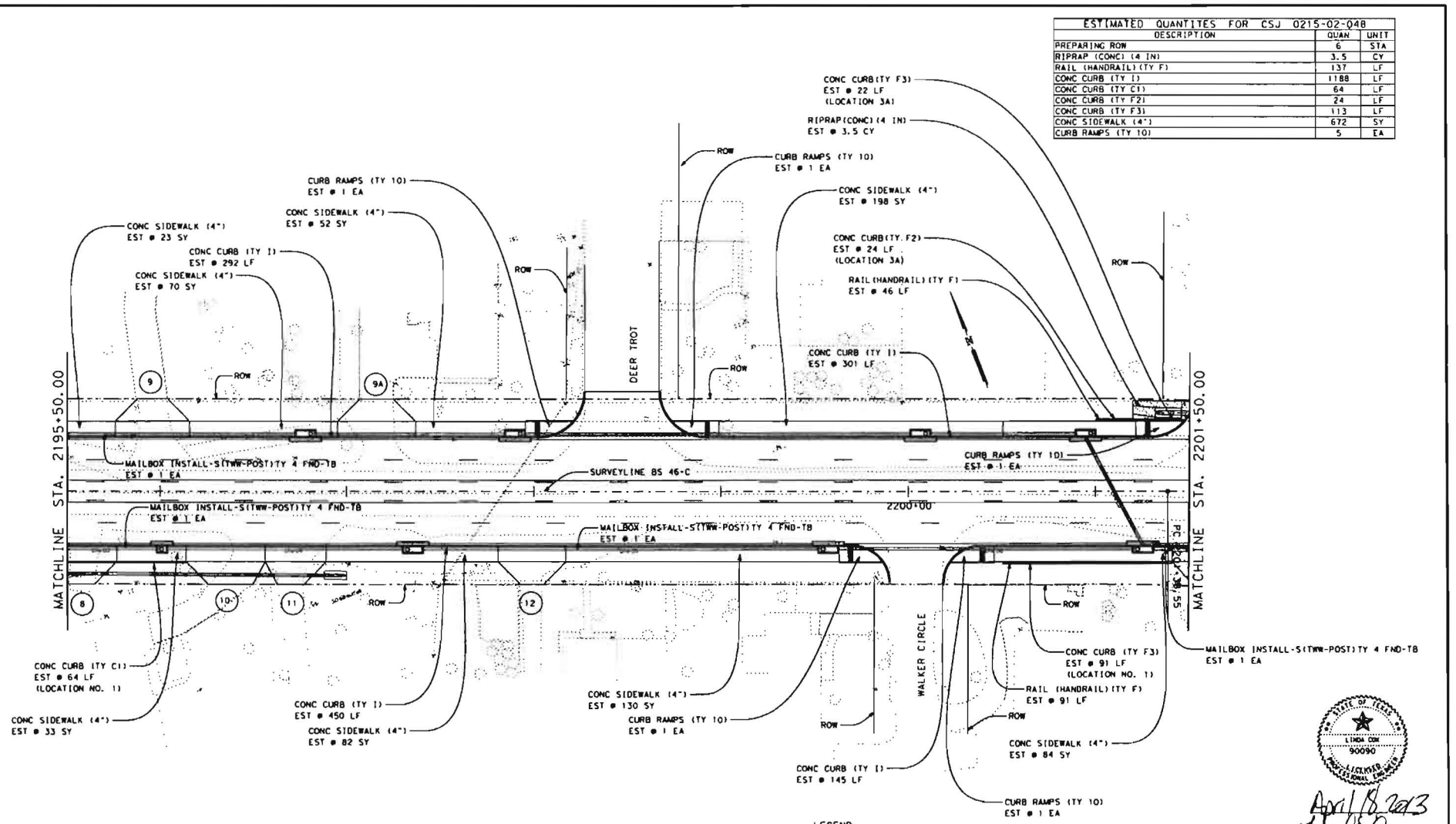
April 18 2013
Linda Cox P.E.

Texas Department of Transportation

SHEET 3 OF 12

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\projects\pgl\tydot\jperbourn\moreno\dms18994\PLN003.dgn
DATE: 4/18/2013 9:46:42 AM



NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE DRIVEWAY TYPICAL SECTION AND SUMMARY SHEET FOR DRIVEWAY DETAILS AND QUANTITIES.

SEE INTERSECTION LAYOUTS FOR INTERSECTION DETAILS.

BS 46-C
PLAN SHEETS

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

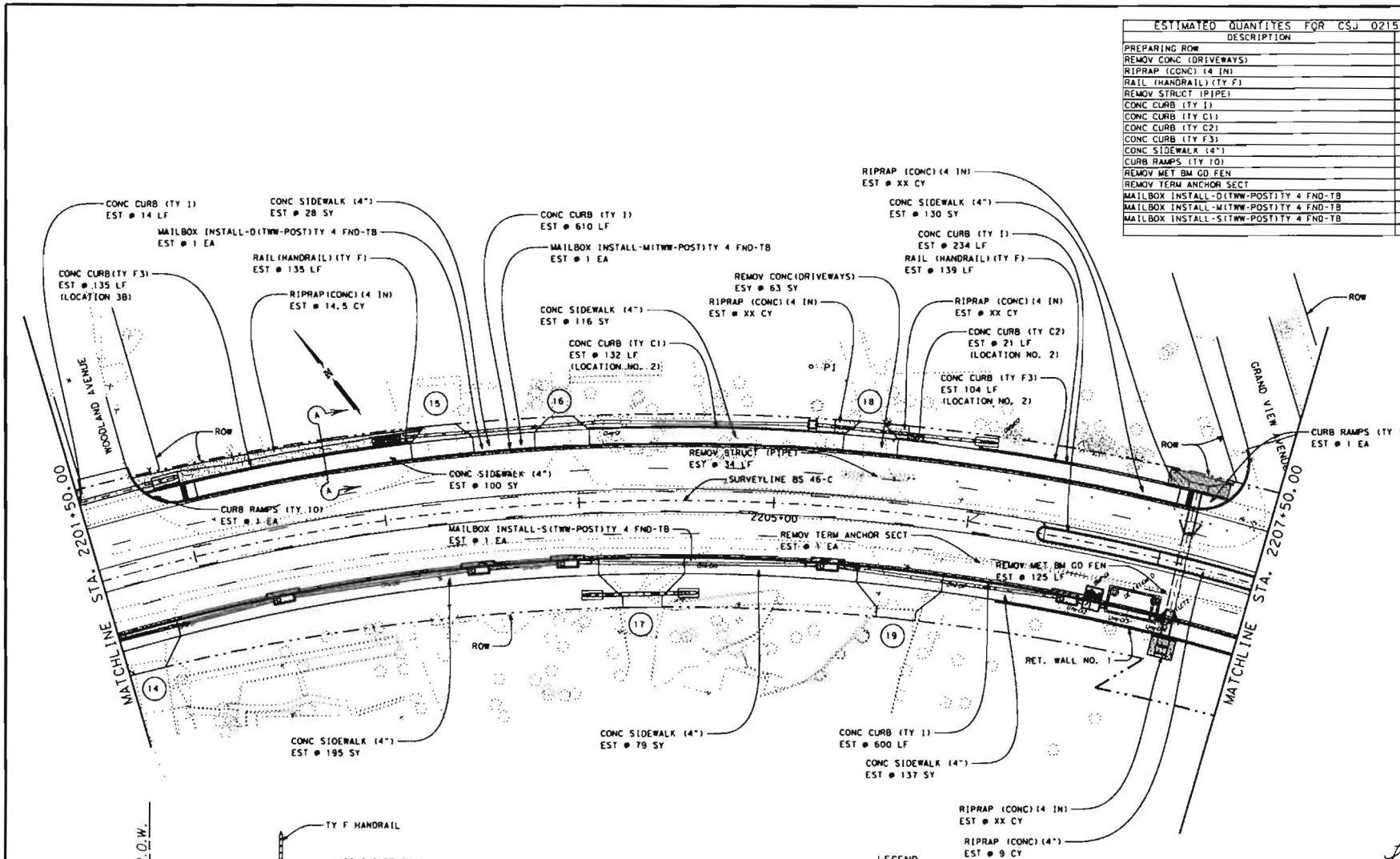
Apr 18 2013
Linda Cox P.E.

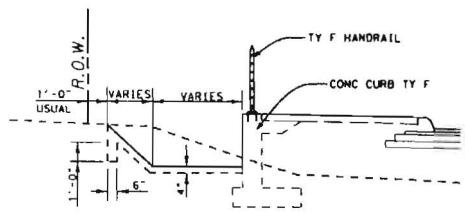
SHEET 4 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\pbsoutm\moremnt\dms118994\PLN004.dgn
DATE: 4/18/2013 9:47:01 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
PREPARING ROW	6	STA
REMOV CONC (DRIVEWAYS)	63	SY
RIPRAP (CONC) (4 IN)	23.5	CY
RAIL (HANDRAIL) (TY F)	274	LF
REMOV STRUCT (PIPE)	34	LF
CONC CURB (TY I)	1458	LF
CONC CURB (TY C1)	132	LF
CONC CURB (TY C2)	21	LF
CONC CURB (TY F3)	239	LF
CONC SIDEWALK (4")	785	SY
CURB RAMPS (TY 10)	2	EA
REMOV MET BM GD FEN	125	LF
REMOV TERM ANCHOR SECT	1	EA
MAILBOX INSTALL-D(TWW-POST)TY 4 FND-TB	1	EA
MAILBOX INSTALL-M(TWW-POST)TY 4 FND-TB	1	EA
MAILBOX INSTALL-S(TWW-POST)TY 4 FND-TB	1	EA





SECTION A-A

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE DRIVEWAY TYPICAL SECTION AND SUMMARY SHEET FOR DRIVEWAY DETAILS AND QUANTITIES.

SEE INTERSECTION LAYOUTS FOR INTERSECTION DETAILS.

LEGEND

- ① DRIVEWAY NUMBER
- GABION MATTRESSES
- CONC RIPRAP
- LANDSCAPE PAVERS
- WIDENING AREA
- EXISTING ACP TO REMAIN

BS 46-C
PLAN SHEETS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

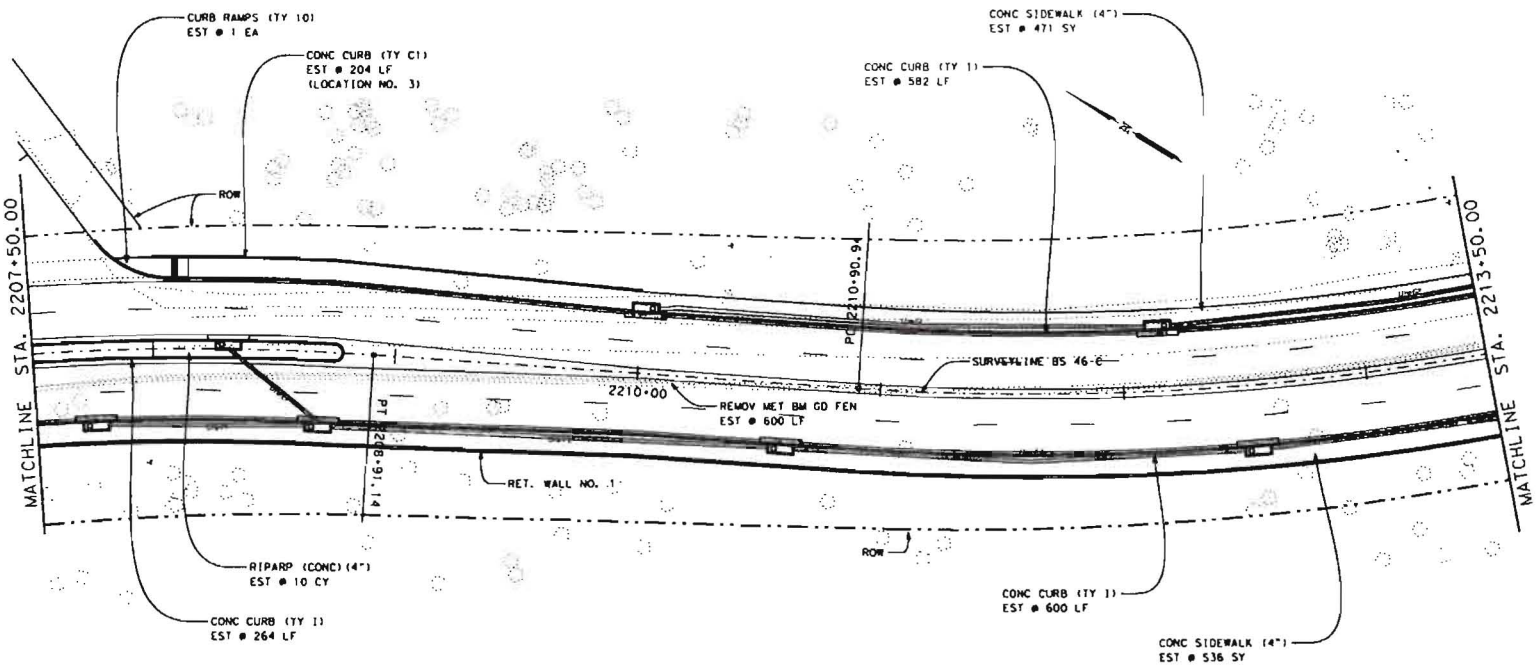
Texas Department of Transportation

SHEET 5 OF 12

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\ng\vxd01\vbeaumont\vmicrand\dms18994\PLN005.dgn
DATE: 4/18/2013 9:53:37 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
PREPARING ROW	6	STA
RIPRAP (CONC) (4 IN)	10	CY
CONC CURB (TY I)	1446	LF
CONC CURB (TY C1)	204	LF
CONC SIDEWALK (4")	1007	SY
CURB RAMPS (TY 10)	1	EA
REMOV MET BM GD FEN	600	LF



NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE DRIVEWAY TYPICAL SECTION AND SUMMARY SHEET FOR DRIVEWAY DETAILS AND QUANTITIES.

SEE INTERSECTION LAYOUTS FOR INTERSECTION DETAILS.

LEGEND

① DRIVEWAY NUMBER

GABION MATTRESSES

CONC RIPRAP

LANDSCAPE PAVERS

WIDENING AREA

EXISTING ACP TO REMAIN

0 50 100
SCALE IN FEET

BS 46-C
PLAN SHEETS

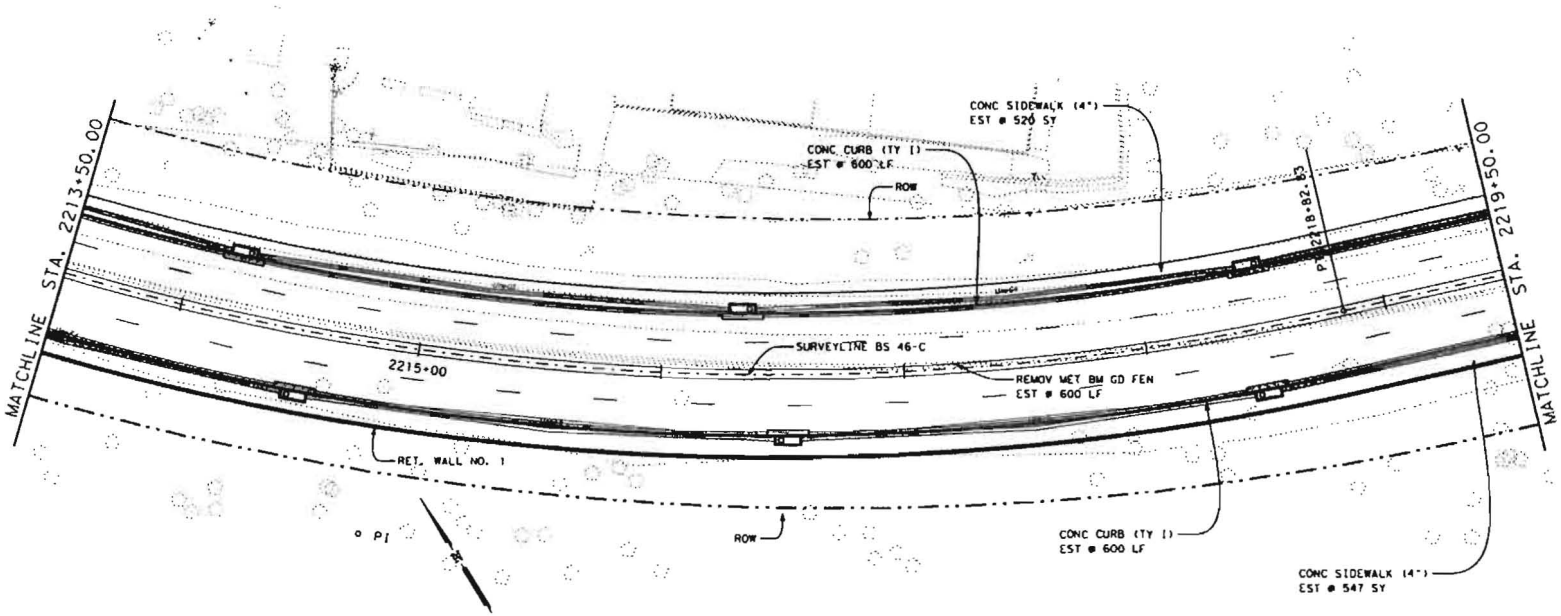
LINDA COX 90090 LICENSED PROFESSIONAL ENGINEER
April 18, 2013
P.E.

SHEET 6 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\projects\gov\txdot\txdot\sat\comal\bs46c\cms18994\PLN006.dgn
DATE: 4/18/2013 9:47:34 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
PREPARING ROW	6	STA
CONC CURB (TY I)	1200	LF
CONC SIDEWALK (4")	1067	SY
REMOV WET BM GD FEN	600	LF



NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE DRIVEWAY TYPICAL SECTION AND SUMMARY SHEET FOR DRIVEWAY DETAILS AND QUANTITIES.

SEE INTERSECTION LAYOUTS FOR INTERSECTION DETAILS.

LEGEND

① DRIVEWAY NUMBER

GABION MATTRESSES

CONC RIPRAP

LANDSCAPE PAVERS

WIDENING AREA

EXISTING ACP TO REMAIN

0 50 100
SCALE IN FEET

BS 46-C
PLAN SHEETS

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

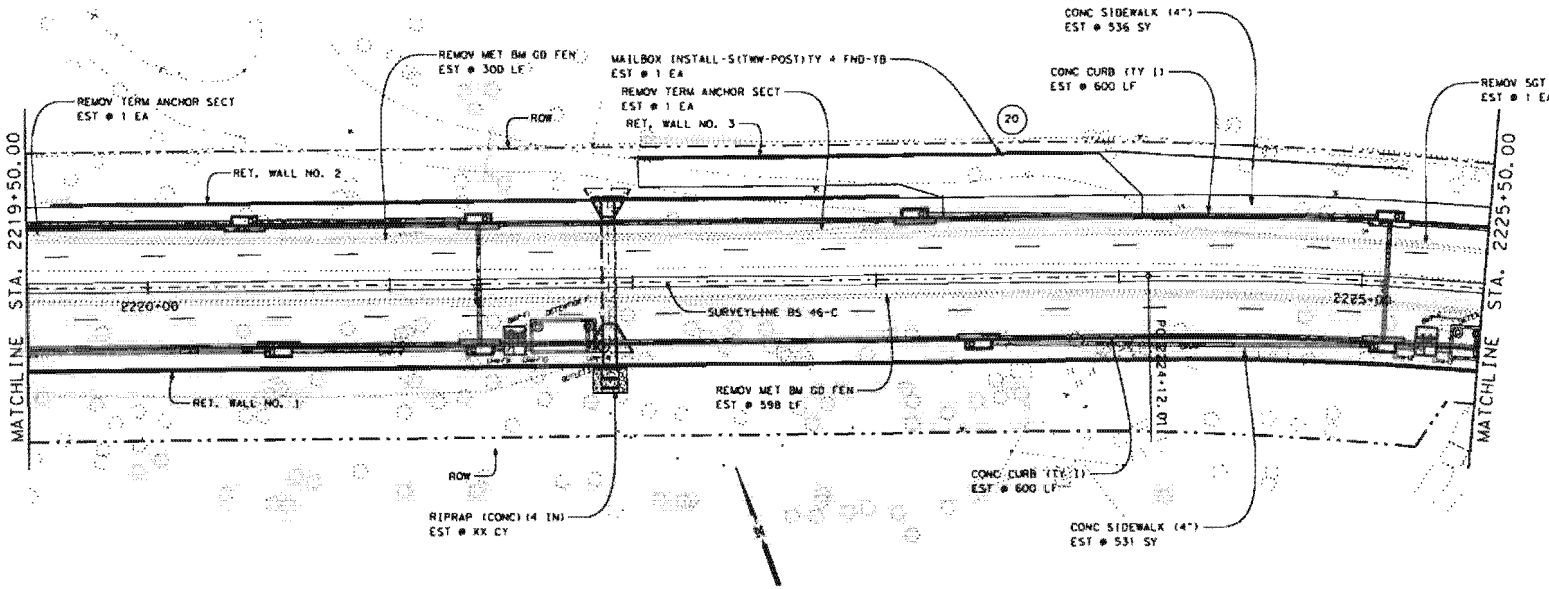
Texas Department of Transportation

SHEET 7 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\x\xdot\dwilson.rtn\vmoreno\dms18994\PLN007.dgn
DATE: 4/18/2013 9:47:50 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
PREPARING ROW	6	STA
CONC CURB (TY I)	1200	LF
CONC SIDEWALK (4")	1067	SY
REMOV MET BM GD FEN	898	LF
REMOV TERM ANCHOR SECT	2	EA
REMOV SGT	1	EA
MAILBOX INSTALL-S(TWW-POST)TY 4 FND-TB	1	EA



NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE DRIVEWAY TYPICAL SECTION AND SUMMARY SHEET FOR DRIVEWAY DETAILS AND QUANTITIES.

SEE INTERSECTION LAYOUTS FOR INTERSECTION DETAILS.

LEGEND

① DRIVEWAY NUMBER

GABION MATTRESSES

CONC RIPRAP

LANDSCAPE PAVERS

WIDENING AREA

EXISTING ACP TO REMAIN

BS 46-C
PLAN SHEETS

0 50 100
SCALE IN FEET

LYNDA COX 90090 LICENSED PROFESSIONAL ENGINEER

April 18, 2013
Lynda Cox P.E.

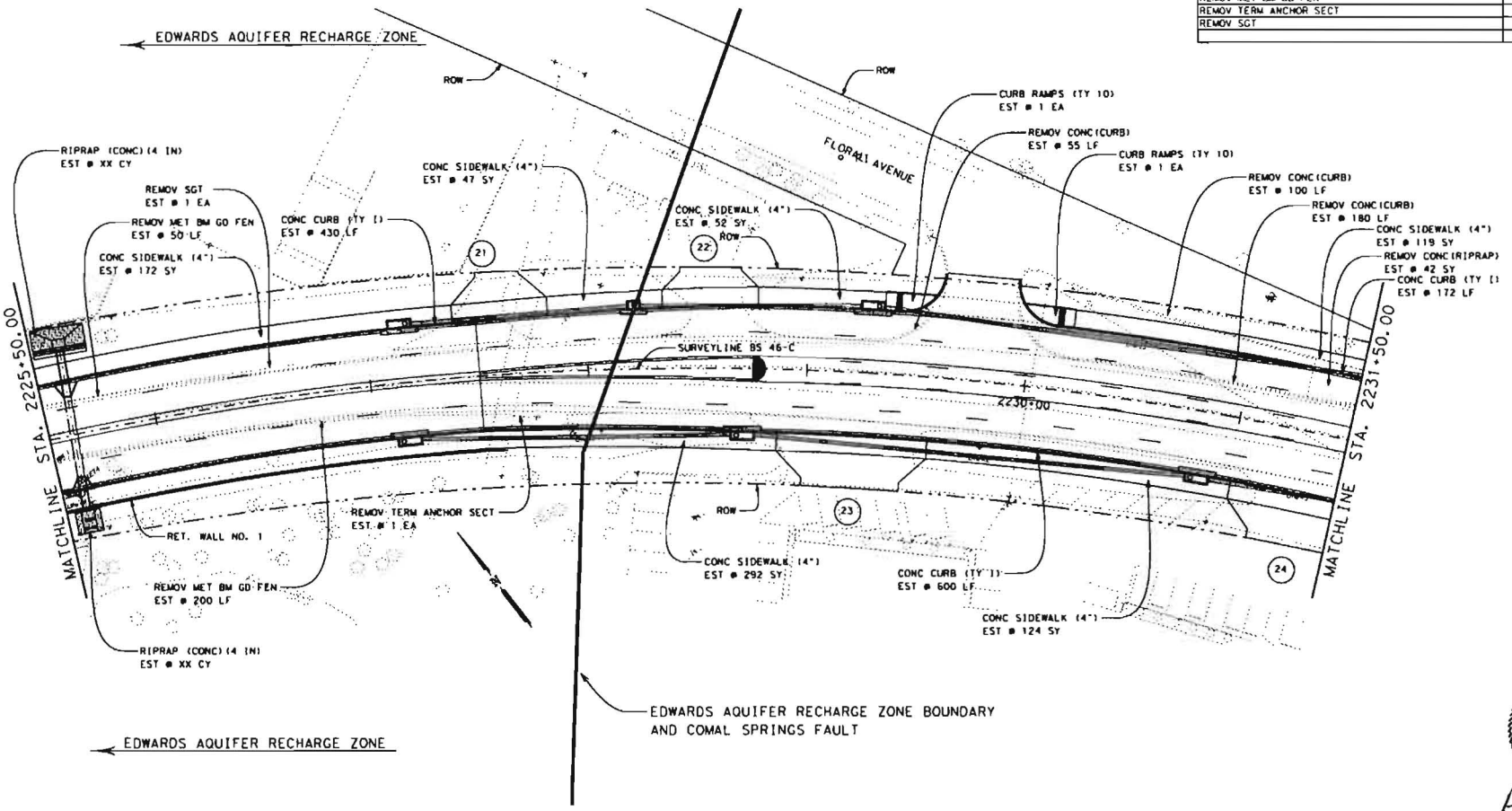
Texas Department of Transportation

SHEET 8 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwwork\mgoldson\jobs\bs46south\anchor and curb\bs46_PLAN008.dgn
DATE: 4/18/2013 9:48:06 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
PREPARING ROW	6	STA
REMOV CONC (RIPRAP)	42	SY
REMOV CONC (CURB)	335	LF
CONC CURB (TY I)	1202	LF
CONC SIDEWALK (4")	806	SY
CURB RAMPS (TY 10)	2	EA
REMOV MET BM GD FEN	250	LF
REMOV TERM ANCHOR SECT	1	EA
REMOV SGT	1	EA



NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE DRIVEWAY TYPICAL SECTION AND SUMMARY SHEET FOR DRIVEWAY DETAILS AND QUANTITIES.

SEE INTERSECTION LAYOUTS FOR INTERSECTION DETAILS.

LEGEND

① DRIVEWAY NUMBER

GABION MATTRESSES

CONC RIPRAP

LANDSCAPE PAVERS

WIDENING AREA

EXISTING ACP TO REMAIN

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

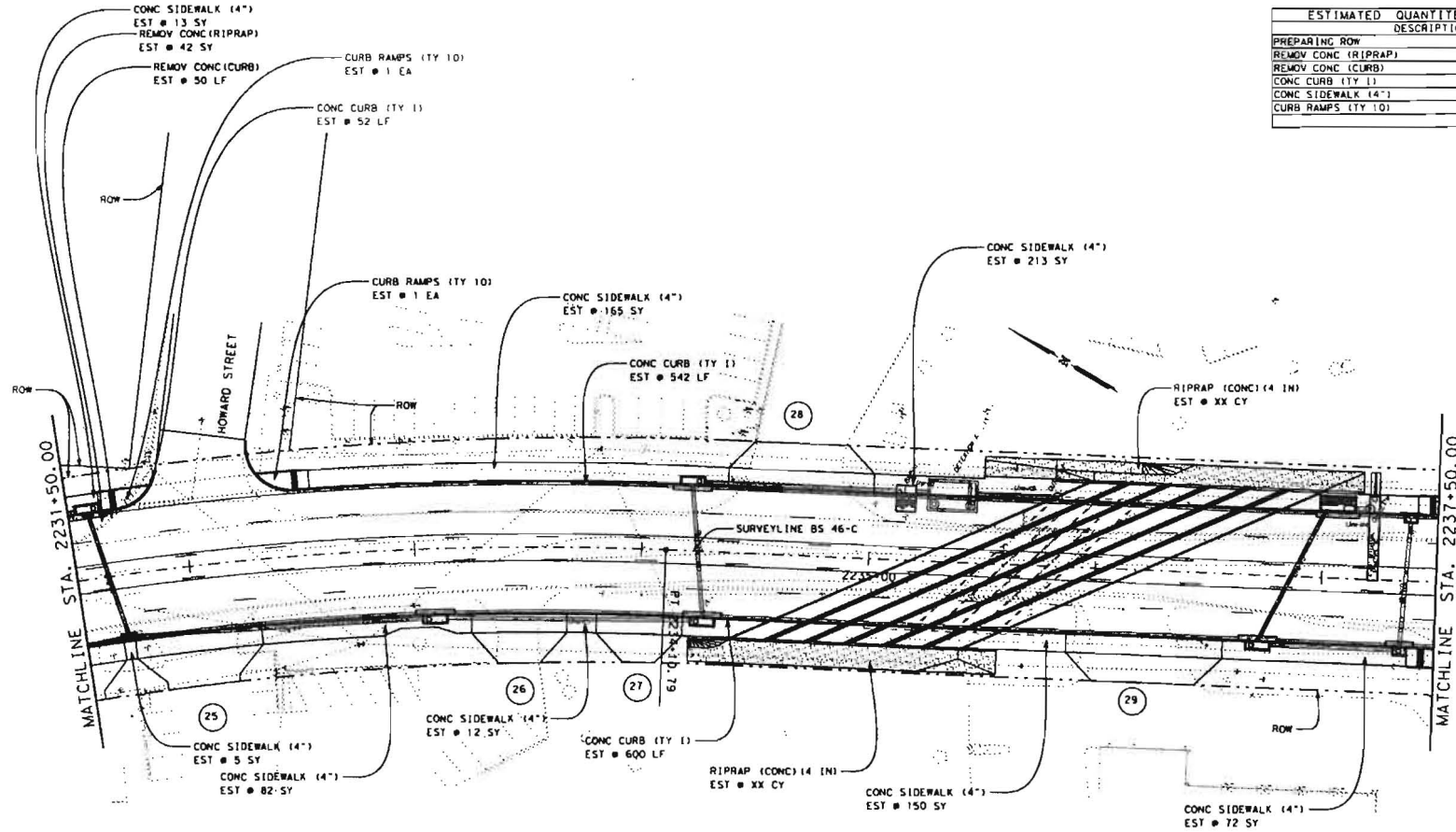
BS 46-C
PLAN SHEETS

0 50 100
SCALE IN FEET

SHEET 9 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\projects\hydro\bs46south\mgmt\dms18994\PLN009.dgn
DATE: 4/18/2013 9:48:21 AM



ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
PREPARING ROW	6	STA
REMOV CONC (RIPRAP)	42	SY
REMOV CONC (CURB)	50	LF
CONC CURB (TY I)	1194	LF
CONC SIDEWALK (4")	712	SY
CURB RAMPS (TY 10)	2	EA

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE DRIVEWAY TYPICAL SECTION AND SUMMARY SHEET FOR DRIVEWAY DETAILS AND QUANTITIES.

SEE INTERSECTION LAYDUTS FOR INTERSECTION DETAILS.

LEGEND

① DRIVEWAY NUMBER

GABION MATTRESSES

CONC RIPRAP

LANDSCAPE PAVERS

WIDENING AREA

EXISTING ACP TO REMAIN

BS 46-C
PLAN SHEETS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

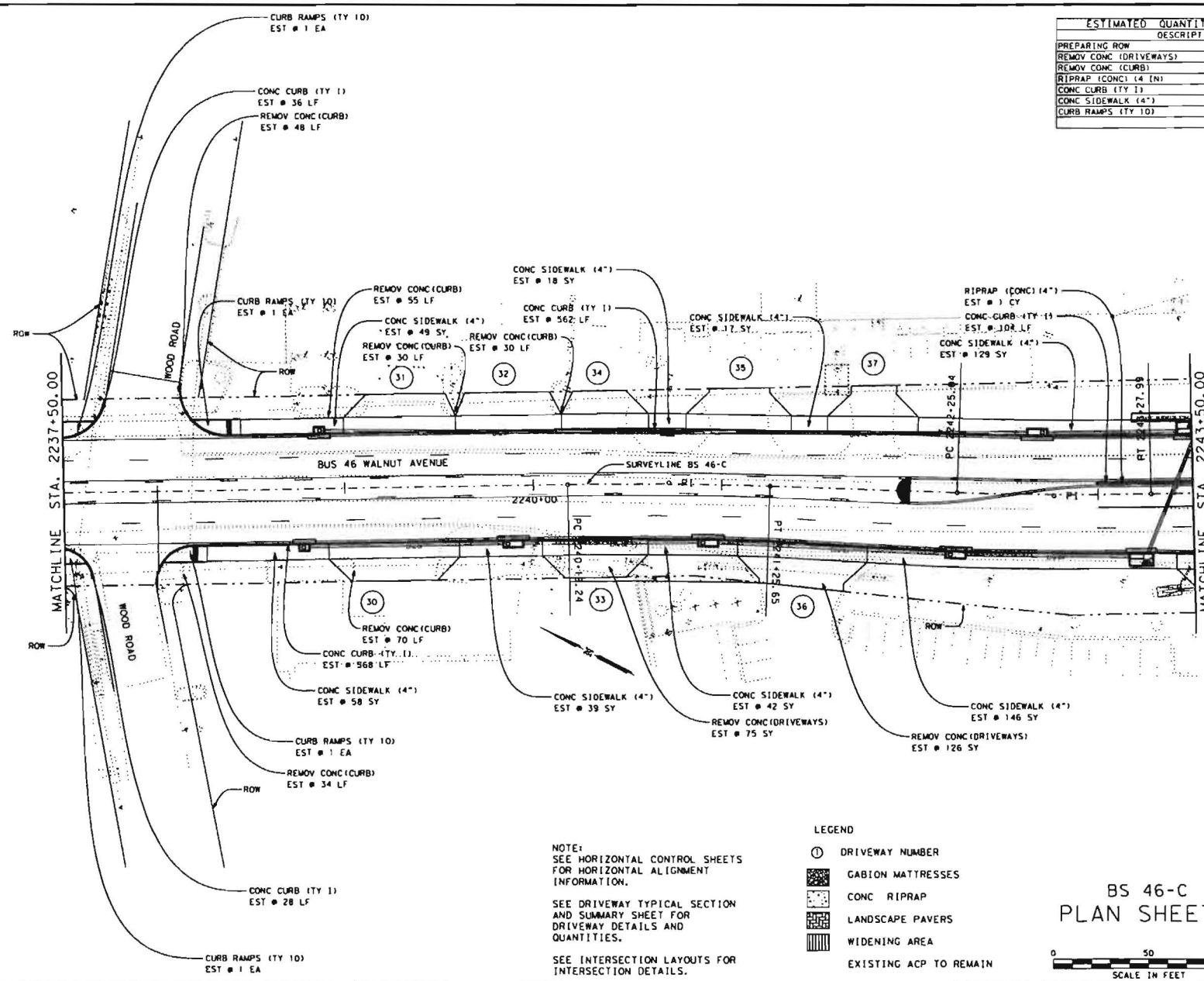
April 18, 2013
Linda Cox P.E.

© 2012 Texas Department of Transportation

SHEET 10 OF 12

FHWA FLMG DIVISION	FEDERAL AID PROJECT NO.		SHEET NO. 8 - 5
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\jpellouth\jmorend\dms18994\PLM010.dgn
DATE: 4/18/2013 9:48:38 AM



ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
PREPARING ROW	6	STA
REMOV CONC (DRIVEWAYS)	201	SY
REMOV CONC (CURB)	267	LF
RIPRAP (CONC) (4 IN)	1	CY
CONC CURB (TY 1)	1298	LF
CONC SIDEWALK (4")	498	SY
CURB RAMPS (TY 10)	4	EA

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE DRIVEWAY TYPICAL SECTION AND SUMMARY SHEET FOR DRIVEWAY DETAILS AND QUANTITIES.

SEE INTERSECTION LAYOUTS FOR INTERSECTION DETAILS.

LEGEND

① DRIVEWAY NUMBER

GABION MATTRESSES

CONC RIPRAP

LANDSCAPE PAVERS

WIDENING AREA

EXISTING ACP TO REMAIN

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 18, 2013
P.E.

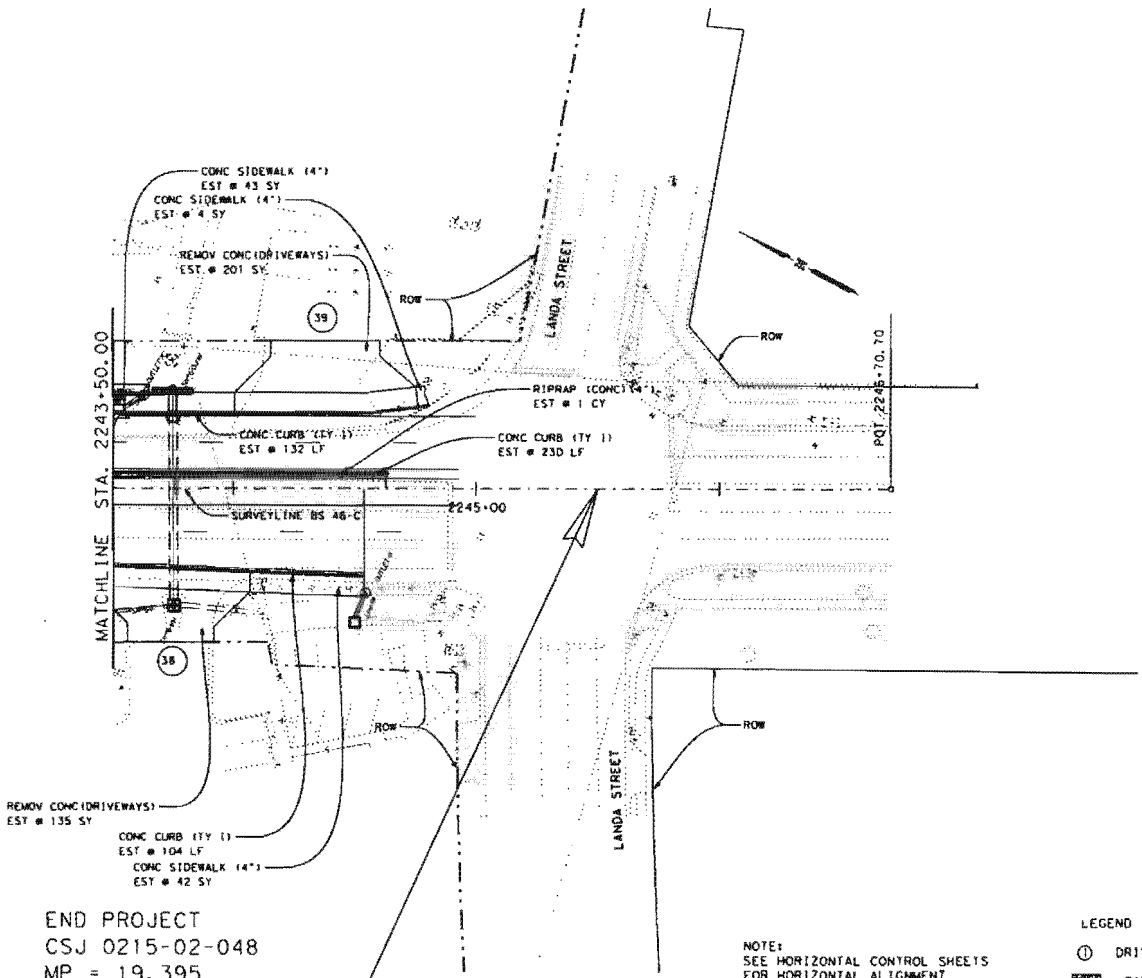
BS 46-C
PLAN SHEETS

Texas Department of Transportation
SHEET 11 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\projects\pgi\tyson\jobs\north\minor and\gnal18994\PLN011.dgn
DATE: 4/18/2013 9:49:00 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
PREPARING ROW	2	STA
REMOV CONC (DRIVEWAYS)	336	SY
RIPRAP (CONC) (4 IN)	1	CY
CONC CURB (TY I)	466	LF
CONC SIDEWALK (4")	89	SY



END PROJECT
CSJ 0215-02-048
MP = 19.395
REF MRK = 0512+1.214
STA. 2245+50.00

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE DRIVEWAY TYPICAL SECTION AND SUMMARY SHEET FOR DRIVEWAY DETAILS AND QUANTITIES.

SEE INTERSECTION LAYOUTS FOR INTERSECTION DETAILS.

LEGEND

① DRIVEWAY NUMBER

GABION MATTRESSES

CONC RIPRAP

LANDSCAPE PAVERS

WIDENING AREA

EXISTING ACP TO REMAIN

BS 46-C
PLAN SHEETS

0 50 100
SCALE IN FEET

LINDA COX
80090
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
4/18/2013
P.E.

© 2013 Texas Department of Transportation

SHEET 12 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

HIGHWAY NO. BS 46-C

FILE: d:\projects\dgn\bs46cmatchline.dgn
DATE: 4/18/2013 9:49:17 AM

Note To Designer:
1. *Do not alter Street Design or Font style, size or weight - match text attributes.*
2. *If additional space is needed for a numbered section, fence and adjust sections up or down as needed for proportioning and readability but do not relocate from it's neutral position.*

A. GENERAL SITE DATA

1. PROJECT LIMITS: *From Kerlick Lane To Landa Street*

2. PROJECT SITE MAPS:
- *Project Latitude :29.7083955 Project Longitude -98.1472245*
- *Project Location Maps: Shown on Title Sheet*
- *Drainage Patterns: Shown on Drainage Area Maps*
- *Approx. Slopes Anticipated After Major Gradings and Areas of Soil Disturbance: Shown on Typical Sections*
- *Major Controls and Locations of Stabilization Practices: Shown on SW3P Sheets*
- *Project Specific Locations: Off-site waste, borrow, or storage areas are not part of this SW3P.*
- *Surface Waters and Discharge Locations: Shown on Drainage and Culvert Layout Sheets*

3. PROJECT DESCRIPTION: *Base, Grad, Str, Surf, & Pavement Markings*

Non-Joint Bid Utilities are not part of this SW3P.

4. FOR MAJOR SOIL DISTURBING ACTIVITIES SEQUENCE OF EVENTS:

1. Install controls down-slope of work area and initiate inspection and maintenance activities.

2. Begin phased construction with interim stabilization practices. Adjust erosion and sedimentation controls during construction to meet requirements and changing conditions and as directed/approved by the Engineer.

3. Major soil disturbing activities may include but are not limited to: right-of-way preparation, cut and/or fill to improve roadway profile, final grading and placement of topsoil and the following (if marked):

- *X Placement of road base*
- *X Extensive ditch grading*
- *X Upgrading or replacing culverts or bridges*
- *___ Temporary detour road(s)*
- *X Other: Storm Drainage (Inlets & BMPs) Strs, Curbs, & Sidewalks*

5. EXISTING AND PROPOSED CONDITIONS:

Description of existing vegetative cover: Native Grasses

Percentage of existing vegetative cover: 65%

Existing vegetative cover: (mark one)
- *___ Thick or uniformly established*
- *X Thin and Patchy*
- *___ None or minimal cover*

Description of soils: Lewisville-Gruene-Krum: Deep, shallow, and very shallow, nearly level to gently sloping soils over loamy, clayey, and gravelly sediments; on stream terraces and valley fills of Blackland Prairie and Edwards Plateau.

Site Acreage: 14.24 Ac *Acreage disturbed: 9.99 Ac*

Site runoff coefficient (pre-construction): 0.74 *Site runoff coefficient (post-construction): 0.82*

6. RECEIVING WATERS: *(Mark all that apply)*

X A classified stream does not pass through project.

___ A classified stream passes through project. Name: _____ Segment Number: _____

Name of receiving waters that will receive discharges from disturbed areas of the project: N/NE-Tributary to Comal River to Guadalupe River, SW/S/SE-Dry Comal Creek to Comal River to Guadalupe River.

Site is in a Municipal Separate Storm Sewer System (MS4).
MS4 Operator (name): TxDOT

B. BEST MANAGEMENT PRACTICES

General timing or sequence for implementation of BMPs shall be as required and/or as directed/approved by the Engineer to provide adequate controls. BMPs shown on plan sheets are to be considered "proposed" unless/until Install date is shown. BMPs are to reduce sediments from road construction activities.

1. SOIL STABILIZATION PRACTICES: (Select T = Temporary or P = Permanent, as applicable)

T/P SEEDING	T/P PRESERVATION OF NATURAL RESOURCES
___ MULCHING (Hay or Straw)	___ FLEXIBLE CHANNEL LINER
___ BUFFER ZONES	___ RIGID CHANNEL LINER
___ PLANTING	___ SOIL RETENTION BLANKET
___ COMPOST/MULCH FILTER BERM	P COMPOST MANUFACTURED TOPSOIL
P SODDING	___ OTHER: (Specify Practice)

2. STRUCTURAL PRACTICES: (Select T = Temporary or P = Permanent, as applicable)

- T SILT FENCES
- ___ HAY BALES
- T ROCK FILTER DAMS
- ___ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- ___ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- ___ DIVERSION DIKE AND SWALE COMBINATIONS
- ___ PIPE SLOPE DRAINS
- ___ PAVED FLUMES
- T ROCK BEDDING AT CONSTRUCTION EXIT
- ___ TIMBER MATTING AT CONSTRUCTION EXIT
- ___ CHANNEL LINERS
- ___ SEDIMENT TRAPS
- ___ SEDIMENT BASINS
- ___ STORM INLET SEDIMENT TRAP
- ___ STONE OUTLET STRUCTURES
- P CURBS AND GUTTERS
- P STORM SEWERS
- P VELOCITY CONTROL DEVICES
- ___ OTHER: (Specify Practice)

3. STORM WATER MANAGEMENT:

The proposed facility was designed in consideration of hydraulic design standards to convey stormwater in a manner that is protective of public safety and property. The control of erosion from the facility is inherent in the design. Additional factors affecting post-construction stormwater at the project location include: (mark all that apply)

- *X Existing or new vegetation provides natural filtration.*
- *X The design includes provisions for permanent erosion controls provided by strategically placed pervious and impervious surfaces.*
- *X Project includes permanent sedimentation controls (other than grass).*
- *___ Velocities do not require dissipation devices.*
- *X Velocity-dissipation devices included in the design.*
- *___ Other: _____*

4. NON-STORM WATER DISCHARGES:

Off-site discharges are prohibited except as follows:

1. *Discharges from fire fighting activities and/or fire hydrant flushings.*
2. *Vehicle, external building, and pavement wash water where detergents and soaps are not used and where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed).*
3. *Plain water used to control dust.*
4. *Plain water originating from potable water sources.*
5. *Uncontaminated groundwater, spring water or accumulated stormwater.*
6. *Foundation or footing drains where flows are not contaminated with process materials such as solvents.*
7. *Other: _____*

Concrete truck wash water discharges on the site should be prohibited or minimized. If allowed by the Engineer, they must be managed in a manner so as not to contaminate surface water. They must not be located in areas of concentrated flow. Concrete truck washout locations must be shown on the SW3P Layout and included in the inspections.

Hazardous material spill/leak shall be prevented or minimized. At a minimum, this includes asphalt products, fuels, oils, lubricants, solvents, paints, acids, concrete curing compounds and chemical additives for soil stabilization. BMPs shall be implemented to the storage areas of these products. All spills must be cleaned and disposed properly and reported to the Engineer. Report any release at or above the reportable quantity during a 24 hour period to the National Response Center at 1-800-424-8802.

C. OTHER REQUIREMENTS & PRACTICES

1. MAINTENANCE:

All erosion and sediment controls shall be maintained in good working order. If a repair is necessary, it shall be performed before the next anticipated storm event but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from equipment. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable. Disturbed areas on which construction activities have ceased, temporarily or permanently, shall be stabilized within 14 calendar days unless they are scheduled to and do resume within 21 calendar days. The areas adjacent to creeks and drainageways shall have priority followed by protecting storm sewer inlets.

2. INSPECTION:

For areas of the construction site that have not been finally stabilized, areas used for storage of materials, structural control measures, and locations where vehicles enter or exit the site, personnel provided by the permittee and familiar with the SW3P must inspect disturbed areas at least once every fourteen (14) calendar days and within twenty four (24) hours of the end of a storm of 0.5 inches or greater. As an alternative to the above-described inspection schedule of once every fourteen (14) calendar days and within twenty four (24) hours of a storm of 0.5 inches or greater, the SW3P may be developed to require that these inspections will occur at least once every seven (7) calendar days. If this alternative schedule is developed, the inspection must occur on a specifically defined day, regardless of whether or not there has been rainfall since the previous inspection. An inspection and Maintenance Report shall be prepared for each inspection and the controls shall be revised on the SW3P within seven (7) calendar days following the inspection.

3. WASTE MATERIALS:

All non-hazardous municipal waste materials such as litter, rubbish, trash and garbage located on or originating from the project shall be collected and stored in a securely lidded metal dumpster, provided by the Contractor. The dumpster shall be emptied as necessary or as required by local regulation and the trash shall be hauled to a permitted disposal facility. The burying of non-hazardous municipal waste on the project shall not be permitted. Construction material waste sites, stockpiles and haul roads shall be constructed to minimize and control the amount of sediment that may enter receiving waters. Construction material waste sites shall not be located in any wetland, water body or stream bed. Construction staging areas and vehicle maintenance areas shall be constructed in a manner to minimize the runoff of pollutants.

4. OFFSITE VEHICLE TRACKING:

Off-site vehicle tracking of sediments and the generation of dust must be minimized. Excess sediments on road shall be removed on a regular basis as directed/approved by the Engineer.

5. OTHER:

See the EPIC sheet for additional environmental information.

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

Linda Cox, P.E. 4/18/13
Signature of Registrant & Date

REVISION DATE: 08/04

© 2001 Texas Department of Transportation

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
6			BS 46-C
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	SHEET NO.
0215	02	048	$--$

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit (CGP) required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 1122.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000.
2. Comply with the Storm Water Pollution Prevention Plan (SW3P) and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and Texas Commission on Environmental Quality (TCEQ), Environmental Protection Agency (EPA) or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, Contractor shall submit Notice of Intent (NOI) to TCEQ and the Engineer.
5. NOI required: ☒ Yes ☐ No

Note: If amount of soil disturbance changes, permit requirements may change.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

US Army Corps of Engineers (USACE) Permit required for filling, dredging, excavating or other work in any potential USACE jurisdictional water, such as, rivers, creeks, streams, or wetlands.

The Contractor shall adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required

☐ Nationwide Permit (NWP) 14 - Pre-construction Notice (PCN) not Required

☐ Nationwide Permit 14 - PCN Required

☐ Individual 404 Permit Required

☒ Other Nationwide Permit Required: NWP#14 W/PCN DUE TO GC18 (ENDANGERED SPECIES)

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices (BMPs) planned to control erosion, sedimentation and post-project total suspended solids (TSS).

1. Un-named Tributary Abuts or Crosses Project Limits at these areas:
   1) At Sta/ 2221+70 to Sta. 2226+50 it's Ordinary High Water Mark is shown on the SW3P Layouts.
   2) Sta. 2235+50 (Large MBC Near Wood St.)
2.
3.
4.

401 Best Management Practices: (Not applicable if no USACE permit)

Erosion	Sedimentation	Post-Construction TSS
☐ Temporary Vegetation	☒ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☒ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular filter Dike	☐ Extended Detention Basin
☒ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☐ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☒ Sand Filter Systems
	☐ Sediment Basins	☐ Sedimentation Chambers

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.
2.
3.
4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.

☐ No Action Required ☒ Required Action

Action No.

1. Avoid and minimize removal of mature trees including Large Oak near Howard St.
2.
3.
4.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☐ No Action Required ☒ Required Action

Action No.

1. MIGRATORY BIRD NESTS: Schedule construction activities as needed to meet the following requirements:

   A. Do not remove or destroy any active migratory bird nests (nests containing eggs and/or flightless birds) at any time of year. If there are any active nests, they shall not be removed until the nests become inactive.

   B. On/in structures. If there are any active nests, they shall not be removed until all nests become inactive. After inactive nests are removed and/or before nest activity begins, deterrent materials may be applied to the structures to prevent future nest building.

2. See Item 5 in General Notes.
3. No Staging Areas in State ROW Within Panther Canyon or Blieders Creek watersheds.
4. No Excess Materials Remove from Project Shall Be Placed In Floodplains or waters of the U.S.
5. Use Appropriate Measures to Prevent, Minimize and Control Spills of Hazardous Materials

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
- Dead or distressed vegetation (not identified as normal)
- Trash piles, drums, canister, barrels, etc.
- Undesirable smells or odors
- Evidence of leaching or seepage of substances

Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1.

Does the project involve the demolition of a span bridge?

☐ Yes ☒ No (No further action required)

If "Yes", a pre-demolition notification must be submitted to the Texas Department of State Health Services, 20 calendar days prior to the demolition of the bridge(s) on the project. Contact TxDOT's hazardous material Coordinator at 210-615-6486 for assistance with the notification.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☐ No Action Required ☒ Required Action

Action No.

1. Comply with the TCEQ-approved Edwards Aquifer Protection Plan and conditions in the TCEQ-authorization letter for this project.
2. The Contractor must immediately report spills (including sanitary sewer discharge) of reportable quantities to TxDOT and to the following:
   - State Emergency Response Center (800) 832-8224
   - TCEQ Regional Office (210) 490-3096
   - National Response Center at (800) 424-8802
   - Edwards Aquifer Authority at (210) 222-2204,
   - New Braunfels Utilities for Sewer Spill at (830) 608-8800
3. Hazardous substances (e.g., fuel, oil, asphalt emulsion, concrete curing compounds) shall not be stored on the State ROW or easements.
4. Intentional discharges of sediment laden storm water during construction are not allowed.
5. If any sensitive feature (e.g., cave, sinkhole, well) is discovered during construction, all regulated activities near the sensitive feature must be suspended immediately and notify the TxDOT Environmental Office. Construction near the sensitive feature may not proceed until the feature has been evaluated and approval to continue construction has been received.

Texas Department of Transportation
San Antonio District Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

File: epic August 2012.dgn	Dn: TxDOT	Ck: TxDOT	Dw: SK	Ck: JAB
©TxDOT August 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0215	02	048	BS 46-C
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		8--8

Texas Commission on Environmental Quality
Water Pollution Abatement Plan
General Construction Notes

1. Written construction notification must be given to the appropriate TCEQ regional office no later than 48 hours prior to commencement of the regulated activity. Information must include the date on which the regulated activity will commence, the name of the approved plan for the regulated activity, and the name of the prime contractor and the name and telephone number of the contact person.

2. All contractors conducting regulated activities associated with this project must be provided with complete copies of the approved Water Pollution Abatement Plan and the TCEQ letter indicating the specific conditions of its approval. During the course of these regulated activities, the contractors are required to keep on-site copies of the approved plan and approval letter.

3. If any sensitive feature is discovered during construction, all regulated activities near the sensitive feature must be suspended immediately. The appropriate TCEQ regional office must be immediately notified of any sensitive features encountered during construction. The regulated activities near the sensitive feature may not proceed until the TCEQ has reviewed and approved the methods proposed to protect the sensitive feature and the Edwards Aquifer from any potentially adverse impacts to water quality.

4. No temporary aboveground hydrocarbon and hazardous substance storage tank system is installed within 150 feet of a domestic, industrial, irrigation, or public water supply well, or other sensitive feature.

5. Prior to commencement of construction, all temporary erosion and sedimentation (E&S) control measures must be properly selected, installed, and maintained in accordance with the manufacturers specifications and good engineering practices. Controls specified in the temporary storm water section of the approved Edwards Aquifer Protection Plan are required during construction. If inspections indicate a control has been used inappropriately, or incorrectly, the applicant must replace or modify the control for site situations. The controls must remain in place until disturbed areas are revegetated and the areas have become permanently stabilized.

6. 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).

7. Sediment must be removed from sediment traps or sedimentation ponds not later than when design capacity has been reduced by 50%. A permanent stake must be provided that can indicate when the sediment occupies 50% of the basin volume.

8. 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).

9. All spoils (excavated material) generated from the project site must be stored on-site with proper E&S controls. For storage or disposal of spoils at another site on the Edwards Aquifer Recharge Zone, the owner of the site must receive approval of a water pollution abatement plan for the placement of fill material or mass grading prior to the placement of spoils at the other site.

10. Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 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 temporary or permanently cease is precluded by weather conditions, stabilization measures shall be initiated as soon as practicable. Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 21 days, temporary stabilization measures do not have to be initiated on that portion of site. In areas experiencing droughts where the initiation of stabilization measures by the 14th day after construction activity has temporarily or permanently ceased is precluded by seasonal arid conditions, stabilization measures shall be initiated as soon as practicable.

11. The following records shall be maintained and made available to the TCEQ upon request: 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.

12. The holder of any approved Edward Aquifer protection plan must notify the appropriate regional office in writing and obtain approval from the executive director prior to initiating any of the following:

A. any physical or operational modification of any water pollution abatement structure(s), including but not limited to ponds, dams, berms, sewage treatment plants, and diversionary structures;

B. any change in the nature or character of the regulated activity from that which was originally approved or a change which would significantly impact the ability of the plan to prevent pollution of the Edwards Aquifer;

C. any development of land previously identified as undeveloped in the original water pollution abatement plan.

Austin Regional Office	San Antonio Regional Office
2800 S. IH 35, Suite 100	14250 Judson Road
Austin, Texas 78704-5712	San Antonio, Texas 78233-4480
Phone (512) 339-2929	Phone (210) 490-3096
Fax (512) 339-3795	Fax (210) 545-4329

THESE GENERAL CONSTRUCTION NOTES MUST BE INCLUDED ON THE CONSTRUCTION PLANS PROVIDED TO THE CONTRACTOR AND ALL SUBCONTRACTORS.

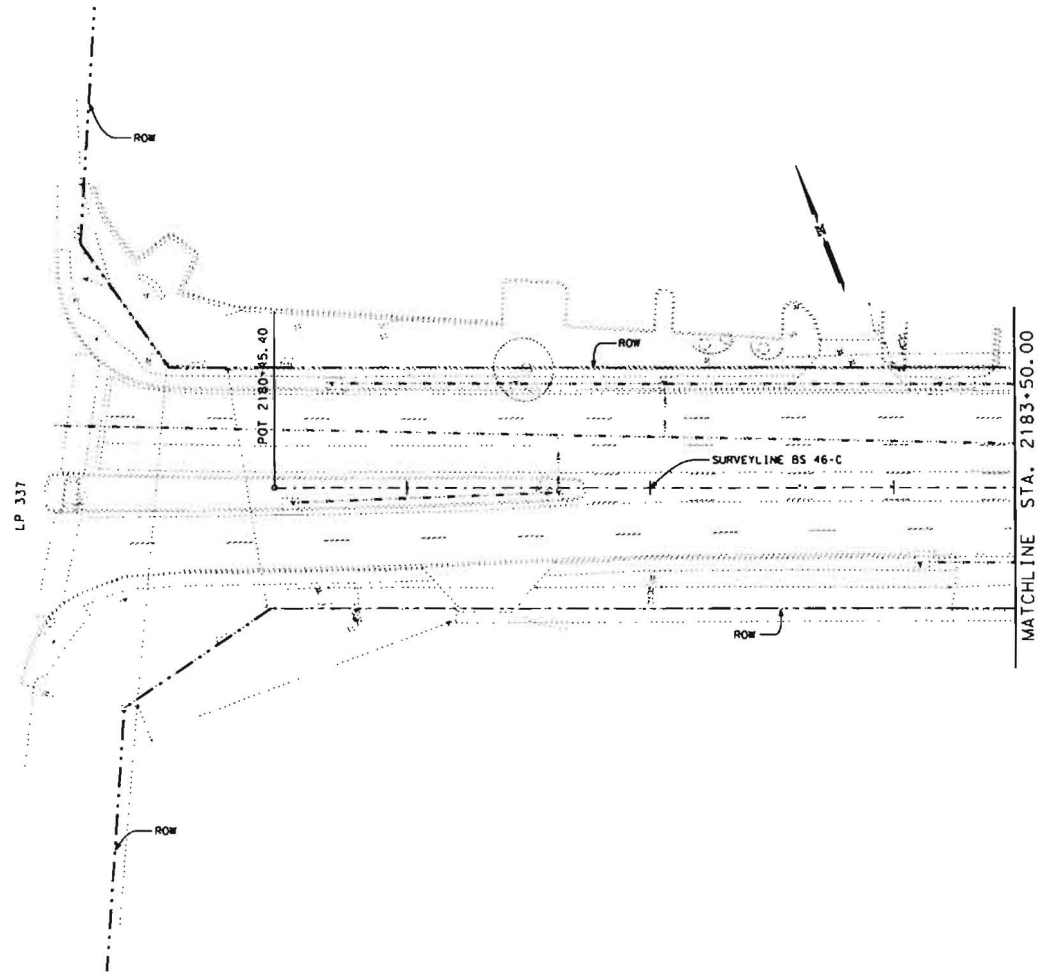
BS 46-C

TCEQ WPAP
GENERAL CONSTRUCTION
NOTES

Texas Department of Transportation

FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
			545A
STATE	DISTRICT	COUNTY	
TEXAS	SDST0	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\pwsouth\unnorend\vmsa8108\TCEQ Gen Notes WPAP.dgn
DATE: 4/17/2013 2:42:35 PM



NOTE:
SW3P MEASURES SHOWN SHALL BE PLACED PRIOR TO CONSTRUCTION AS SHOWN AND/OR AS DIRECTED BY THE ENGINEER

NOTE:
LOCATION OF CONSTRUCTION EXIT/ENTRANCE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

LEGEND
- FLOW ARROWS
- TEMPORARY ROCK FILTER DAM (TY 2)
- TEMPORARY ROCK FILTER DAM (TY 5)
- TEMPORARY SEDIMENT CONTROL FENCE

BS 46-C
SW3P LAYOUTS

0 50 100
SCALE IN FEET

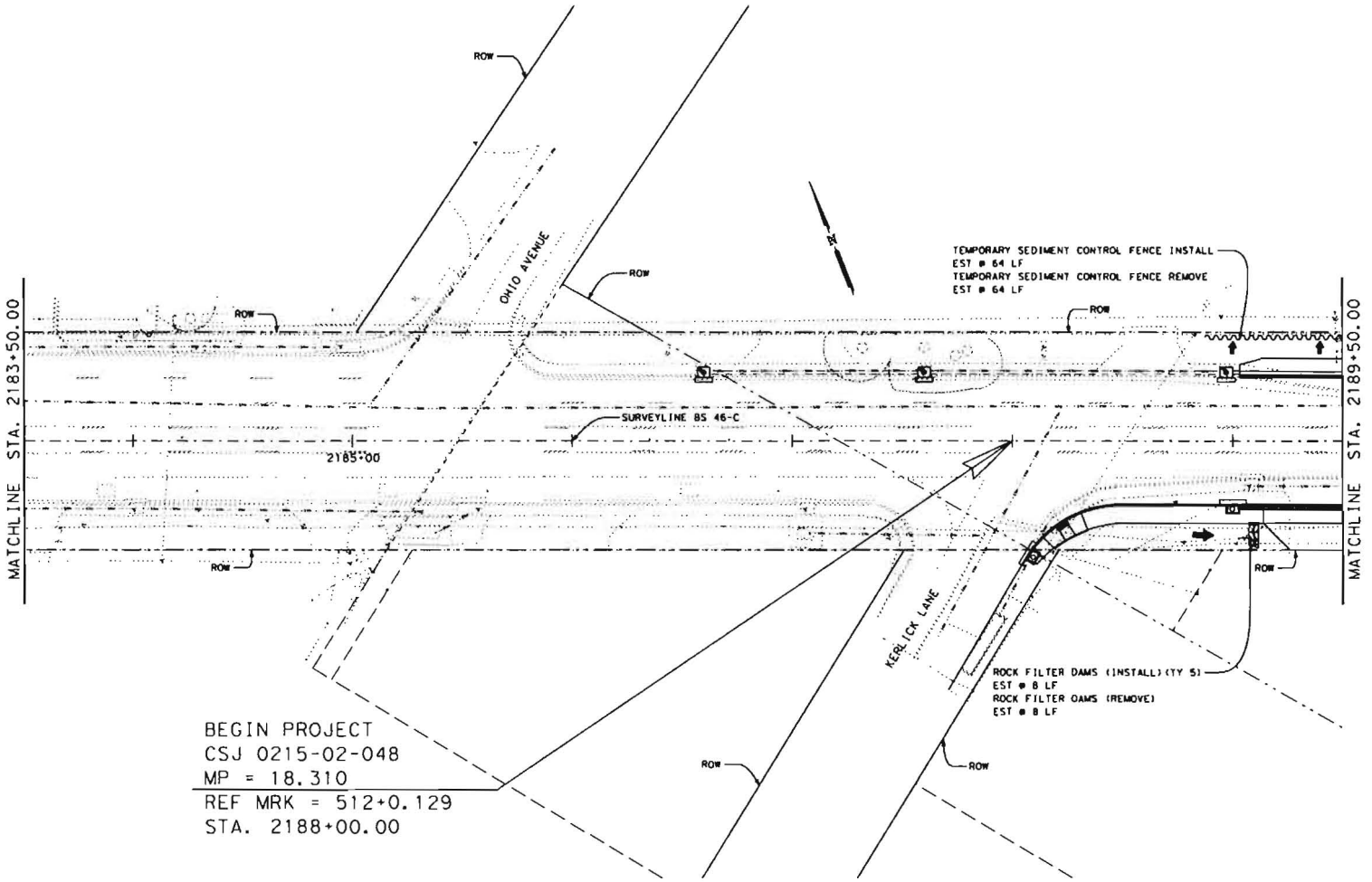
LINDA COX 90090 LICENSED PROFESSIONAL ENGINEER
April 18, 2013
P.E.

Texas Department of Transportation
SHEET 1 OF 12

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\projects\txdot\sansouth\environ\sms\18931\SW3P001.dgn
DATE: 4/18/2013 9:20:10 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
ROCK FILTER DAMS (REMOVE)	8	LF
TEMPORARY SEDIMENT CONTROL FENCE (INSTALL)	64	LF
ROCK FILTER DAMS (INSTALL) (TY 5)	8	LF
TEMPORARY SEDIMENT CONTROL FENCE (REMOVE)	64	LF



NOTE:
SW3P MEASURES SHOWN SHALL BE PLACED PRIOR TO CONSTRUCTION AS SHOWN AND/OR AS DIRECTED BY THE ENGINEER

NOTE:
LOCATION OF CONSTRUCTION EXIT/ENTRANCE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

LEGEND
- FLOW ARROWS
- TEMPORARY ROCK FILTER DAM (TY 2)
- TEMPORARY ROCK FILTER DAM (TY 5)
- TEMPORARY SEDIMENT CONTROL FENCE

BS 46-C SW3P LAYOUTS

0 50 100
SCALE IN FEET

LINDA COX 90090 LICENSED PROFESSIONAL ENGINEER
April 18, 2013
P.E.

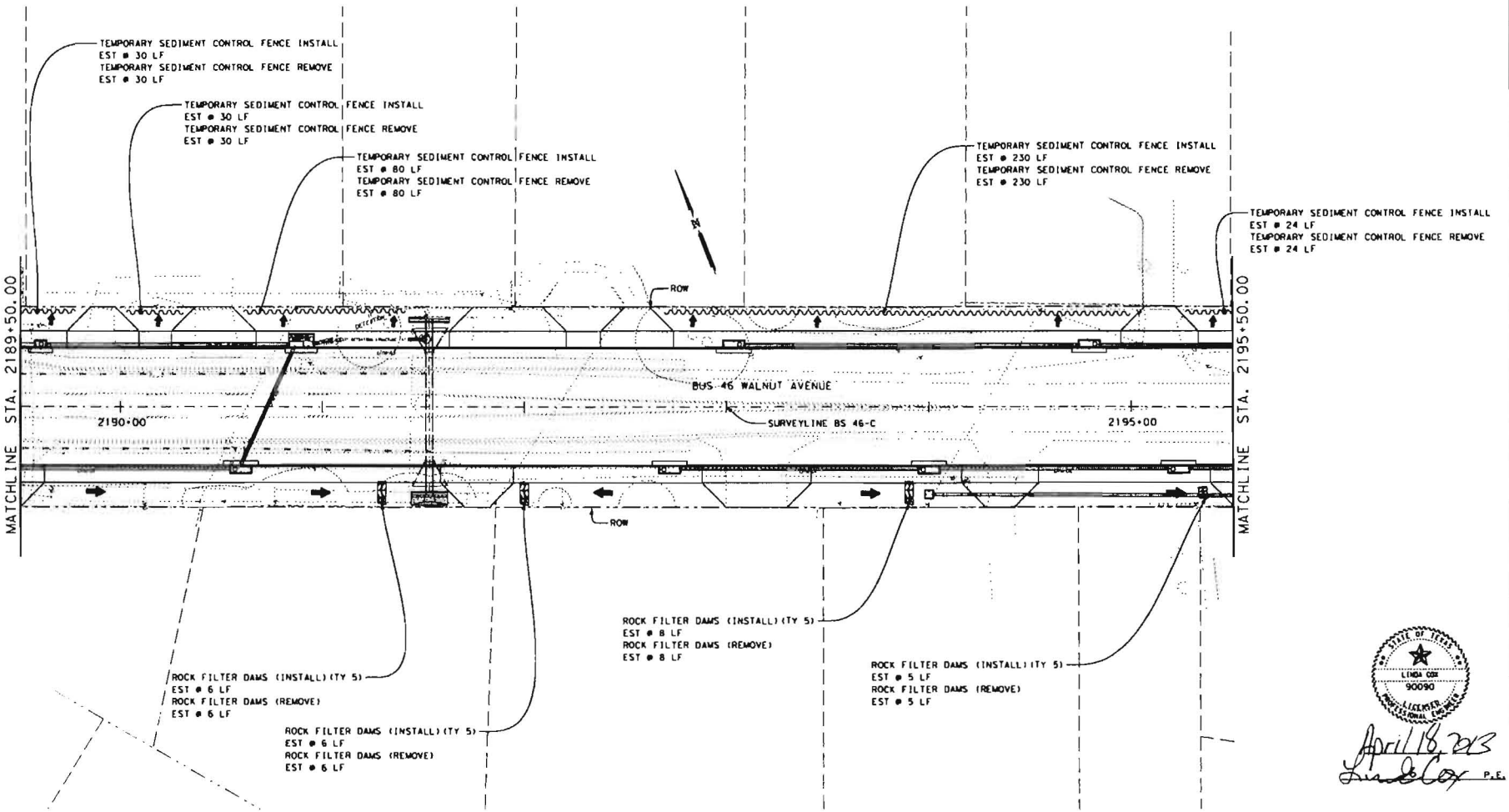
Texas Department of Transportation
SHEET 2 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

BS 46-C

FILE: c:\pmorking\vtxdot\pwsouth\pmorend\dms118993\sw3p002.dgn
DATE: 4/18/2013 9:20:31 AM

ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
ROCK FILTER DAMS (REMOVE)	25	LF
TEMPORARY SEDIMENT CONTROL FENCE (INSTALL)	394	LF
ROCK FILTER DAMS (INSTALL) (TY 5)	25	LF
TEMPORARY SEDIMENT CONTROL FENCE (REMOVE)	394	LF



NOTE:
SW3P MEASURES SHOWN SHALL BE PLACED PRIOR TO CONSTRUCTION AS SHOWN AND/OR AS DIRECTED BY THE ENGINEER

NOTE:
LOCATION OF CONSTRUCTION EXIT/ENTRANCE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

LEGEND
- FLOW ARROWS
- TEMPORARY ROCK FILTER DAM (TY 2)
- TEMPORARY ROCK FILTER DAM (TY 5)
- TEMPORARY SEDIMENT CONTROL FENCE

BS 46-C
SW3P LAYOUTS

0 50 100
SCALE IN FEET

LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER
April 18, 2013
Linda Cox P.E.

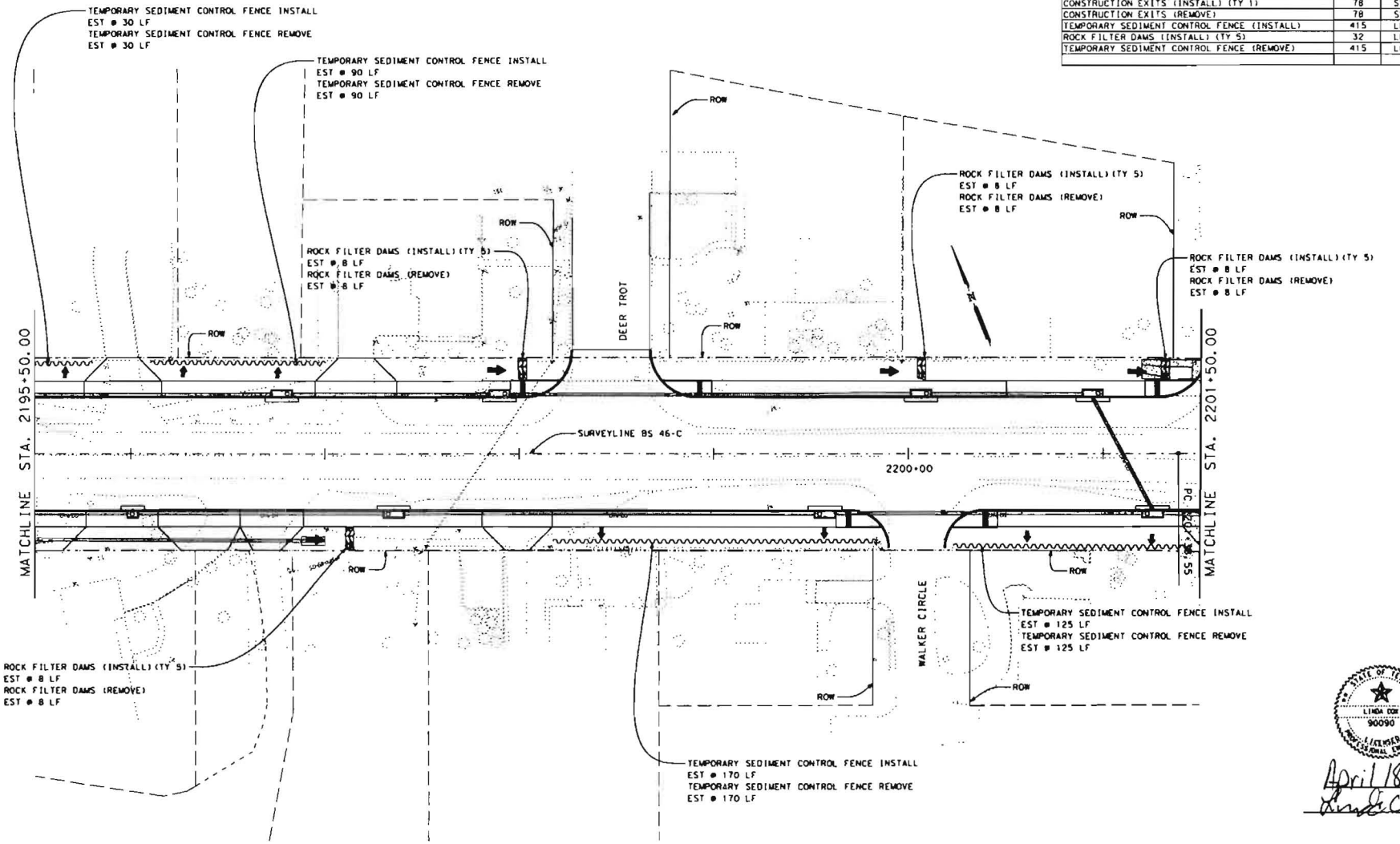
Texas Department of Transportation
SHEET 3 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

HIGHWAY NO. BS 46-C

FILE: c:\projects\txdot\projects\sat\bs46south\environ\cms18993\sw3p003.dgn
DATE: 4/18/2013 9:20:51 AM

ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
ROCK FILTER DAMS (REMOVE)	32	LF
CONSTRUCTION EXITS (INSTALL) (TY 1)	78	SY
CONSTRUCTION EXITS (REMOVE)	78	SY
TEMPORARY SEDIMENT CONTROL FENCE (INSTALL)	415	LF
ROCK FILTER DAMS (INSTALL) (TY 5)	32	LF
TEMPORARY SEDIMENT CONTROL FENCE (REMOVE)	415	LF



NOTE:
SW3P MEASURES SHOWN SHALL BE PLACED PRIOR TO CONSTRUCTION AS SHOWN AND/OR AS DIRECTED BY THE ENGINEER

NOTE:
LOCATION OF CONSTRUCTION EXIT/ENTRANCE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

LEGEND
- FLOW ARROWS
- TEMPORARY ROCK FILTER DAM (TY 2)
- TEMPORARY ROCK FILTER DAM (TY 5)
- TEMPORARY SEDIMENT CONTROL FENCE

BS 46-C
SW3P LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

Texas Department of Transportation

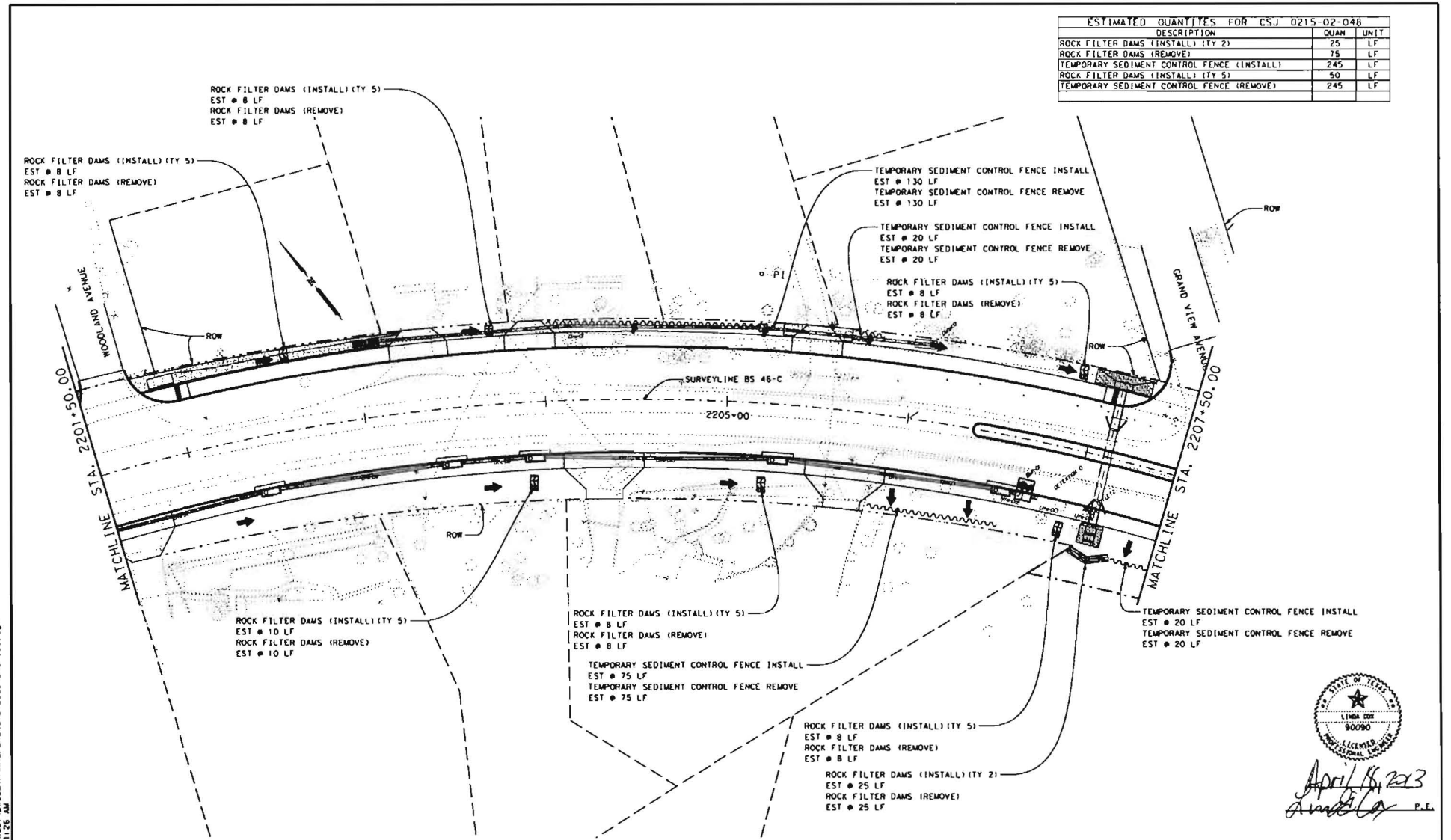
SHEET 4 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

BS 46-C

FILE: c:\projects\traffic\projects\sheets\bs46sw3p004.dgn
DATE: 4/18/2013 9:21:08 AM

ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
ROCK FILTER DAMS (INSTALL) (TY 2)	25	LF
ROCK FILTER DAMS (REMOVE)	75	LF
TEMPORARY SEDIMENT CONTROL FENCE (INSTALL)	245	LF
ROCK FILTER DAMS (INSTALL) (TY 5)	50	LF
TEMPORARY SEDIMENT CONTROL FENCE (REMOVE)	245	LF



NOTE:
SW3P MEASURES SHOWN SHALL BE PLACED PRIOR TO CONSTRUCTION AS SHOWN AND/OR AS DIRECTED BY THE ENGINEER

NOTE:
LOCATION OF CONSTRUCTION EXIT/ENTRANCE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

LEGEND
- FLOW ARROWS
- TEMPORARY ROCK FILTER DAM (TY 2)
- TEMPORARY ROCK FILTER DAM (TY 5)
- TEMPORARY SEDIMENT CONTROL FENCE

BS 46-C SW3P LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER
April 18, 2013
P.E.

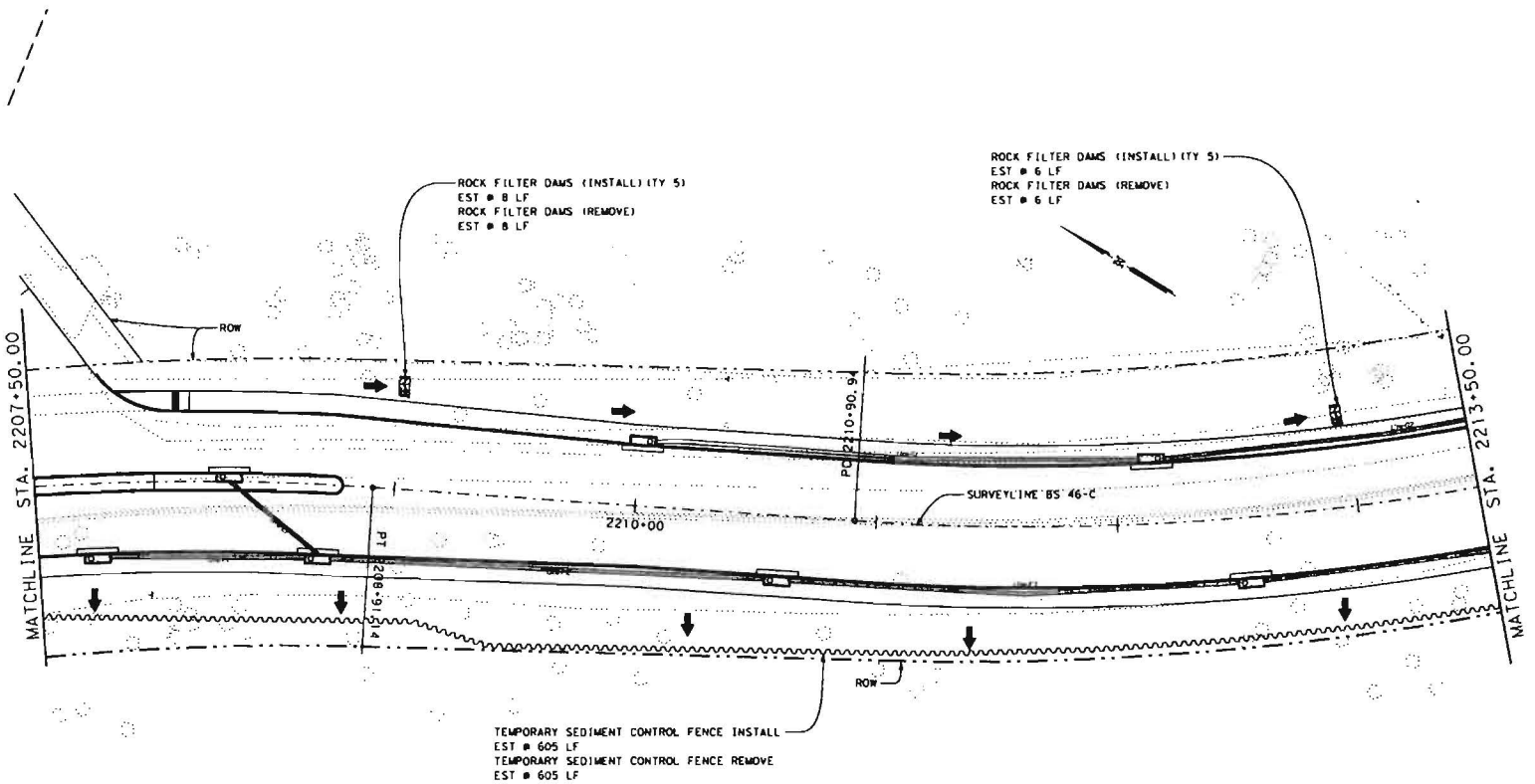
SHEET 5 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

BS 46-C

FILE: d:\pwworking\txdot\pbsaustmanorendcma18993\sw3p005.dgn
DATE: 4/18/2013 9:21:26 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
ROCK FILTER DAMS (REMOVE)	14	LF
TEMPORARY SEDIMENT CONTROL FENCE (INSTALL)	605	LF
ROCK FILTER DAMS (INSTALL) (TY 5)	14	LF
TEMPORARY SEDIMENT CONTROL FENCE (REMOVE)	605	LF



NOTE:
SW3P MEASURES SHOWN SHALL BE PLACED PRIOR TO CONSTRUCTION AS SHOWN AND/OR AS DIRECTED BY THE ENGINEER

NOTE:
LOCATION OF CONSTRUCTION EXIT/ENTRANCE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

LEGEND
- FLOW ARROWS
- TEMPORARY ROCK FILTER DAM (TY 2)
- TEMPORARY ROCK FILTER DAM (TY 5)
- TEMPORARY SEDIMENT CONTROL FENCE

BS 46-C SW3P LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER
April 18, 2013
P.E.

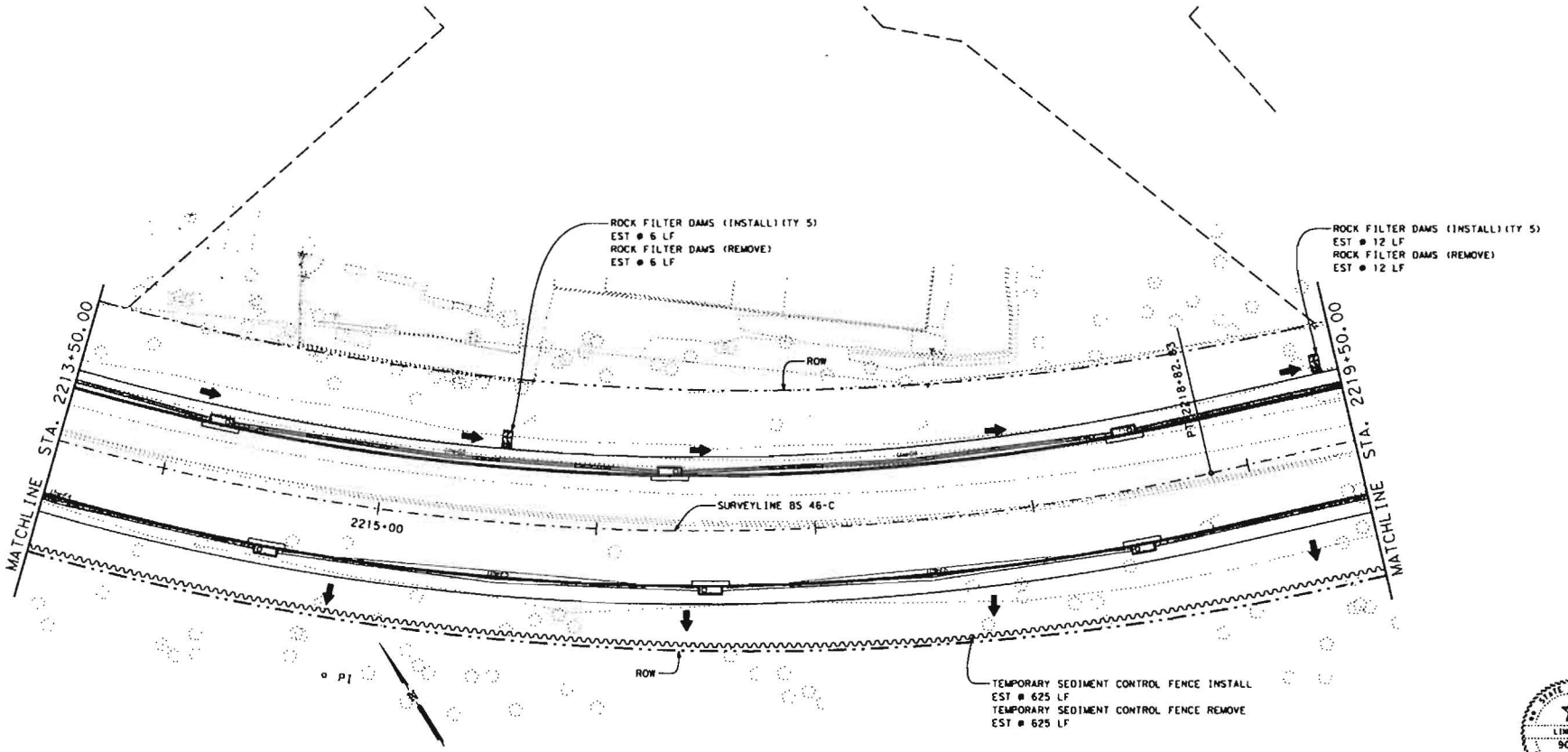
Texas Department of Transportation
SHEET 6 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

HIGHWAY NO. BS 46-C

FILE: d:\projects\txdot\pleasanton\comal8993\SW3P006.dgn
DATE: 4/18/2013 9:21:45 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
ROCK FILTER DAMS (REMOVE)	18	LF
TEMPORARY SEDIMENT CONTROL FENCE (INSTALL)	625	LF
ROCK FILTER DAMS (INSTALL) (TY 5)	18	LF
TEMPORARY SEDIMENT CONTROL FENCE (REMOVE)	625	LF



NOTE:
SW3P MEASURES SHOWN SHALL BE PLACED PRIOR TO CONSTRUCTION AS SHOWN AND/OR AS DIRECTED BY THE ENGINEER

NOTE:
LOCATION OF CONSTRUCTION EXIT/ENTRANCE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

LEGEND
- FLOW ARROWS
- TEMPORARY ROCK FILTER DAM (TY 2)
- TEMPORARY ROCK FILTER DAM (TY 5)
- TEMPORARY SEDIMENT CONTROL FENCE

BS 46-C
SW3P LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

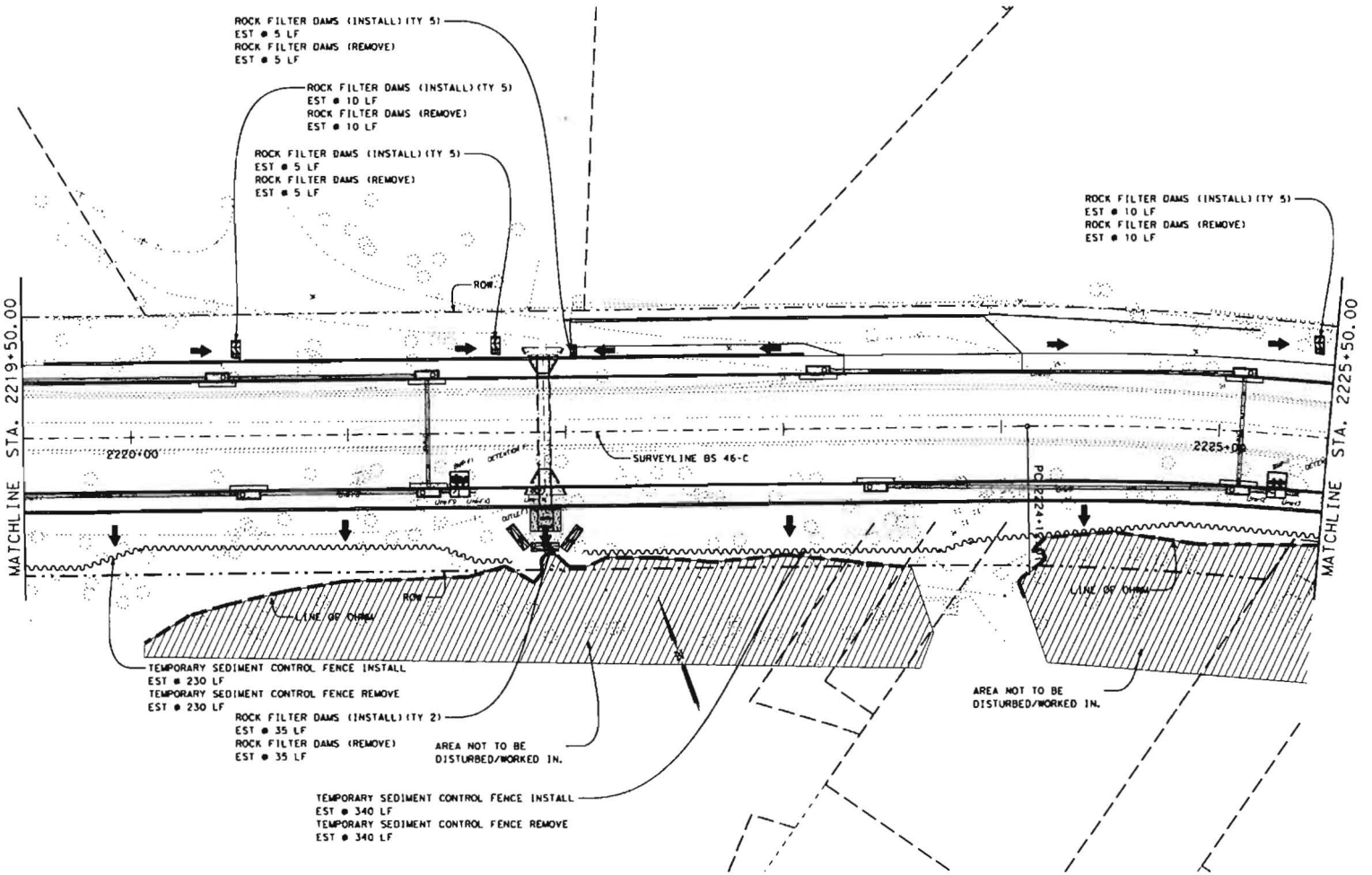
Texas Department of Transportation

SHEET 7 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\projects\ng\tx\den\projects\south\mmoreno\cms16993\SW3P007.dgn
DATE: 4/18/2013 9:22:01 AM

ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
ROCK FILTER DAMS (INSTALL) (TY 2)	35	LF
ROCK FILTER DAMS (REMOVE)	65	LF
TEMPORARY SEDIMENT CONTROL FENCE (INSTALL)	570	LF
ROCK FILTER DAMS (INSTALL) (TY 5)	30	LF
TEMPORARY SEDIMENT CONTROL FENCE (REMOVE)	570	LF



NOTE:
SW3P MEASURES SHOWN SHALL BE PLACED PRIOR TO CONSTRUCTION AS SHOWN AND/OR AS DIRECTED BY THE ENGINEER

NOTE:
LOCATION OF CONSTRUCTION EXIT/ENTRANCE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

LEGEND
- FLOW ARROWS
- TEMPORARY ROCK FILTER DAM (TY 2)
- TEMPORARY ROCK FILTER DAM (TY 5)
- TEMPORARY SEDIMENT CONTROL FENCE

BS 46-C
SW3P LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 15, 2013
Linda Cox P.E.

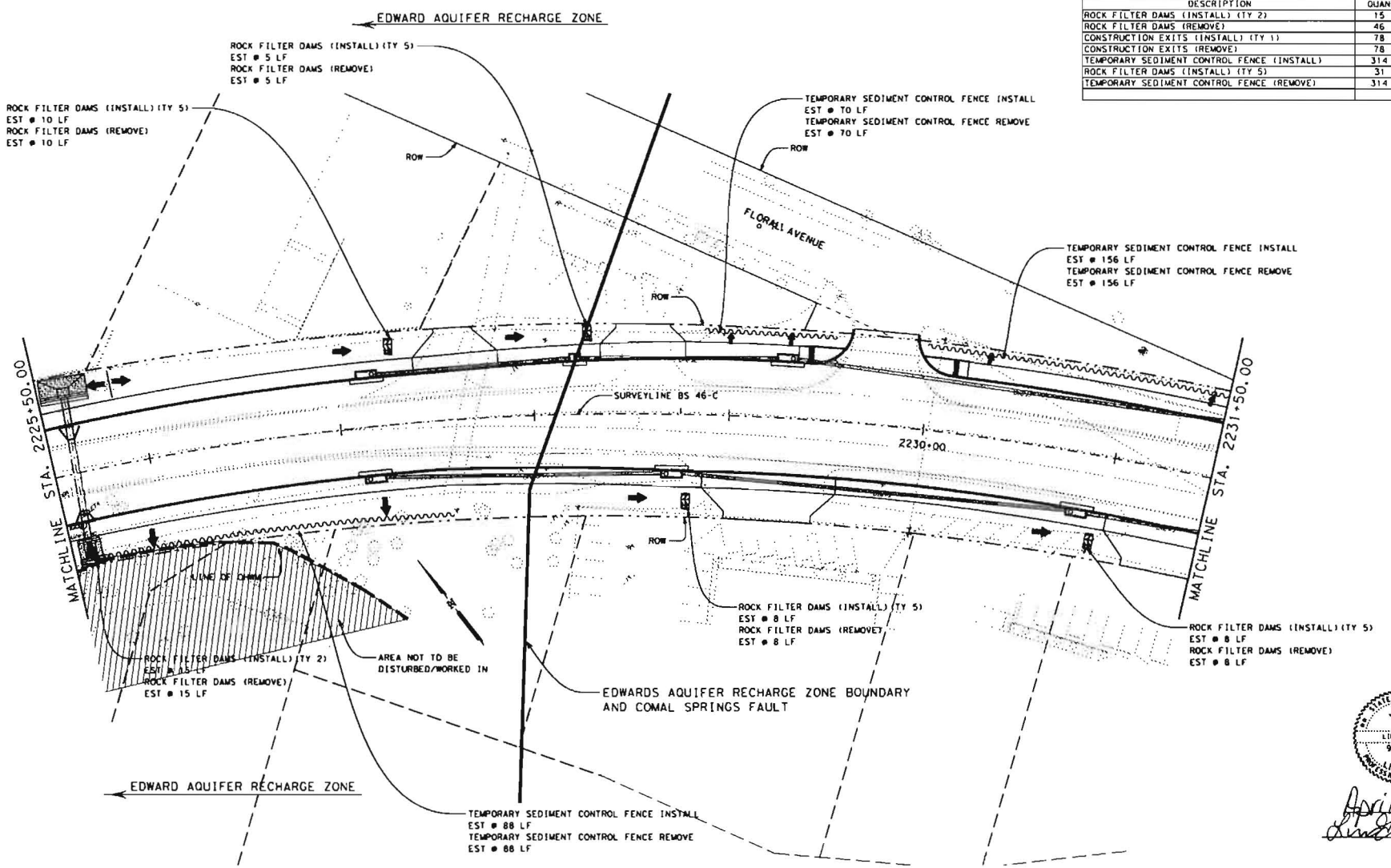
SHEET 8 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

HIGHWAY NO.: BS 46-C

FILE: c:\pwworking\txdot\wsaustin\mhorendo\d0118993\SW3P008.dgn
DATE: 4/18/2013 9:22:21 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
ROCK FILTER DAMS (INSTALL) (TY 2)	15	LF
ROCK FILTER DAMS (REMOVE)	46	LF
CONSTRUCTION EXITS (INSTALL) (TY 1)	78	SY
CONSTRUCTION EXITS (REMOVE)	78	SY
TEMPORARY SEDIMENT CONTROL FENCE (INSTALL)	314	LF
ROCK FILTER DAMS (INSTALL) (TY 5)	31	LF
TEMPORARY SEDIMENT CONTROL FENCE (REMOVE)	314	LF



NOTE:
SW3P MEASURES SHOWN SHALL BE PLACED PRIOR TO CONSTRUCTION AS SHOWN AND/OR AS DIRECTED BY THE ENGINEER

NOTE:
LOCATION OF CONSTRUCTION EXIT/ENTRANCE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

LEGEND
- FLOW ARROWS
- TEMPORARY ROCK FILTER DAM (TY 2)
- TEMPORARY ROCK FILTER DAM (TY 5)
- TEMPORARY SEDIMENT CONTROL FENCE

SW3P LAYOUTS

0 50 100
SCALE IN FEET

LINDA COX 90090 LICENSED PROFESSIONAL ENGINEER
April 18, 2013
P.E.

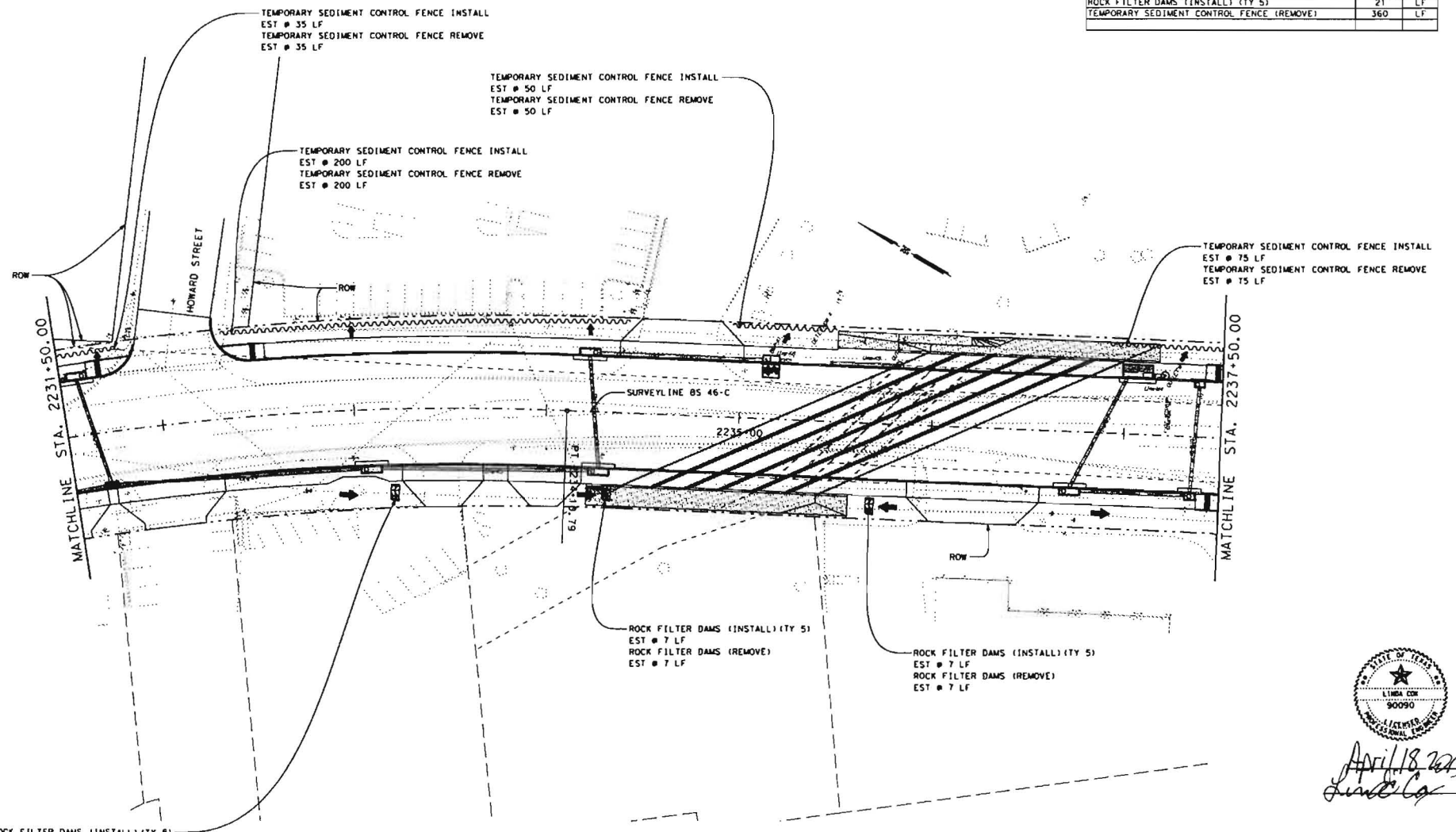
Texas Department of Transportation
SHEET 9 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

HIGHWAY NO. BS 46-C

FILE: c:\pwwork\pw1\txdot\pwfsouth\pwforms\dms18993\SW3P009.dgn
DATE: 4/18/2013 9:22:37 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
ROCK FILTER DAMS (REMOVE)	21	LF
TEMPORARY SEDIMENT CONTROL FENCE (INSTALL)	360	LF
ROCK FILTER DAMS (INSTALL) (TY 5)	21	LF
TEMPORARY SEDIMENT CONTROL FENCE (REMOVE)	360	LF



NOTE:
SW3P MEASURES SHOWN SHALL BE PLACED PRIOR TO CONSTRUCTION AS SHOWN AND/OR AS DIRECTED BY THE ENGINEER

NOTE:
LOCATION OF CONSTRUCTION EXIT/ENTRANCE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

LEGEND
- FLOW ARROWS
- TEMPORARY ROCK FILTER DAM (TY 2)
- TEMPORARY ROCK FILTER DAM (TY 5)
- TEMPORARY SEDIMENT CONTROL FENCE

BS 46-C
SW3P LAYOUTS

0 50 100
SCALE IN FEET

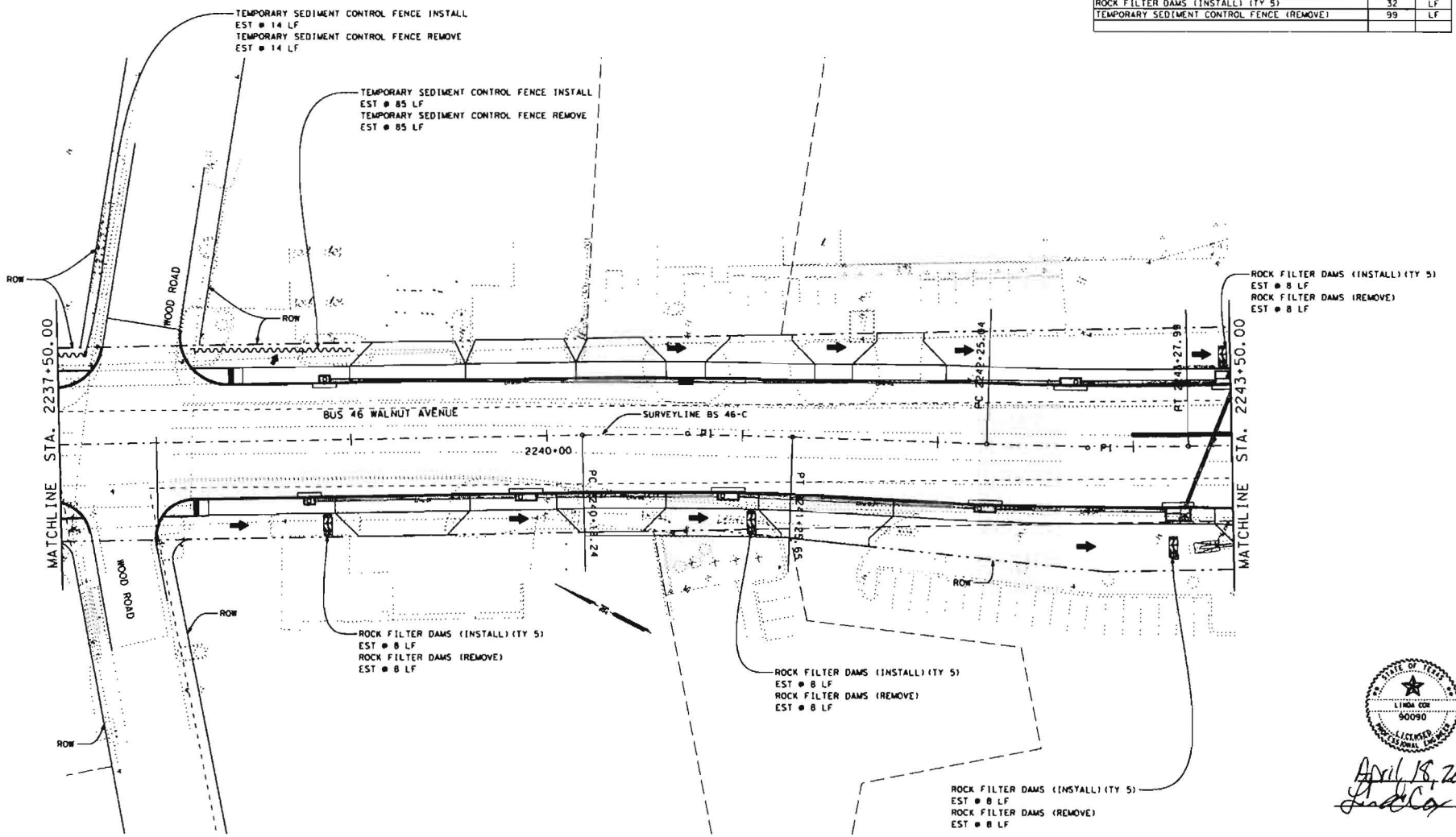
STATE OF TEXAS
LINDA COX
90090
REGISTERED PROFESSIONAL ENGINEER
April 18, 2013
Linda Cox P.E.

Texas Department of Transportation
SHEET 10 OF 12

FED. ROAD DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
			S-10
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pmwork\rpg\tx-dot\comsouth\unor and\cma18993\SW3P010.dgn
DATE: 4/18/2013 9:23:02 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
ROCK FILTER DAMS (REMOVE)	32	LF
TEMPORARY SEDIMENT CONTROL FENCE (INSTALL)	99	LF
ROCK FILTER DAMS (INSTALL) (TY 5)	32	LF
TEMPORARY SEDIMENT CONTROL FENCE (REMOVE)	99	LF



NOTE:
SW3P MEASURES SHOWN SHALL BE PLACED PRIOR TO CONSTRUCTION AS SHOWN AND/OR AS DIRECTEO BY THE ENGINEER

NOTE:
LOCATION OF CONSTRUCTION EXIT/ENTRANCE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

LEGEND
- FLOW ARROWS
- TEMPORARY ROCK FILTER DAM (TY 2)
- TEMPORARY ROCK FILTER DAM (TY 5)
- TEMPORARY SEDIMENT CONTROL FENCE

BS 46-C
SW3P LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

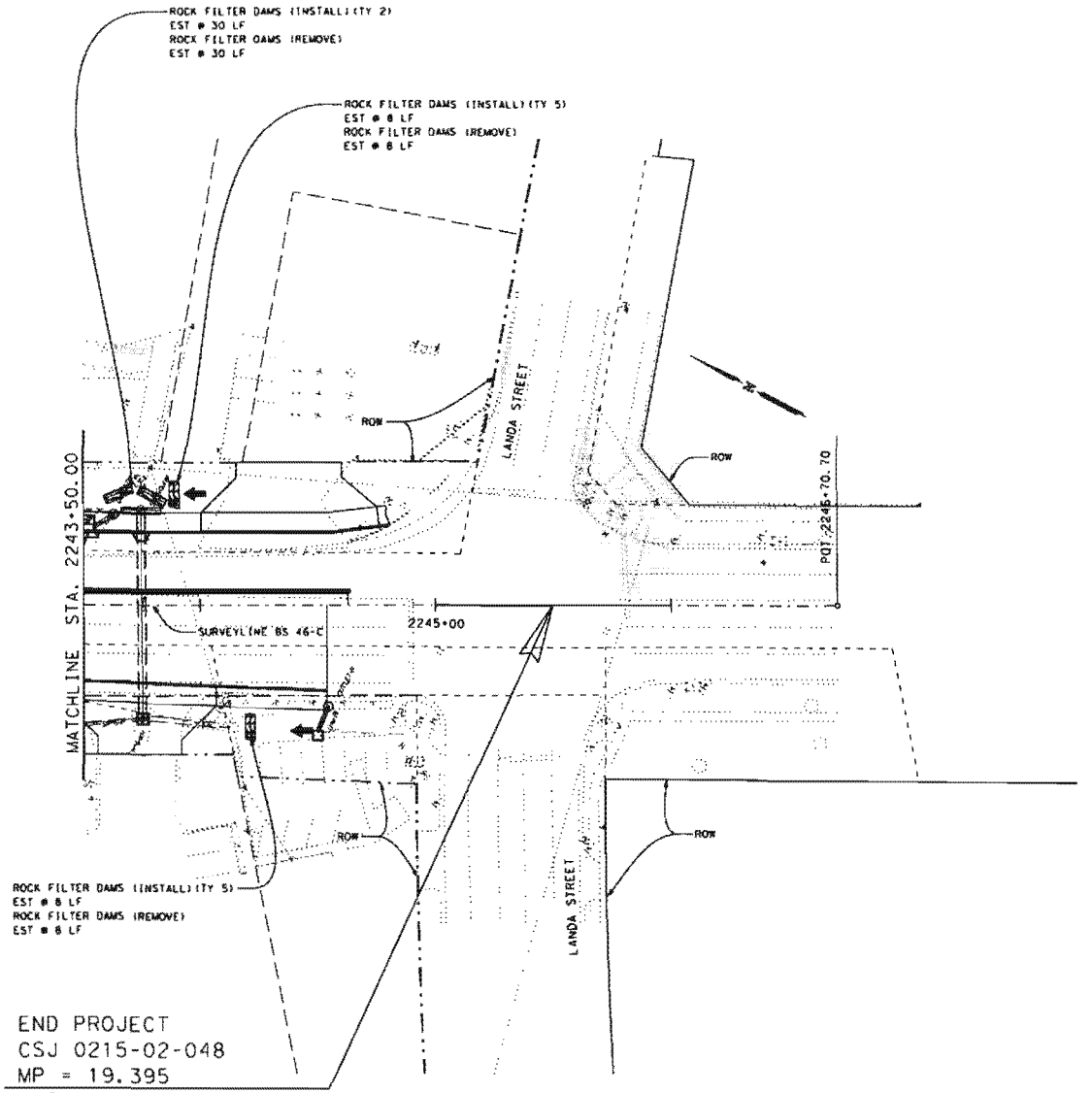
April 18, 2013
Linda Cox P.E.

© 2013 Texas Department of Transportation

SHEET 11 OF 12

FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
			S - 6
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\pwsouth\vmorend\dms18993\SW3P011.dgn
DATE: 4/18/2013 9:23:21 AM



END PROJECT
CSJ 0215-02-048
MP = 19.395
REF MRK = 0512+1.214
STA. 2245+50.00

ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
ROCK FILTER DAMS (INSTALL) (TY 2)	30	LF
ROCK FILTER DAMS (REMOVE)	46	LF
ROCK FILTER DAMS (INSTALL) (TY 5)	16	LF

NOTE:
SW3P MEASURES SHOWN SHALL BE PLACED PRIOR TO CONSTRUCTION AS SHOWN AND/OR AS DIRECTED BY THE ENGINEER

NOTE:
LOCATION OF CONSTRUCTION EXIT/ENTRANCE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

LEGEND
- FLOW ARROWS
- TEMPORARY ROCK FILTER DAM (TY 2)
- TEMPORARY ROCK FILTER DAM (TY 5)
- TEMPORARY SEDIMENT CONTROL FENCE

BS 46-C
SW3P LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

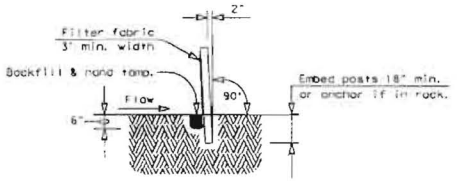
April 18, 2023
Linda Cox P.E.

Texas Department of Transportation
SHEET 12 OF 12

FED.ROAD DIVISION NO.	FEDERAL AID PROJECT NO.		SHEET NO.
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\Designing\Projects\pwsouth\environ\env\dgn\18993\SW3P012.dgn
DATE: 4/18/2013 9:23:38 AM

DATE:
FILE:



SECTION A-A

GENERAL NOTES

1. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

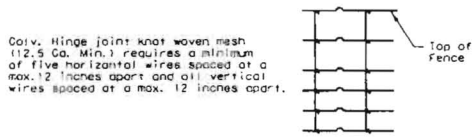
PLAN SHEET LEGEND

Sediment Control Fence —— SCF

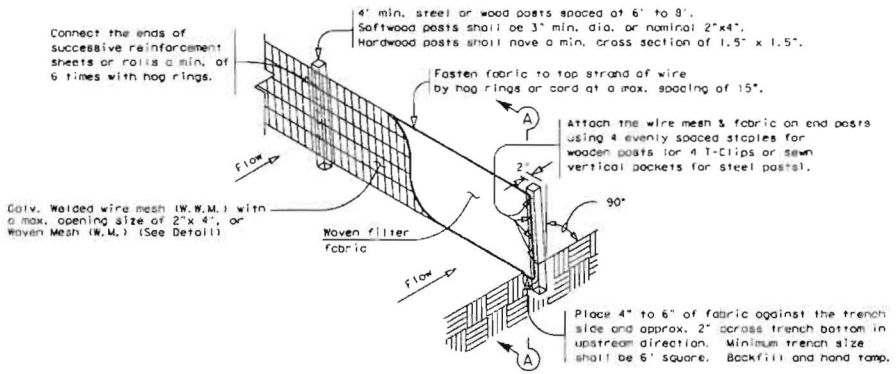
SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a max. flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

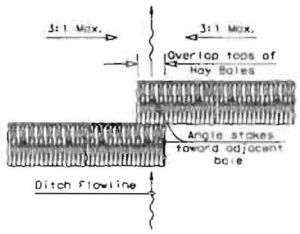


Hinge Joint Knot Woven Mesh (Option)

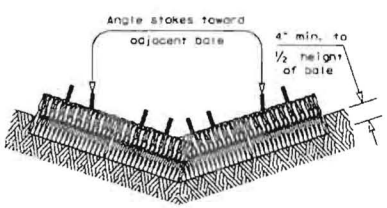


TEMPORARY SEDIMENT CONTROL FENCE

SCF



PLAN VIEW



PROFILE VIEW

PLANS SHEET LEGEND

Baled Hay —— BH

BALED HAY USAGE GUIDELINES

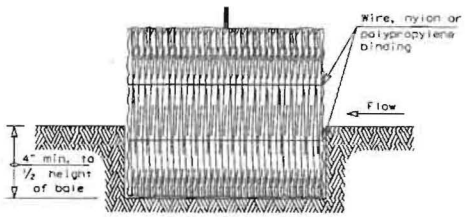
A Baled Hay installation may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A two year storm frequency may be used to calculate the flow rate to be filtered. The installation should be sized to filter a maximum flow thru rate of 5 GPM/FT^2 of cross sectional area. Baled hay may be used at the following locations:

1. Where the runoff approaching the baled hay flows over disturbed soil for less than 100'. If the slope of the disturbed soil exceeds 10%, the length of slope upstream the baled hay should be less than 50'.
2. Where the installation will be required for less than 3 months.
3. Where the contributing drainage area is less than ½ acre.

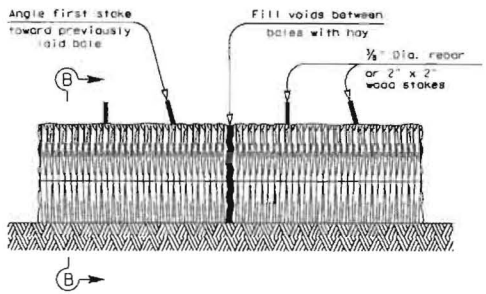
For Baled Hay installations in small ditches, the additional following considerations apply:

1. The ditch sideslopes should be graded as flat as possible to maximize the drainage flowrate thru the hay.
2. The ditch should be graded large enough to contain the overtopping drainage when sediment has filled to the top of the baled hay.

Bales should be replaced usually every 2 months or more often during wet weather when loss of structural integrity is accelerated.



SECTION B-B



BALED HAY FOR EROSION CONTROL

BH

GENERAL NOTES

1. Hay bales shall be a minimum of 30" in length and weigh a minimum of 50 Lbs.
2. Hay bales shall be bound by either wire or nylon or polypropylene string. The bales shall be composed entirely of vegetative matter.
3. Hay bales shall be embedded in the soil a minimum of 4" and where possible ½ the height of the bale.
4. Hay bales shall be placed in a row with ends tightly abutting the adjacent bales. The bales shall be placed with bindings parallel to the ground.
5. Hay bales shall be securely anchored in place with ⅜" Dia. rebar or 2" x 2" wood stakes, driven through the bales. The first stake shall be angled towards the previously laid bale to force the bales together.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation
Design Division Standard

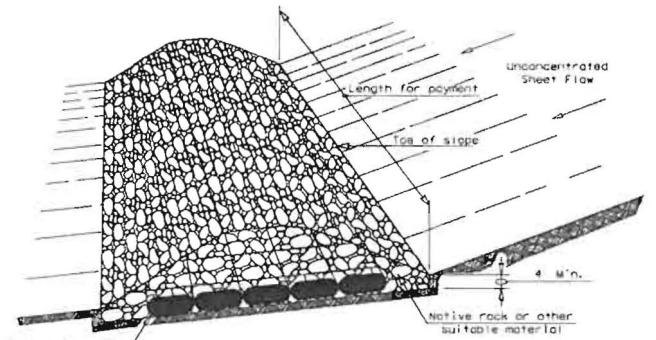
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & BALED HAY

EC(1)-09

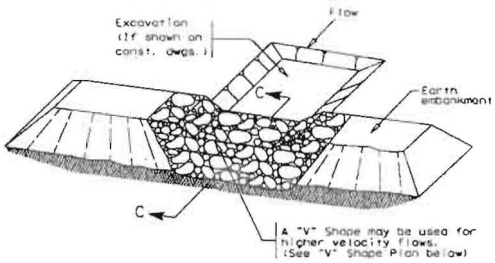
FILE:	ec109.dgn	DN: TxDOT	CK: AM	DW: TV	CK: DO
©TxDOT	June 1993	CONT	SECT	JOB	HIGHWAY
REVISIONS		0215	02	048	BS 46-C
		DIST	COUNTY		SHEET NO.
		SAT	COMAL		5--5

DATE:
FILE:



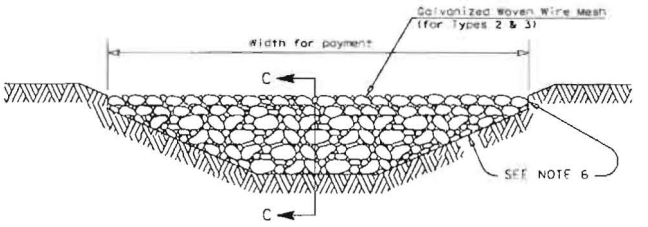
FILTER DAM AT TOE OF SLOPE

RFD1
TYPE 1



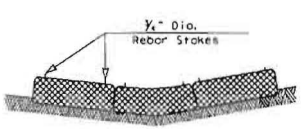
FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2
TYPE 1 OR TYPE 2

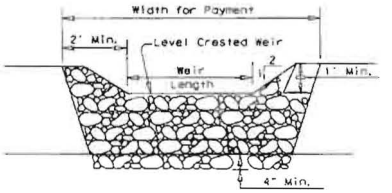


FILTER DAM AT CHANNEL SECTIONS

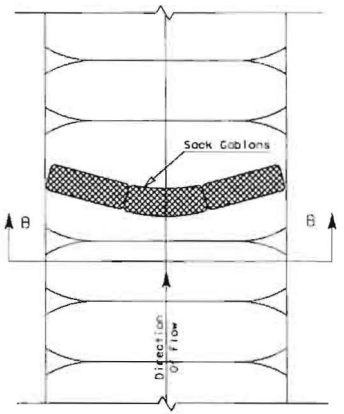
RFD1 OR RFD2 OR RFD3
TYPE 1 OR TYPE 2



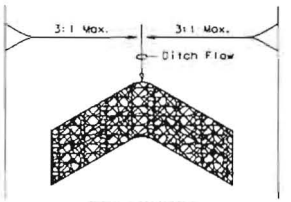
SECTION B-B



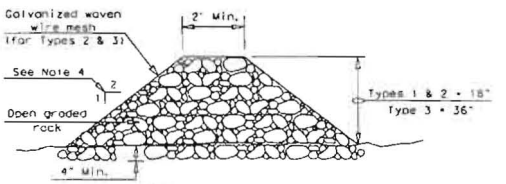
PROFILE



PLAN VIEW



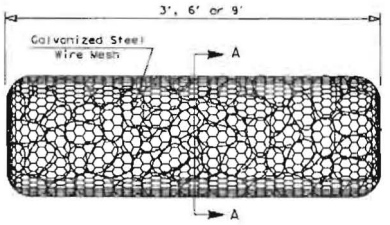
"V" SHAPE
(Plan View)



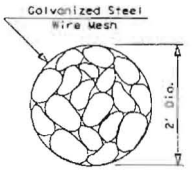
SECTION C-C

PLANS SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3



TYPE 4 (SACK GABIONS)



SECTION A-A

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approx. 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. In stream use the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes.
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation
Design Division Standard

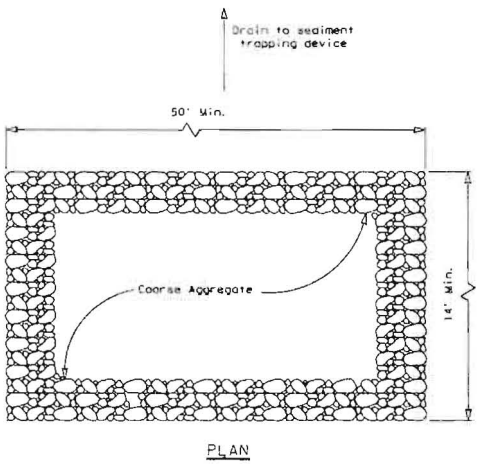
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

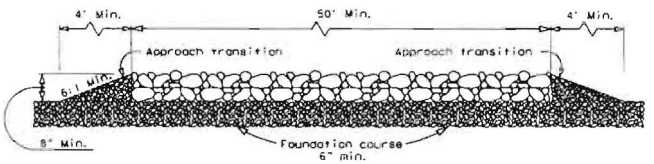
EC(2)-93

FILE: ec293.dgn	DN: TxDOT	CK: REJ	DW: BD	CK:	
©TxDOT June 1993	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0215	02	049	BS 45-C	
	DIST	COUNTY		SHEET NO.	
	SAT	CONAL		8--8	

DATE:
FILE:



PLAN

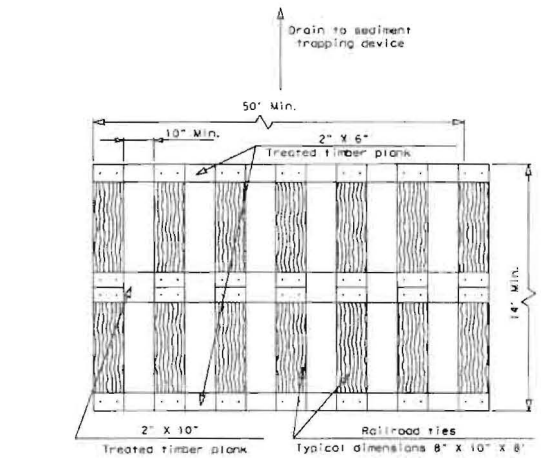


PROFILE

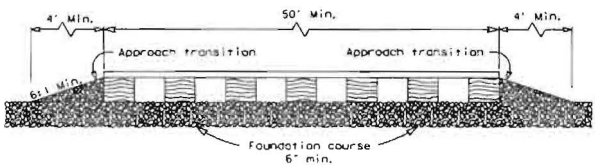
CONSTRUCTION EXIT (TYPE 1)

GENERAL NOTES

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.



PLAN

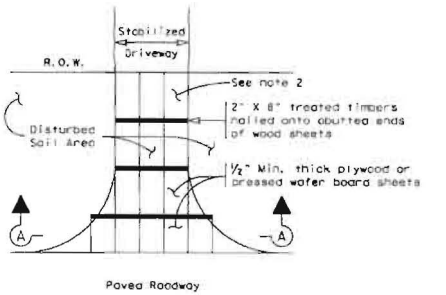


PROFILE

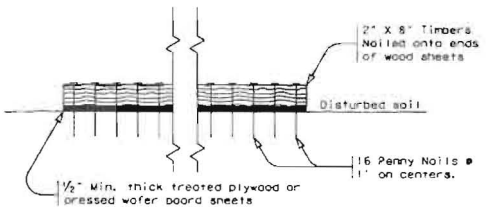
CONSTRUCTION EXIT (TYPE 2)

GENERAL NOTES

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.



PLAN



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

GENERAL NOTES

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation
Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-93

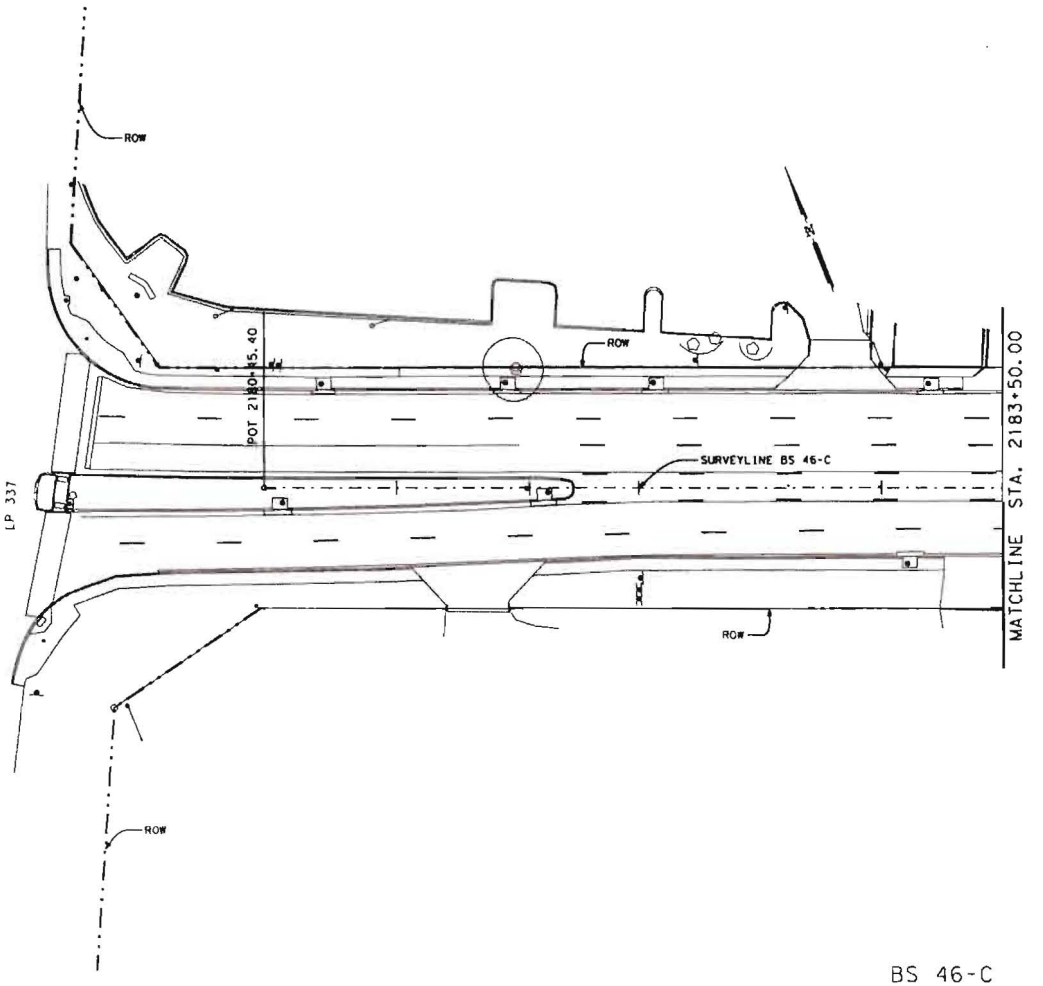
FILE: ec393.dgn	DN: TxDOT	CK: MEJ	DW: BD	CK:
©TxDOT June 1993	CONT	SECT	JOB	HIGHWAY
REVISIONS	0215	02	048	BS 46-C
	DIST	COUNTY		SHEET NO.
	SAT	COMAL		8--8

RDWY: BS 46C
CSJ: 0215-02-048
LIMITS: FROM KERLICH LN. TO LANDA ST.
COUNTY: COMAL

GENERAL NOTE IN PLANS CALLING OUT TY 5 ROCK FILTER DAM.

--Item 1122--
Rock Filter Dam (Ty 5) (reinforced) constructed as follows:

Height:	6" to 12", as directed by the Engineer, measured vertically from the existing ground to the top of the filter dam, with wire mesh
Top Width:	24"
Slopes:	2:1 maximum (outside clear zone) 6:1 maximum (within clear zone)
Aggregate:	Gradation shall be 3 to 6 inches.



BS 46-C

PROPOSED CONTOUR LAYOUTS

0 50 100

SCALE IN FEET

LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013

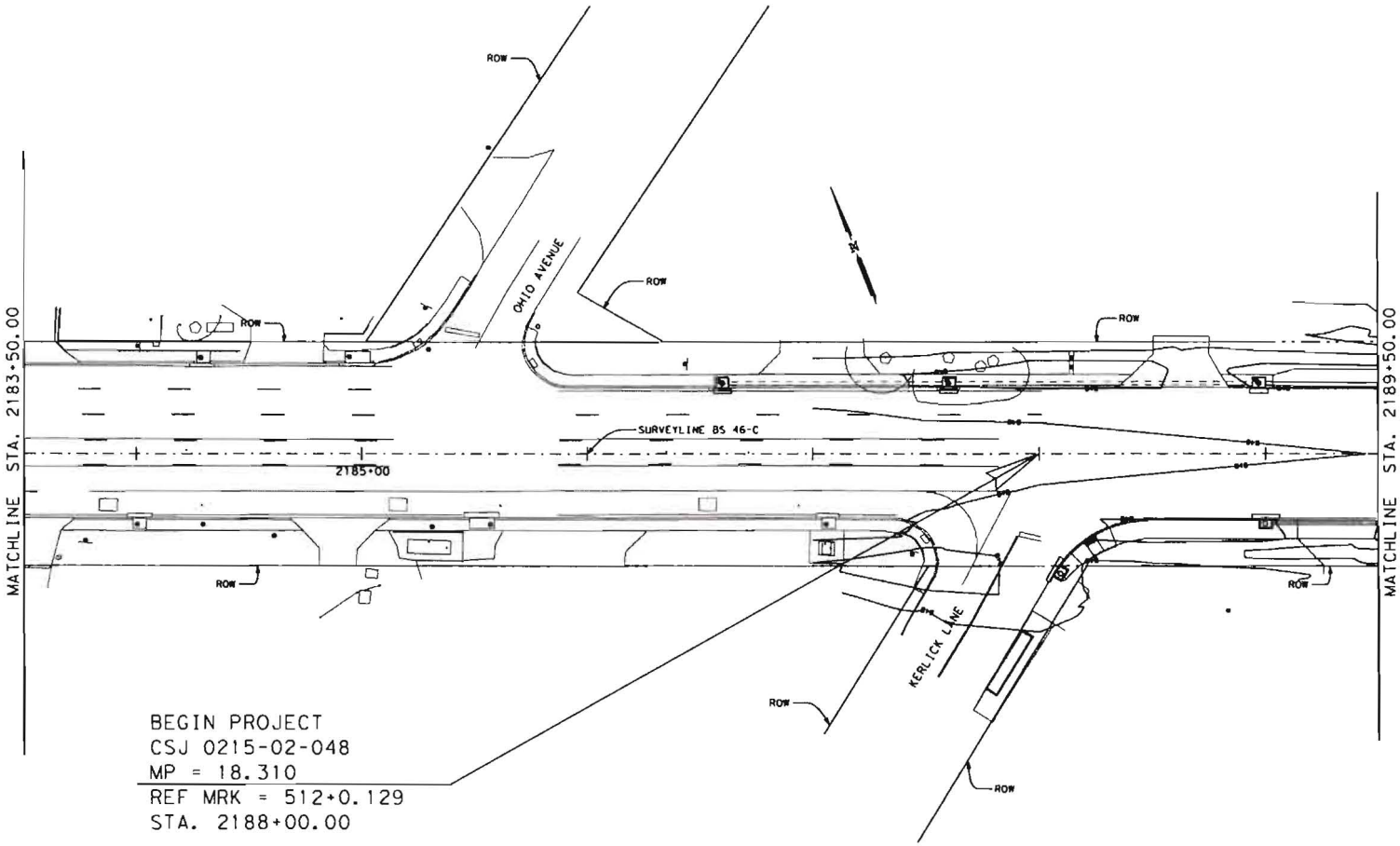
P.E.

Texas Department of Transportation

SHEET 1 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\jwbsouth\jwbsouth\d3215296\PROPCON001.dgn
DATE: 4/18/2013 8:39:39 AM



BEGIN PROJECT
CSJ 0215-02-048
MP = 18.310
REF MRK = 512+0.129
STA. 2188+00.00

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

BS 46-C

PROPOSED CONTOUR LAYOUTS

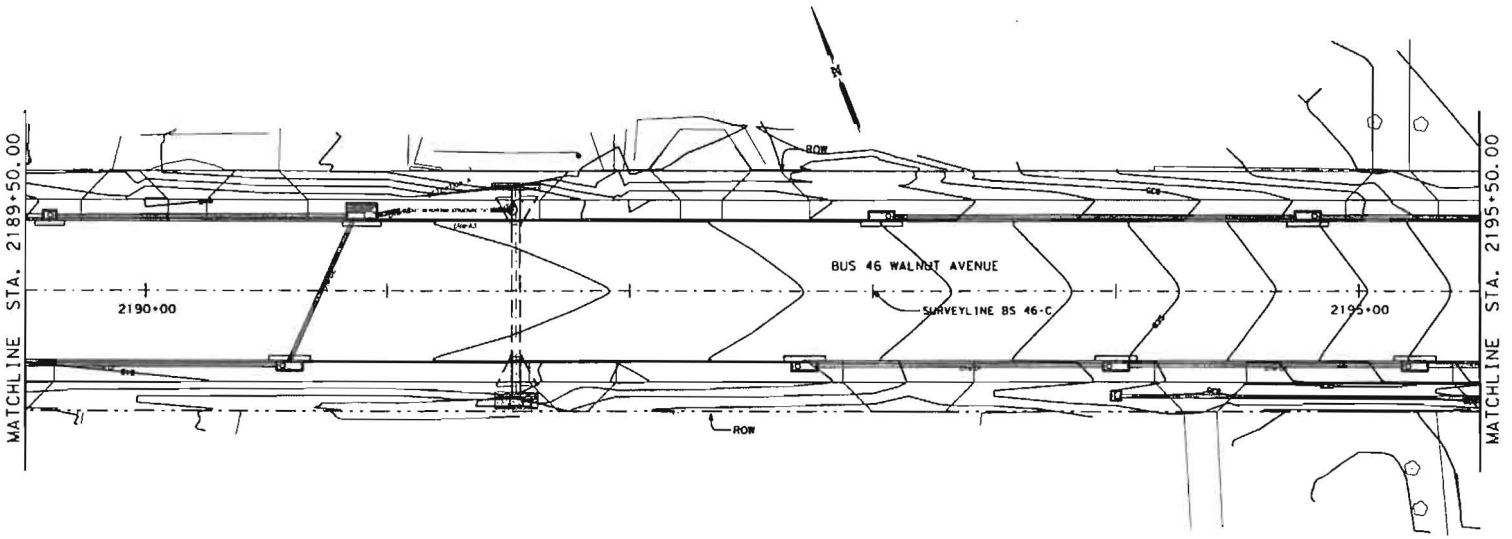
0 50 100
SCALE IN FEET

© 2013 Texas Department of Transportation

SHEET 2 OF 12

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\projects\tx\dot\sat\comal\sheets\ms212296\PROPCON002.dgn
DATE: 4/18/2013 8:40:01 AM



LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

BS 46-C

PROPOSED CONTOUR LAYOUTS

0 50 100
SCALE IN FEET

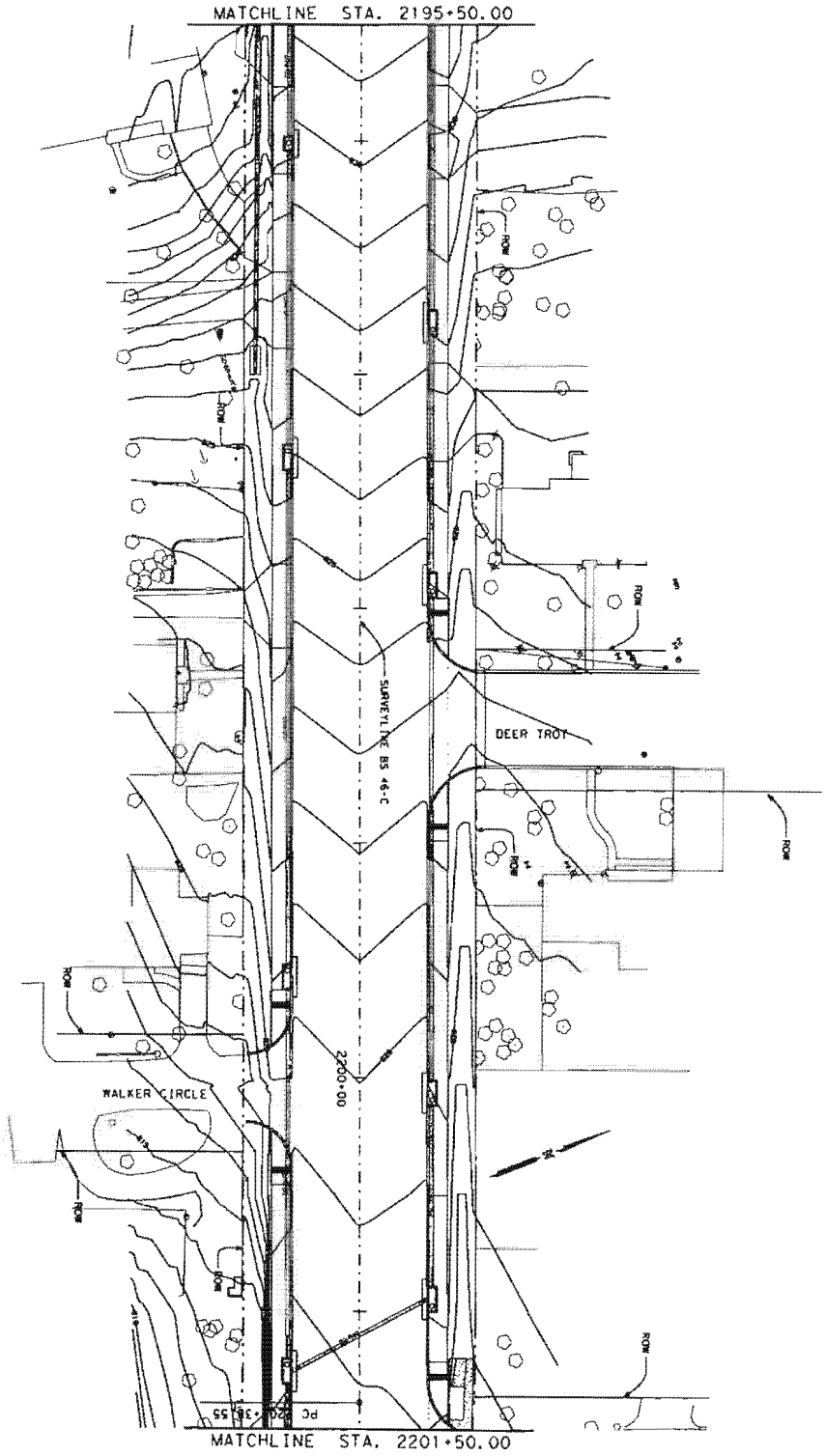
Texas Department of Transportation

SHEET 3 OF 12

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: d:\pwworking\txdot\pwaauthn\mmorend\dms21296\PROPCONN003.dgn
DATE: 4/18/2013 8:40:16 AM

FILE: c:\pwworking\txdot\pwsouth\mnorend\dms21296\PROPCON004.dgn
DATE: 4/18/2013 8:40:25 AM



PROPOSED CONTOUR LAYOUTS

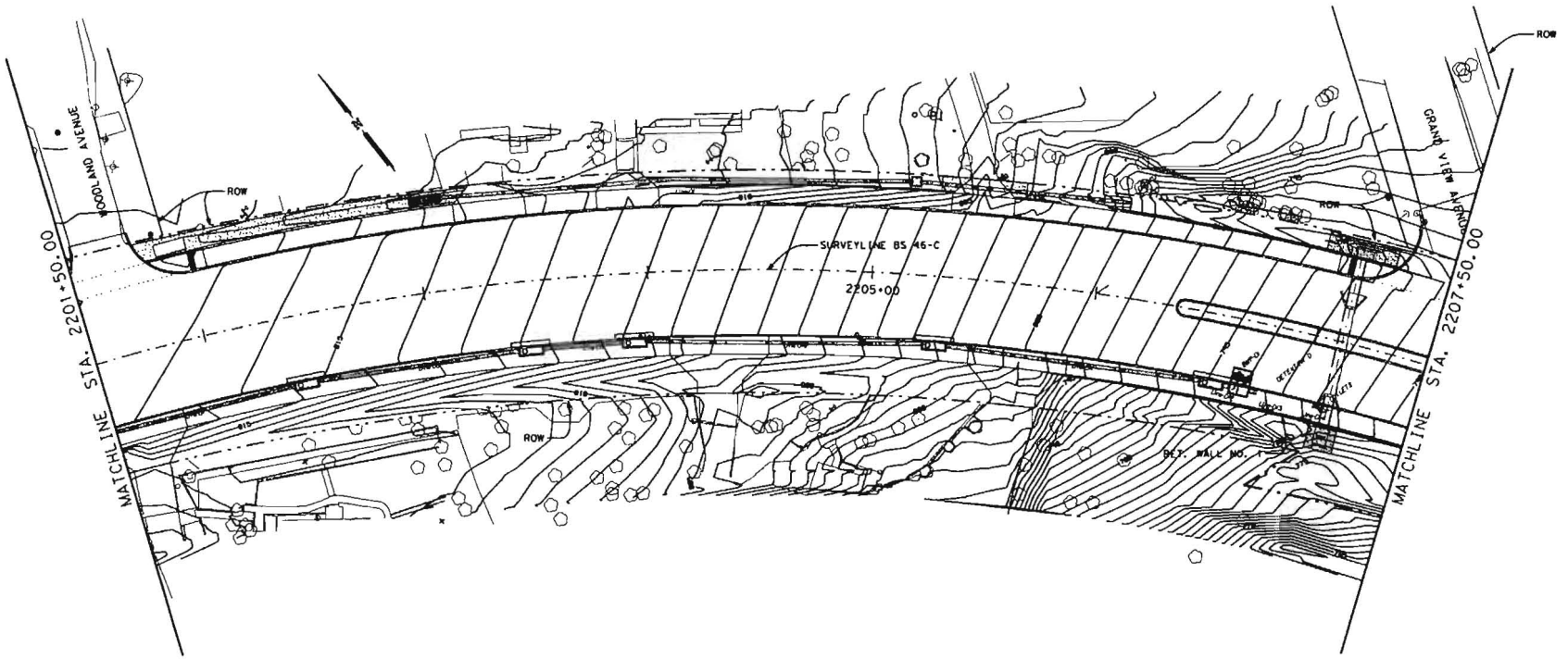
BS 46-C

SCALE IN FEET 0 50 100

April 18, 2013
P.E.

DIST	COUNTY		SHEET NO.
15	COMAL		4
CONTROL	SECTION	JOB	
0215	02	048	
			HIGHWAY NO.
			BS 46-C

Texas Department of Transportation
SHEET 4 OF 12



LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

BS 46-C

PROPOSED CONTOUR LAYOUTS

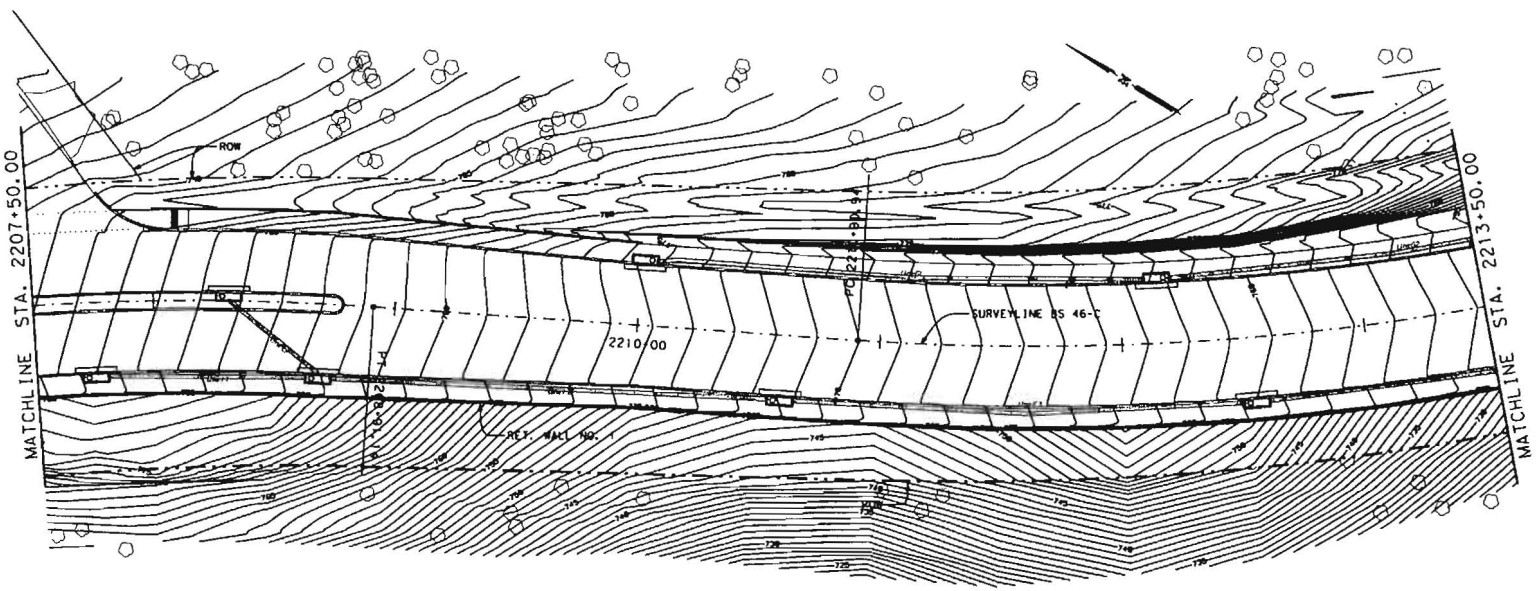
0 50 100
SCALE IN FEET

Texas Department of Transportation

SHEET 5 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: d:\dgnorkingv1\xdot\txdot\newsouth\mmorand\dms21296\PROPCON005.dgn
DATE: 4/18/2013 8:40:39 AM



FILE: c:\onmodrk\hq\tx801\pw&out\tunnorand\dms21296\PROPCOM006.dgn
DATE: 4/18/2013 8:40:49 AM

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 18 2013
Linda Cox P.E.

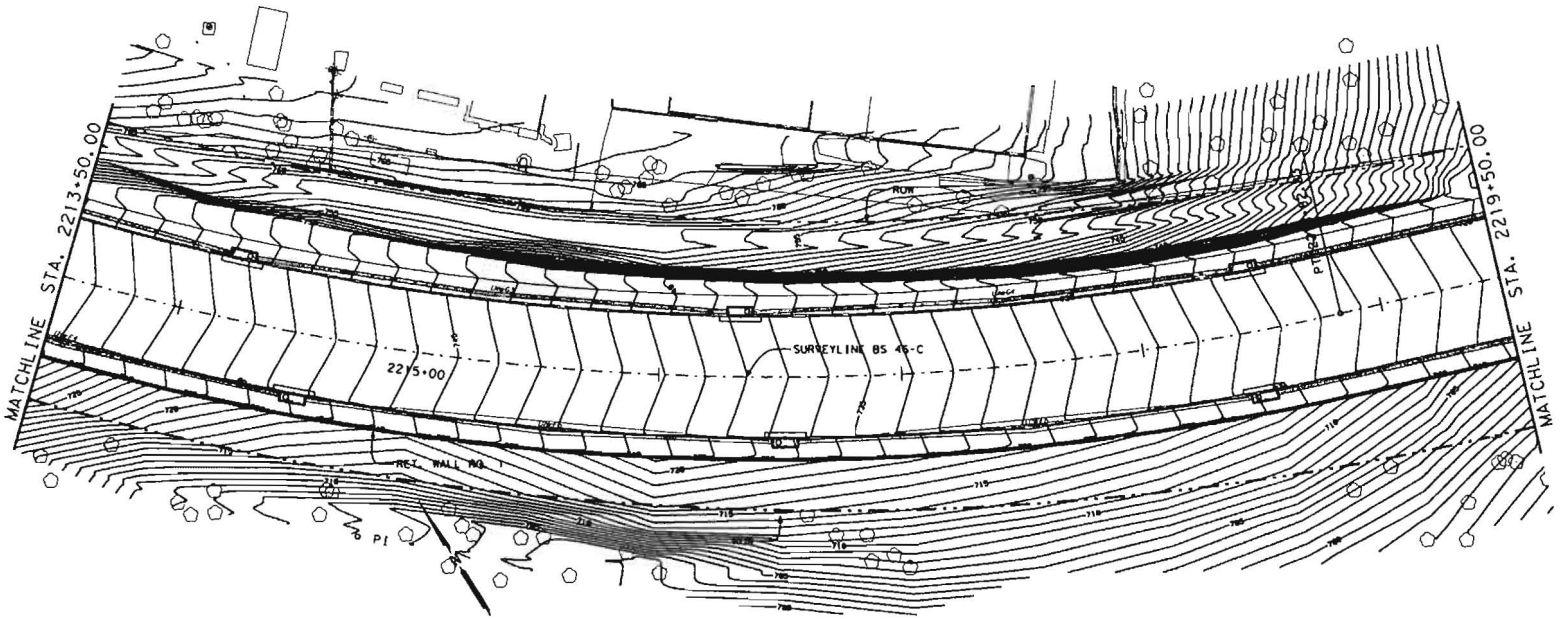
BS 46-C

PROPOSED CONTOUR LAYOUTS

0 50 100
SCALE IN FEET

Texas Department of Transportation
SHEET 6 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C



FILE: c:\pwworking\txdot\pwsouth\unnorend\dms212986\PROPCON0007.dgn
DATE: 4/18/2013 8:40:57 AM

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

BS 46-C

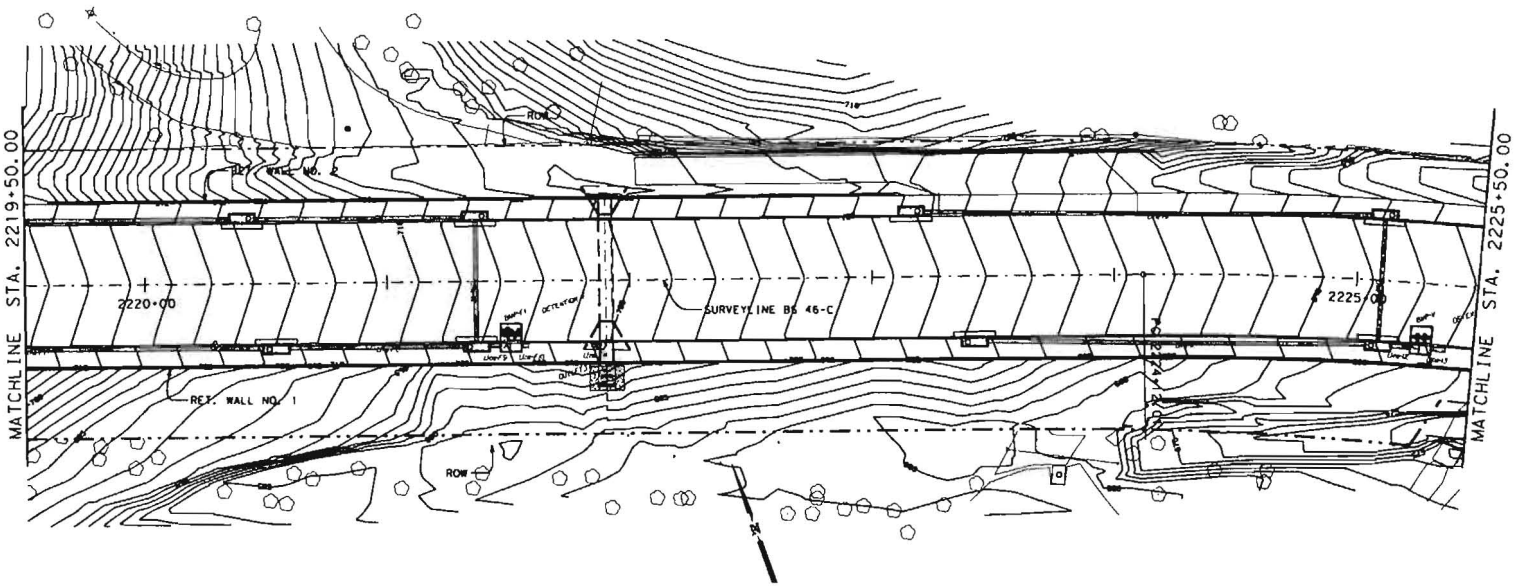
PROPOSED CONTOUR LAYOUTS

0 50 100
SCALE IN FEET

Texas Department of Transportation

SHEET 7 OF 12

FHWA DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
			S - - E
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C



FILE: c:\projects\txdot\brazos\hillsboro\bs46c\dgn\21296\PROPCON008.dgn
DATE: 4/18/2013 8:41:06 AM

LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

BS 46-C

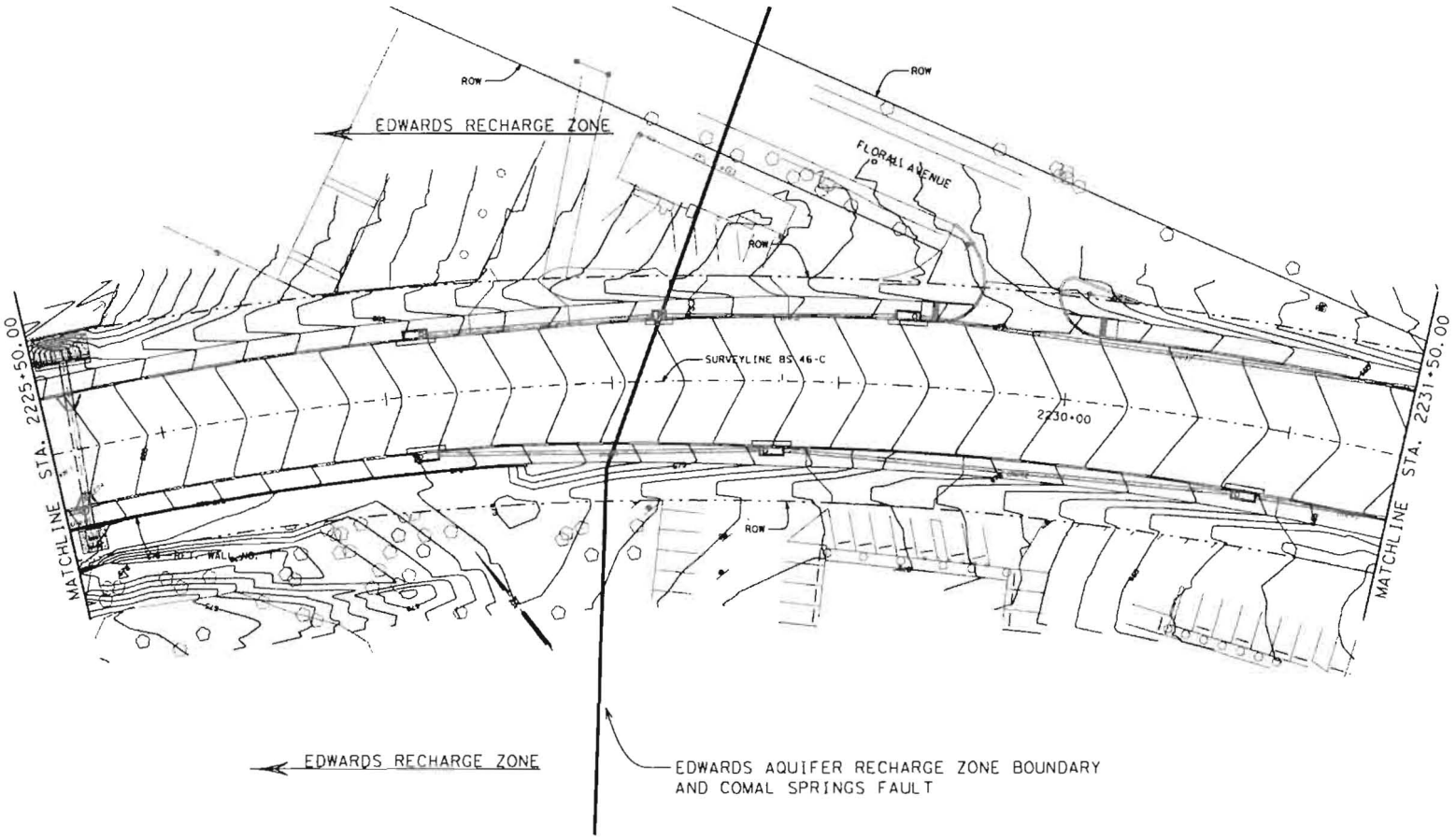
PROPOSED CONTOUR LAYOUTS

0 50 100
SCALE IN FEET

Texas Department of Transportation

SHEET 8 OF 12

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C



STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

BS 46-C

PROPOSED CONTOUR LAYOUTS

0 50 100
SCALE IN FEET

Texas Department of Transportation

SHEET 9 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\Vonwork\log\txdot\2weaustin\mnorend\dgn\21296\PROPCON009.dgn
DATE: 4/18/2013 8:41:14 AM

BS 46-C

PROPOSED CONTOUR LAYOUTS

0 50 100
SCALE IN FEET

RECEIVED
MAY 13 2013
COUNTY ENGINEER

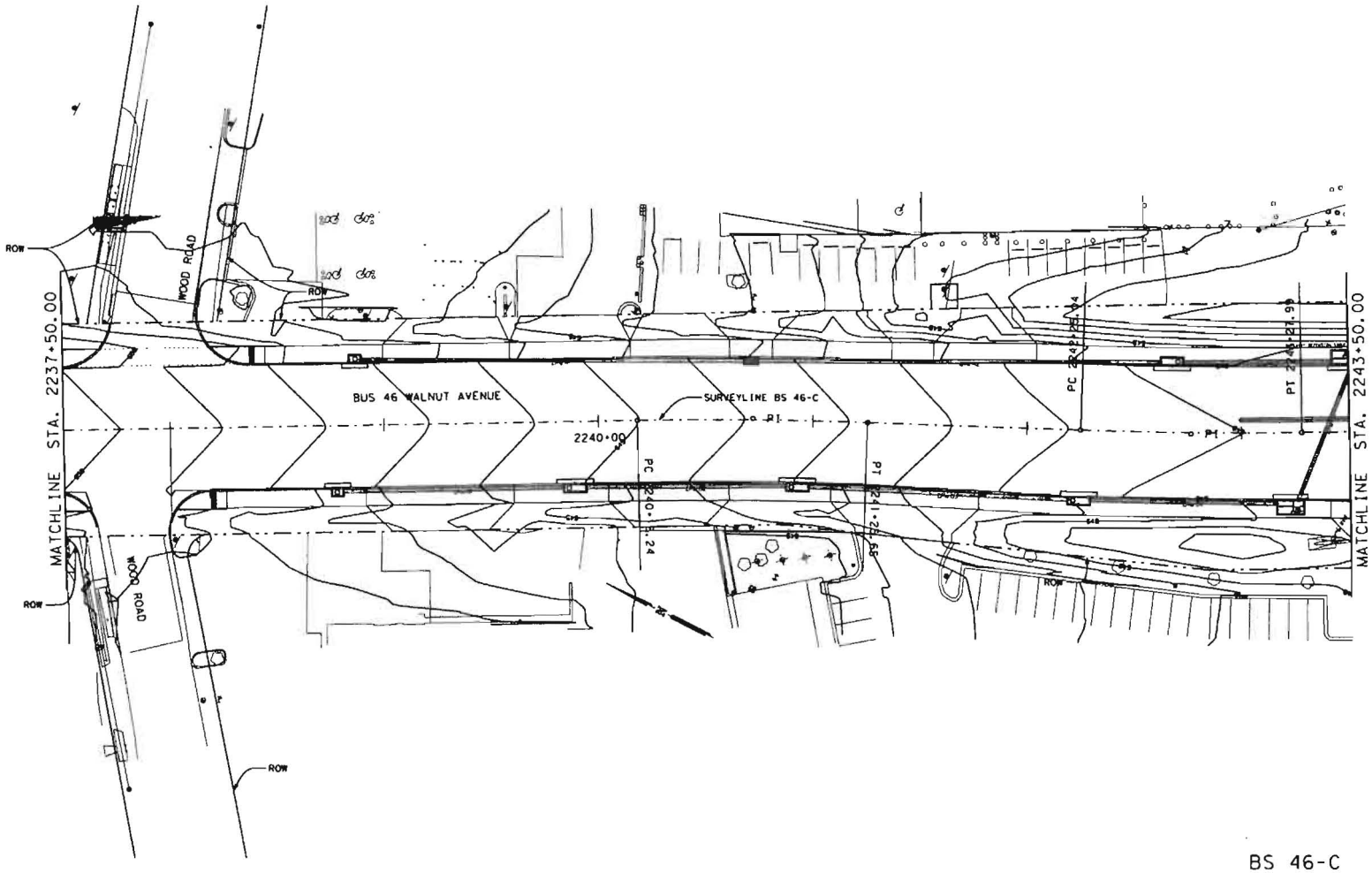
THE STATE OF TEXAS
ANDREW C. COX
100680
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
Andrew C. Cox P.E.

© 2013 Texas Department of Transportation
SHEET 10 OF 12

DIST	COUNTY		
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\bgwork\hqv1xdot\bgou1b\mmorend\dms21296\PROPCON010.dgn
DATE: 4/18/2013 8:41:23 AM



FILE: c:\projworking\txdot\projsourmvmnt\projects\21296\PROPCONT011.dgn
DATE: 4/18/2013 8:41:29 AM

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

BS 46-C

PROPOSED CONTOUR LAYOUTS

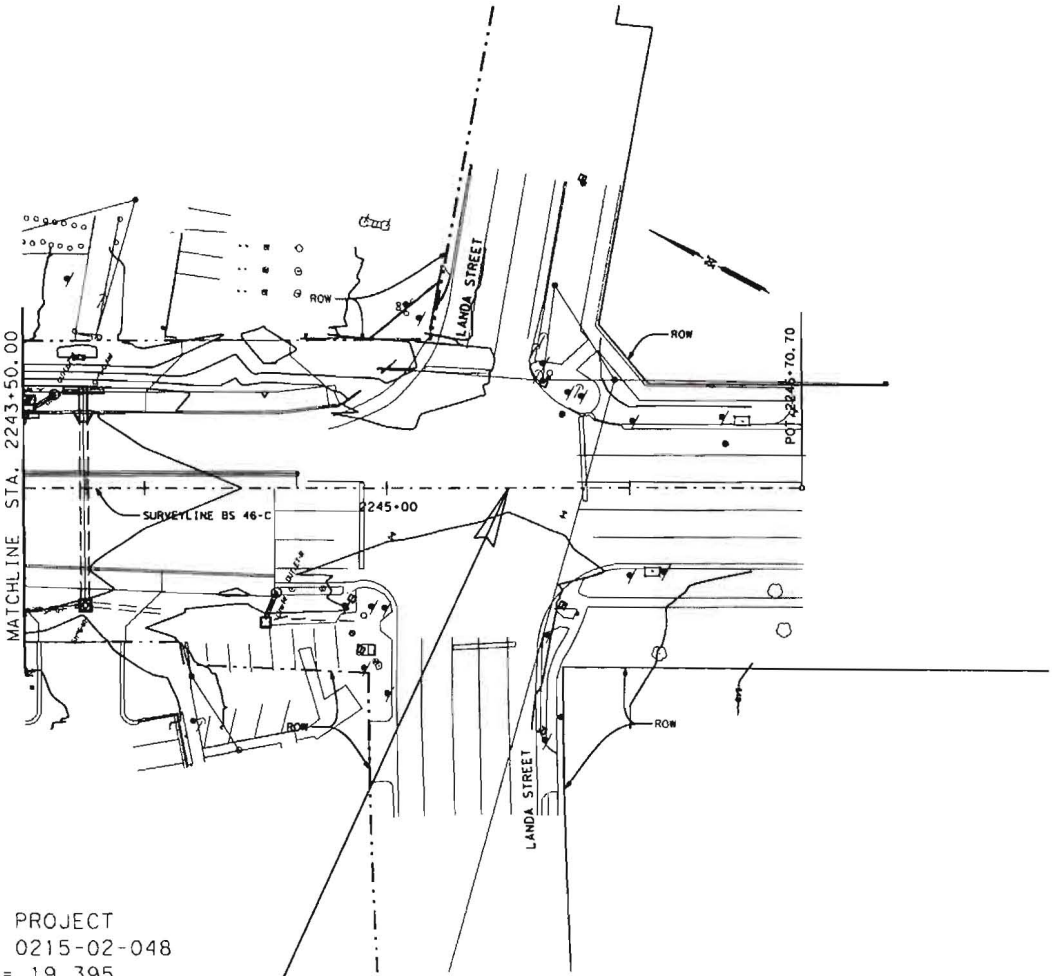
0 50 100
SCALE IN FEET

Texas Department of Transportation

SHEET 11 OF 12

FED. ROAD DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
			BS - 11

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C



END PROJECT
CSJ 0215-02-048
MP = 19.395
REF MRK = 0512+1.214
STA. 2245+50.00

BS 46-C

PROPOSED CONTOUR LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COE
90090
LICENSED PROFESSIONAL ENGINEER

APR 19 2013
P.E.

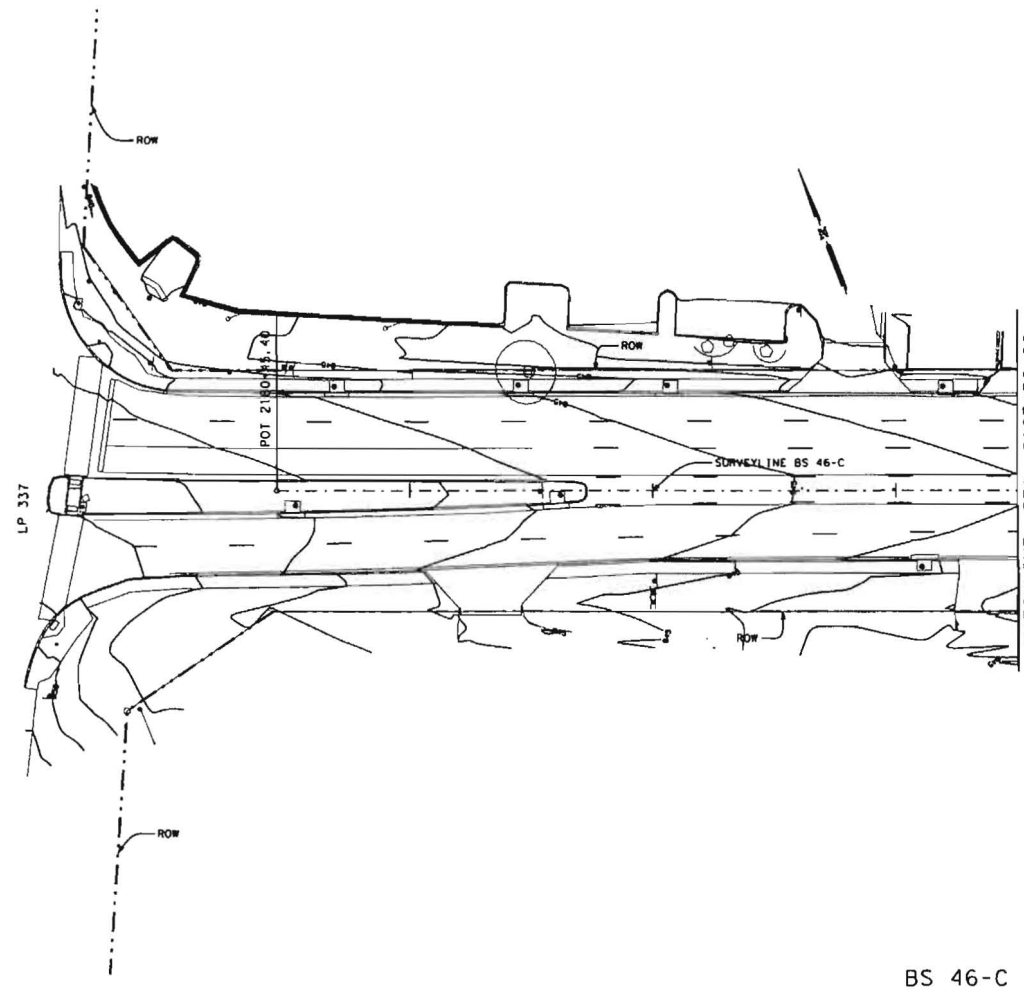
Texas Department of Transportation

SHEET 12 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

HIGHWAY NO. BS 46-C

FILE: c:\Dwnorking\txdot\Dresourn\umarend\dms21296\PROPCON012.dgn
DATE: 4/19/2013 1:23:22 PM



BS 46-C

EXIST CONTOUR LAYOUTS

0 50 100

SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 18, 2013

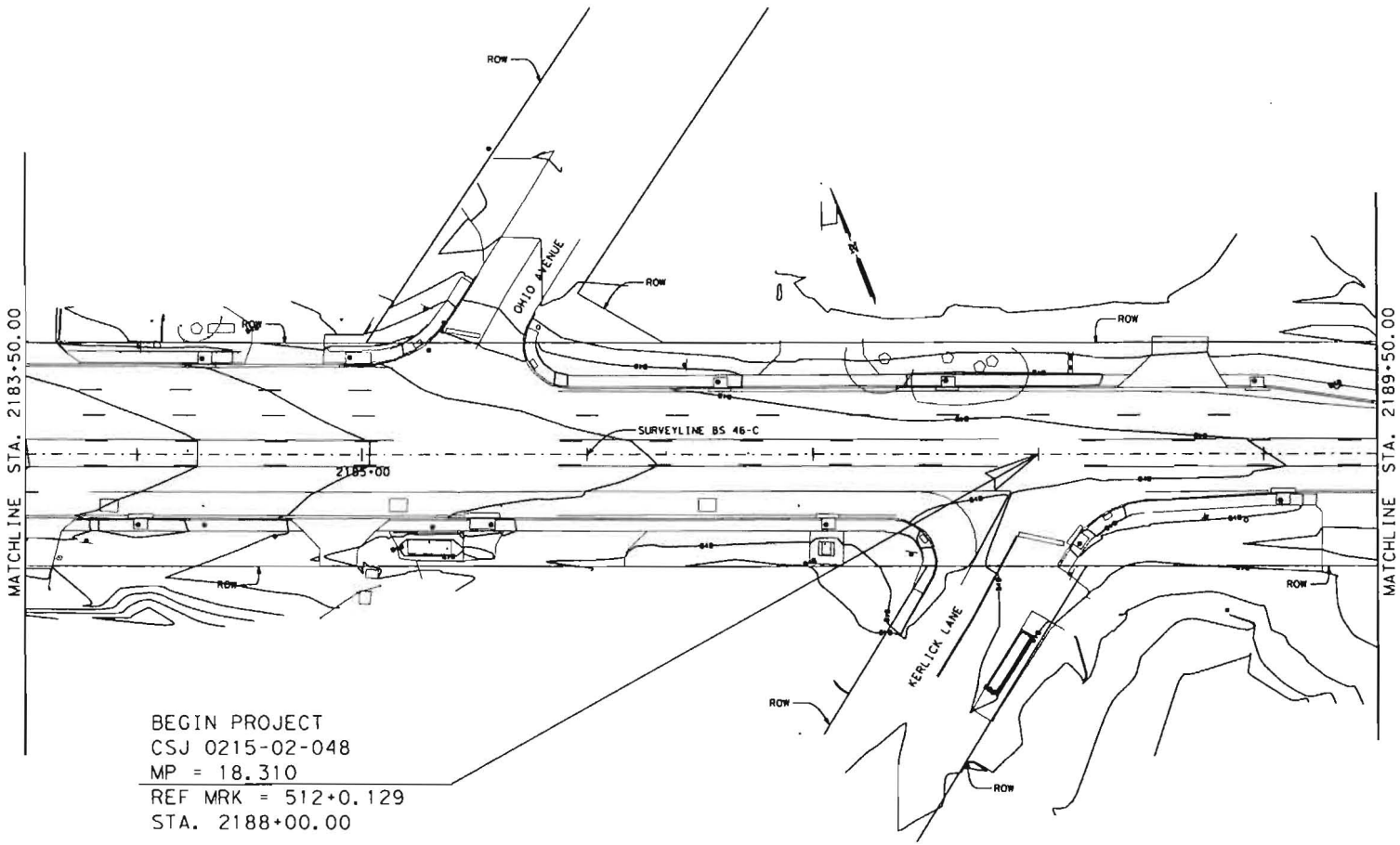
Linda Cox P.E.

Texas Department of Transportation

SHEET 1 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\pwsouthvanarend\ams21295\EXCON001.dgn
DATE: 4/18/2013 8:14:01 AM



BEGIN PROJECT
CSJ 0215-02-048
MP = 18.310
REF MRK = 512+0.129
STA. 2188+00.00

BS 46-C

EXIST CONTOUR LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

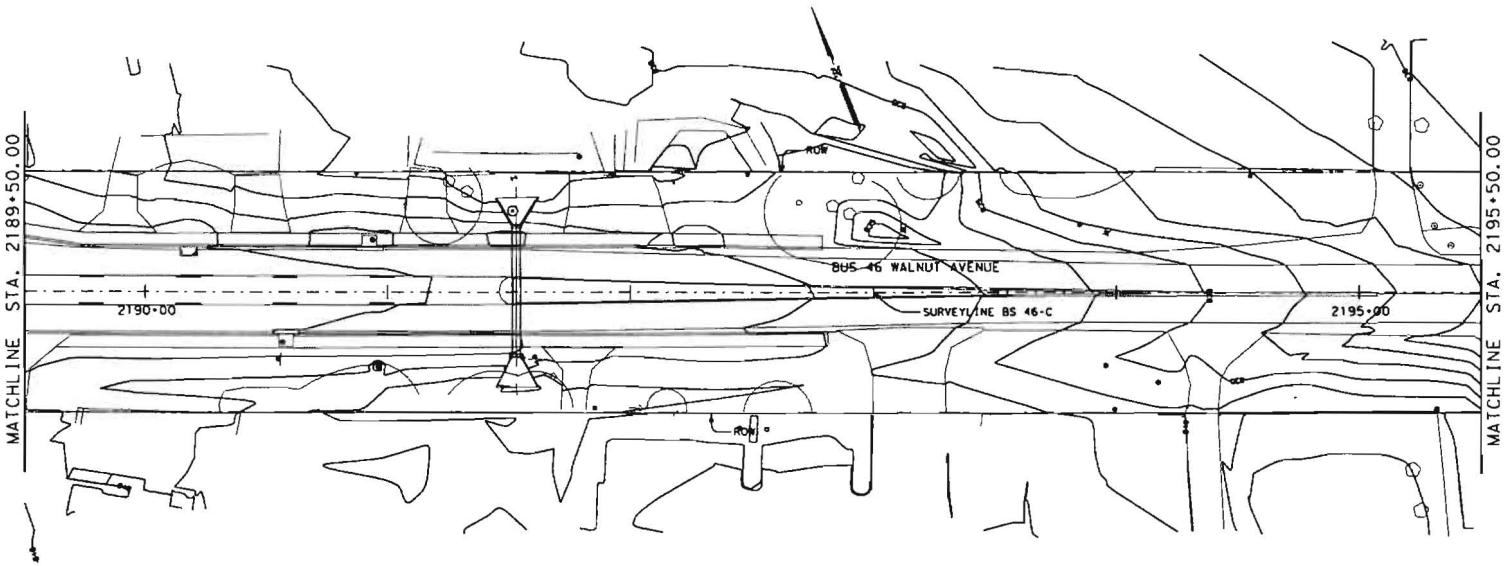
April 18, 2013
Linda Cox P.E.

Texas Department of Transportation

SHEET 2 OF 12

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\projects\tx001\Drawings\comal\comgrading\ons821295\EXCOM002.dgn
DATE: 4/18/2013 8:14:08 AM



FILE: c:\pwworking\txdot\pweaumunro\d0215\VEXCON0003.dgn
DATE: 4/18/2013 8:14:14 AM

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
P.E.

BS 46-C

EXIST CONTOUR LAYOUTS

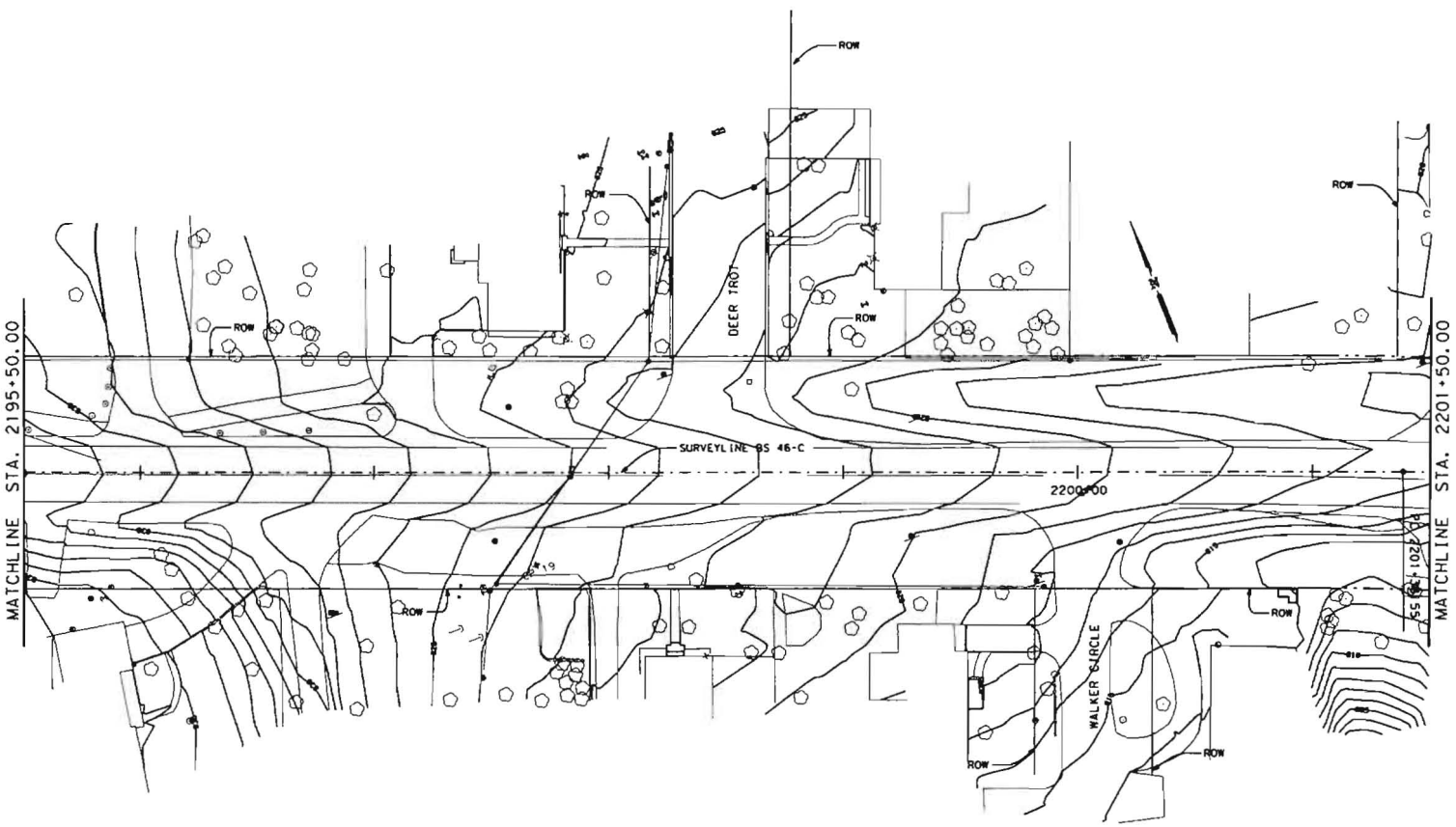
0 50 100
SCALE IN FEET

Texas Department of Transportation

SHEET 3 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

BS 46-C



BS 46-C

EXIST CONTOUR LAYOUTS

0 50 100

SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

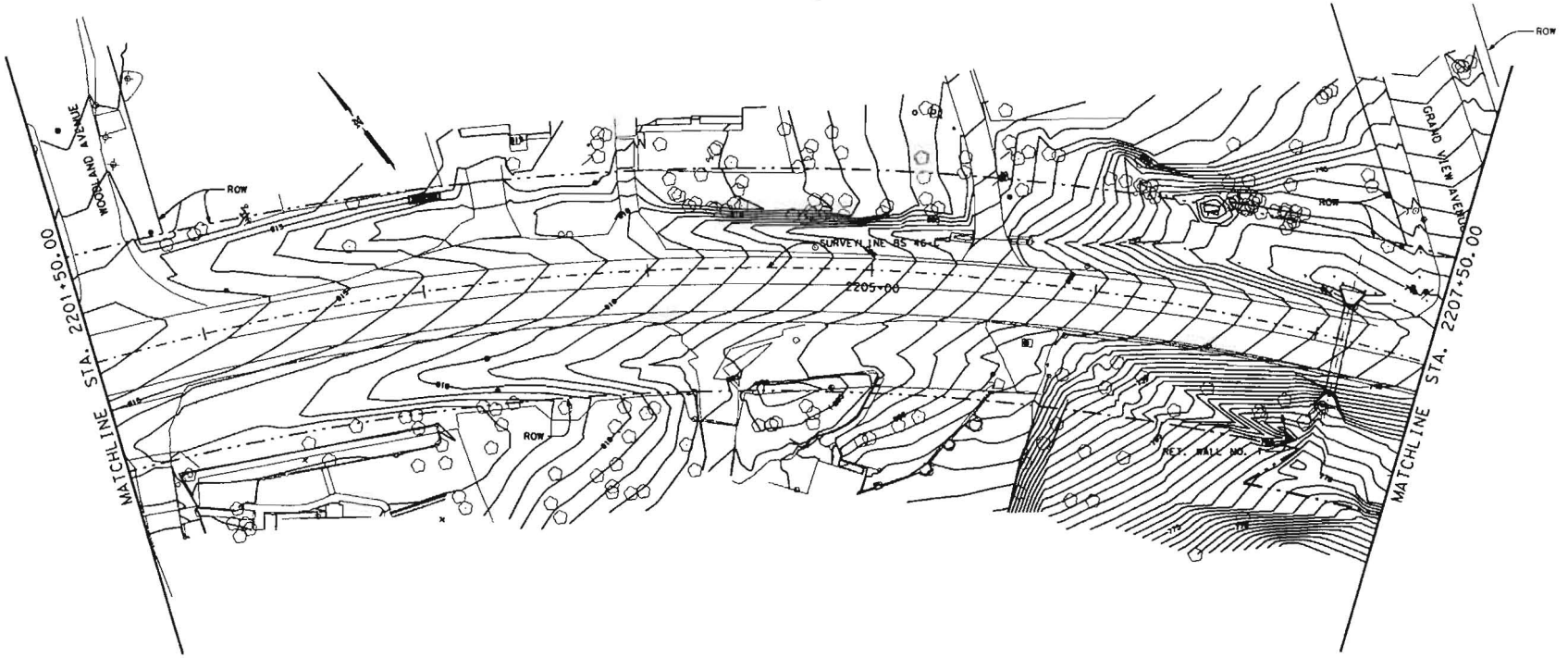
SHEET 4 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

SHEET NO. 0--5

HIGHWAY NO. BS 46-C

FILE: c:\projects\roy\1x001\pwsouth\umorend\dms21295\EXCON004.dgn
DATE: 4/18/2013 8:14:20 AM



LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 16, 2013
P.E.

BS 46-C

EXIST CONTOUR LAYOUTS

0 50 100
SCALE IN FEET

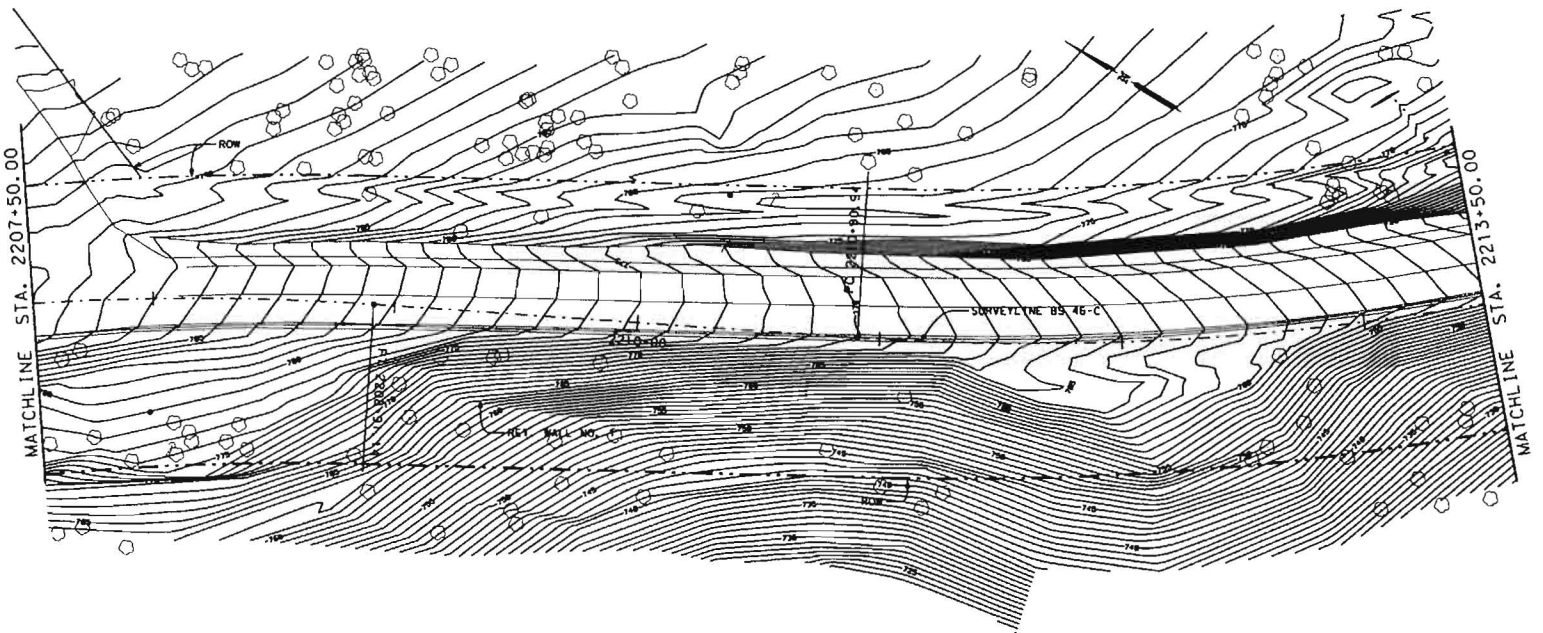
Texas Department of Transportation

SHEET 5 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

BS 46-C

FILE: c:\Dmwork\ng\txdot\brsaustin\mainend\dms212295\EXCON005.dgn
DATE: 4/18/2013 8:14:26 AM



BS 46-C

EXIST CONTOUR LAYOUTS

0 50 100

SCALE IN FEET

LINDA COX 90090 LICENSED PROFESSIONAL ENGINEER

April 16, 2013

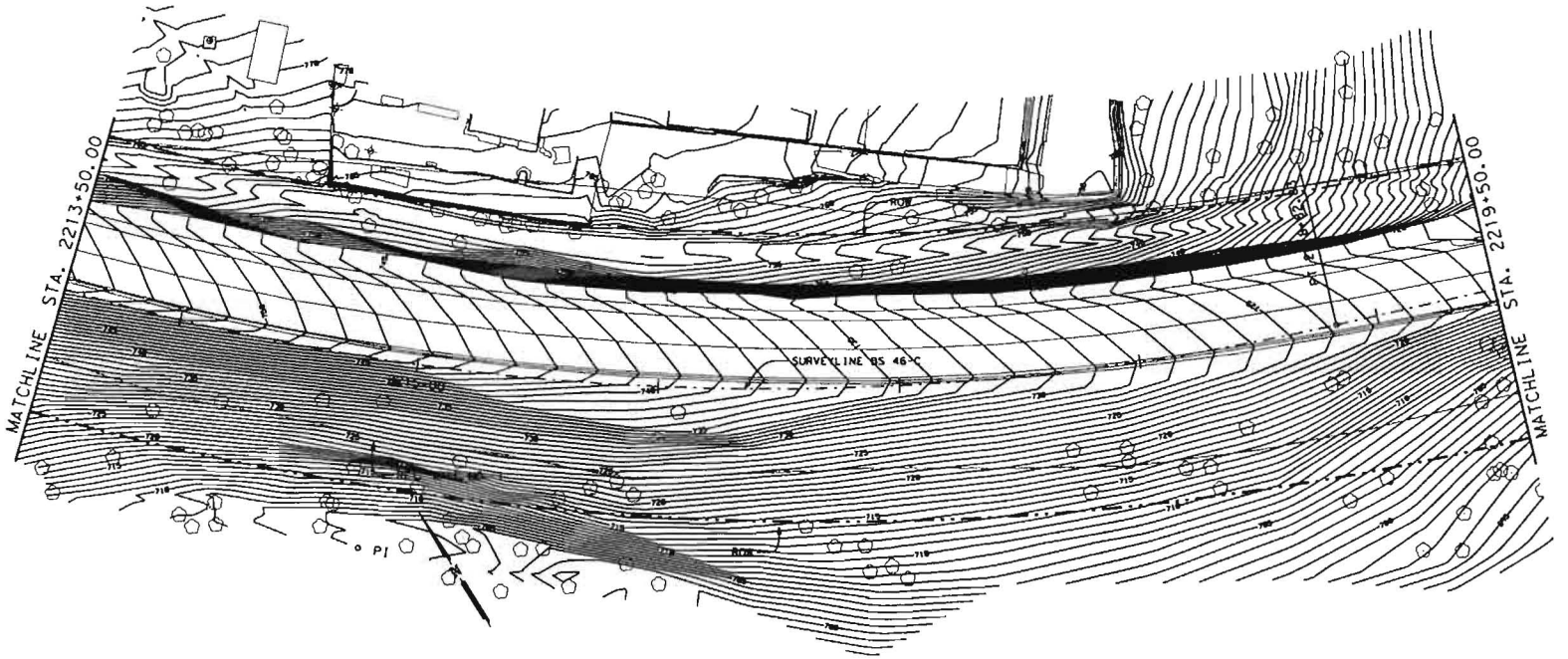
P.E.

Texas Department of Transportation

SHEET 6 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwork\ng\txdot\pesaurn\anchorend\dms21295\EXCON006.dgn
DATE: 4/16/2013 8:14:32 AM



FILE: c:\projects\ngl\txdot\pleasanton\unnoland\cms21295\EXCON007.dgn
DATE: 4/18/2013 8:14:38 AM

BS 46-C

EXIST CONTOUR LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
Linda Cox P.E.

© 2012 Texas Department of Transportation

SHEET 7 OF 12

			SHEET NO. 8 - C
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

April 18, 2013

Linda Gail, P.E.

Texas Department of Transportation

SHEET 9 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

BS 46-C

BS 46-C

EXIST CONTOUR LAYOUTS

0 50 100

SCALE IN FEET

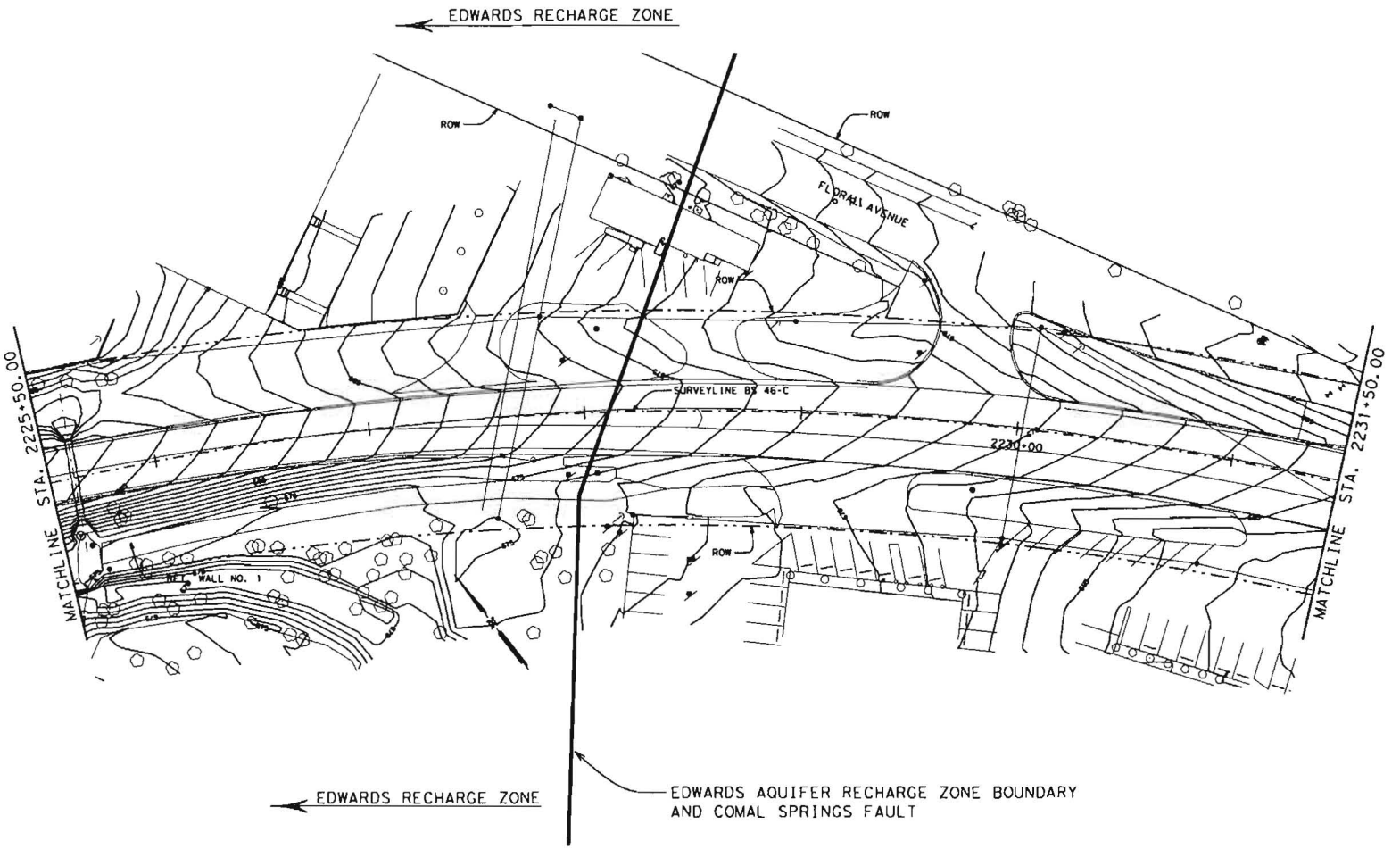
RECEIVED

MAY 13 2013

COUNTY ENGINEER

FILE: c:\projects\tx001\division\major end\dtm21295\EXCON008.dgn

DATE: 4/18/2013 8:14:45 AM



STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
P.E.

BS 46-C

EXIST CONTOUR LAYOUTS

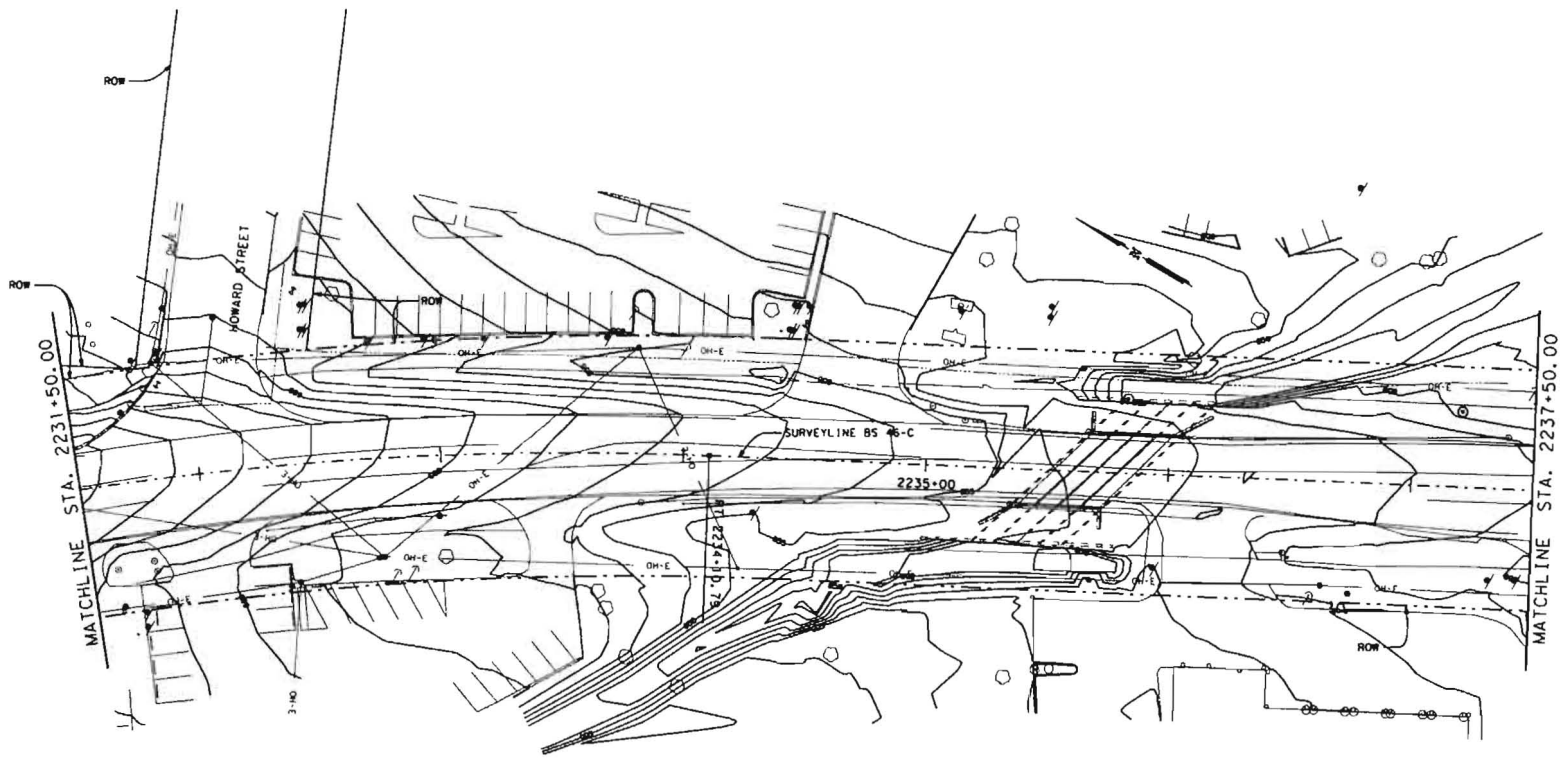
0 50 100
SCALE IN FEET

© 2013 Texas Department of Transportation

SHEET 9 OF 12

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\projects\ng\txdot\brsaurm\environ\cms21295\EXCON009.dgn
DATE: 4/18/2013 8:14:52 AM



FILE: c:\pwwork\rgoldon\pwbsouth\vmanend\cms21295\EXCONN010.dgn
DATE: 4/18/2013 8:14:58 AM

BS 46-C

EXIST CONTOUR LAYOUTS

0 50 100
SCALE IN FEET

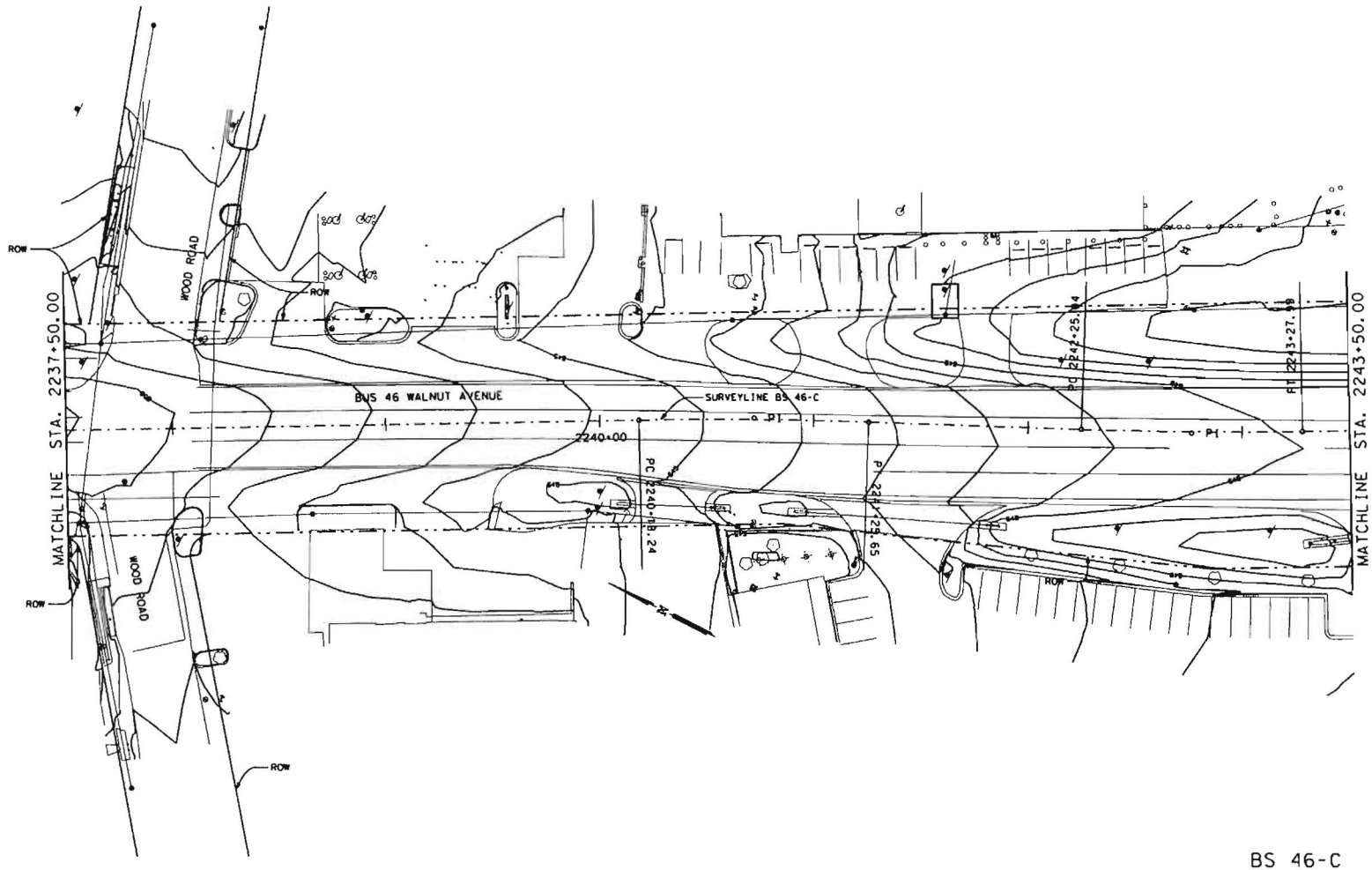
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

April 18, 2013
Linda Cox P.E.

© 2013 Texas Department of Transportation

SHEET 10 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C



BS 46-C

EXIST CONTOUR LAYOUTS

0 50 100

SCALE IN FEET

LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013

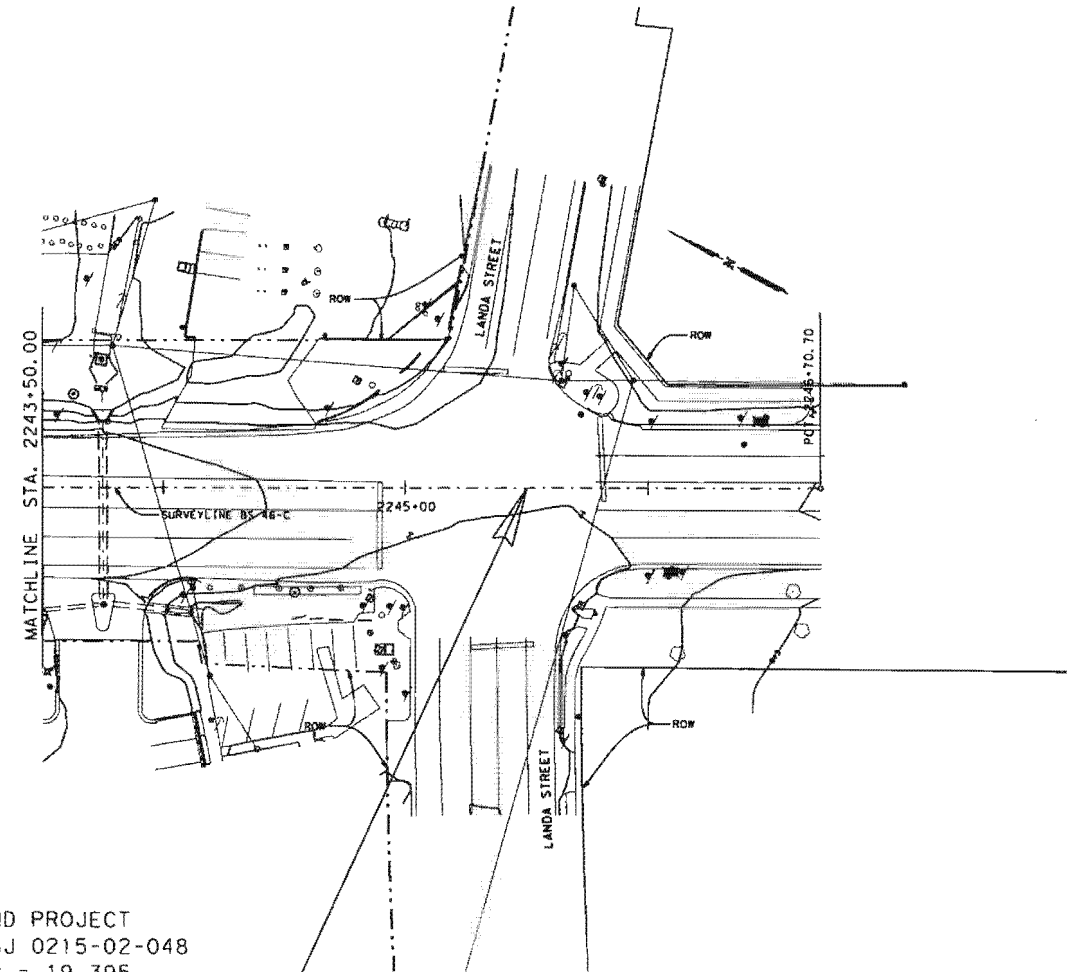
P.E.

Texas Department of Transportation

SHEET 11 OF 12

FROM TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
			B - - S
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwwork\ing\txdot\pwsouth\mmorena\dms21295\EXCON011.dgn
DATE: 4/18/2013 8:15:05 AM



END PROJECT
CSJ 0215-02-048
MP = 19.395
REF MRK = 0512+1.214
STA. 2245+50.00

BS 46-C

EXIST CONTOUR LAYOUTS

0 50 100
SCALE IN FEET

LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER
April 18, 2013
P.E.

Texas Department of Transportation
SHEET 12 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

HIGHWAY NO.: BS 46-C

FILE: d:\pwworking\txdot\pwsouth\innerend\dms21295\EXCON012.dgn
DATE: 4/18/2013 8:15:11 AM

BMP NO. 1 CALCULATIONS
INSIDE EDWARDS AQUIFER RECHARGE ZONE

Texas Commission on Environmental Quality
TSS Removal Calculations

Project Name: BS 46-C (SD1, SD3, SD18 & SD19: Combined at SD3)
Date Prepared: 3/27/2013

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: $L_M = 27.2(A_N \times P)$

$L_{M\ TOTAL\ PROJECT}$ = 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 =	Comal	
Total project area included in plan * =	10.01	acres
Predevelopment impervious area within the limits of the plan * =	3.78	acres
Total post-development impervious area within the limits of the plan* =	6.98	acres
Total post-development impervious cover fraction * =	0.70	
P =	33	inches
$L_{M\ TOTAL\ PROJECT}$ =	2899	lbs.
Number of drainage basins / outfalls areas leaving the plan area =	4	

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

Drainage Basin/Outfall Area No. =	SD3	
Total drainage basin/outfall area =	0.49	acres
Predevelopment impervious area within drainage basin/outfall area =	0.36	acres
Post-development impervious area within drainage basin/outfall area =	0.49	acres
Post-development impervious fraction within drainage basin/outfall area =	1.00	
L_M THIS BASIN =	122	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP =	CS	abbreviation
Removal efficiency =	83	percent

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

RG-348 Page 3-33 Equation 3.7:
LR = (BMP efficiency) x P x (A_I x 34.6 + A_P x 0.54)

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 =	0.49	acres
A_I =	0.49	acres
A_P =	0.00	acres
L_R =	462	lbs.

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

Desired $L_{M\ THIS\ BASIN}$ =	316	lbs.
F =	0.68	

6. Calculate Treated Flow required by the BMP Type for this drainage basin / outfall area.

Calculations from RG-348 Pages Section 3.4.14

Rainfall Depth =	0.73	inches
Rainfall Intensity =	0.32	inches per hour
Post Development Runoff Coefficient =	0.82	
Effective Area =	0.43	acres
Peak Flow =	0.14	cubic feet per second
Required Storage =	1057	cubic feet
Required Storage + 20% =	1268	cubic feet

7. Storm Filter

Designed as Required in RG-348 Section 3.4.14

Cartridge Infiltration Rate =	1	GPM per ft²
Cartridge Height =	27	inches
Cartridge Capacity =	11.25	GPM

Select 1 of the 3 options to the right	Option 1. Volume Design		
	Number of Cartridges for Volume-Based Configuration =	6	
	Storage Volume for Volume-Based Configuration =	1268	cubic feet
	Option 2. Flow Through Design		
	Flow Rate for Flow-Through Configuration =	0.14	cfs
	Number of Cartridges for Flow-Through Configuration =	6	
	Volume for Flow-Through Configuration =	0	cubic feet
	Option 3. Equalization Design		
	Flow Rate for Flow-Through Configuration w/ Equalization =	0.15	cfs
	Number of Cartridges for Flow-Through Configuration w/ Equalization =	6	
	Volume for Flow-Through Configuration w/ Equalization =	0	cubic feet

BMP NO. 2 CALCULATIONS
INSIDE EDWARDS AQUIFER RECHARGE ZONE

Texas Commission on Environmental Quality
TSS Removal Calculations

Project Name: BS 46-C (D-1)
Date Prepared: 4/8/2013

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: $L_M = 27.2(A_N \times P)$

$L_{M\ TOTAL\ PROJECT}$ = 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 =	Comal	
Total project area included in plan * =	10.01	acres
Predevelopment impervious area within the limits of the plan * =	3.78	acres
Total post-development impervious area within the limits of the plan* =	6.98	acres
Total post-development impervious cover fraction * =	0.70	
P =	33	inches
$L_{M\ TOTAL\ PROJECT}$ =	2899	lbs.
Number of drainage basins / outfalls areas leaving the plan area =	4	

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

Drainage Basin/Outfall Area No. =	D1	
Total drainage basin/outfall area =	2.56	acres
Predevelopment impervious area within drainage basin/outfall area =	1.47	acres
Post-development impervious area within drainage basin/outfall area =	2.56	acres
Post-development impervious fraction within drainage basin/outfall area =	1.00	
L_M THIS BASIN =	978	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP =	CS	abbreviation
Removal efficiency =	83	percent

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

RG-348 Page 3-33 Equation 3.7:
LR = (BMP efficiency) x P x (A_I x 34.6 + A_P x 0.54)

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 =	2.56	acres
A_I =	2.56	acres
A_P =	0.00	acres
L_R =	2426	lbs.

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

Desired $L_{M\ THIS\ BASIN}$ =	1613	lbs.
F =	0.66	

6. Calculate Treated Flow required by the BMP Type for this drainage basin / outfall area.

Calculations from RG-348 Pages Section 3.4.14

Rainfall Depth =	0.69	inches
Rainfall Intensity =	0.28	inches per hour
Post Development Runoff Coefficient =	0.82	
Effective Area =	2.30	acres
Peak Flow =	0.63	cubic feet per second
Required Storage =	5257	cubic feet
Required Storage + 20% =	6308	cubic feet

7. Storm Filter

Designed as Required in RG-348 Section 3.4.14

Cartridge Infiltration Rate =	1	GPM per ft²
Cartridge Height =	27	inches
Cartridge Capacity =	11.25	GPM

Select 1 of the 3 options to the right	Option 1. Volume Design		
	Number of Cartridges for Volume-Based Configuration =	27	
	Storage Volume for Volume-Based Configuration =	6308	cubic feet
	Option 2. Flow Through Design		
	Flow Rate for Flow-Through Configuration =	0.63	cfs
	Number of Cartridges for Flow-Through Configuration =	26	
	Volume for Flow-Through Configuration =	0	cubic feet
	Option 3. Equalization Design		
	Flow Rate for Flow-Through Configuration w/ Equalization =	error	cfs
	Number of Cartridges for Flow-Through Configuration w/ Equalization =	27	
	Volume for Flow-Through Configuration w/ Equalization =	#VALUE!	cubic feet

STATE OF TEXAS — LINDA COX — 80090 — LICENSED PROFESSIONAL ENGINEER

April 23, 2013

Linda Cox P.E.

BS 46-C

WPAP LAYOUTS
BMP NO. 1 & BMP NO. 2 CALCULATION DATA

Texas Department of Transportation

SHEET 1 OF 4

DIST.	COUNTY	SHEET NO.
TEXAS	COMAL	
CONTROL	SECTION	JOB
0215	02	048

BS 46-C

FILE: c:\Network\rdot\txdot\austin\vmorand\cms23443\BMP CALC DATA SHTS.DGN
DATE: 4/23/2013 11:42:52 PM

BMP NO. 3 CALCULATIONS
INSIDE EDWARDS AQUIFER RECHARGE ZONE

Texas Commission on Environmental Quality
TSS Removal Calculations

Project Name: BS 46-C (1)
Date Prepared: 4/8/2013

1. The Required Load Reduction for the total project:

Calculations from RG-348 — Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$
Pages 3-27 to 3-30

$L_{M\ TOTAL\ PROJECT}$ = 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 =	Comal		
Total project area included in plan * =	20.01	acres	
Predevelopment impervious area within the limits of the plan * =	3.78	acres	
Total post-development impervious area within the limits of the plan* =	6.98	acres	
Total post-development impervious cover fraction * =	0.70		
P =	33	inches	
$L_{M\ TOTAL\ PROJECT}$ =	2899	lbs.	
Number of drainage basins / outfalls areas leaving the plan area =	4		

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

Drainage Basin/Outfall Area No. =	F-1		
Total drainage basin/outfall area =	2.49	acres	
Predevelopment impervious area within drainage basin/outfall area =	1.12	acres	
Post-development impervious area within drainage basin/outfall area =	2.49	acres	
Post-development impervious fraction within drainage basin/outfall area =	1.00		
$L_{M\ THIS\ BASIN}$ =	1330	lbs.	

3. Indicate the proposed BMP Code for this basin.

Proposed BMP =	CS	abbreviation
Removal efficiency =	85	percent

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:
$LR = (BMP\ efficiency) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

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 =	2.49	acres
A_I =	2.49	acres
A_P =	0.00	acres
L_R =	2360	lbs.

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

Desired $L_{M\ THIS\ BASIN}$ =	1569	lbs.
F =	0.66	

6. Calculate Treated Flow required by the BMP Type for this drainage basin / outfall area.

Calculations from RG-348
Pages Section 3.4.14

Rainfall Depth =	0.69	inches
Rainfall Intensity =	0.38	inches per hour
Post Development Runoff Coefficent =	0.82	
Effective Area =	2.21	acres
Peak Flow =	0.03	cubic feet per second
Required Storage =	511.3	cubic feet
Required Storage + 20% =	613.6	cubic feet

7. Storm Filter

Designed as Required in RG-348
Section 3.4.14

Cartridge Infiltration Rate =	1	GPM per ft²
Cartridge Height =	27	inches
Cartridge Capacity =	11.25	GPM

Select 1 of the 3 options to the right	Option 1. Volume Design		
	Number of Cartridges for Volume-Based Configuration =	27	
	Storage Volume for Volume-Based Configuration =	613.6	cubic feet
	Option 2. Flow Through Design		
	Flow Rate for Flow-Through Configuration =	0.63	cfs
	Number of Cartridges for Flow-Through Configuration =	26	
	Volume for Flow-Through Configuration =	0	cubic feet
	Option 3. Equalization Design		
	Flow Rate for Flow-Through Configuration w/ Equalization =	#VALUE!	cfs
	Number of Cartridges for Flow-Through Configuration w/ Equalization =	27	
	Volume for Flow-Through Configuration w/ Equalization =	#VALUE!	cubic feet

BMP NO. 4 CALCULATIONS
INSIDE EDWARDS AQUIFER RECHARGE ZONE

Texas Commission on Environmental Quality
TSS Removal Calculations

Project Name: BS 46-C (2)
Date Prepared: 4/8/2013

1. The Required Load Reduction for the total project:

Calculations from RG-348 — Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$
Pages 3-27 to 3-30

$L_{M\ TOTAL\ PROJECT}$ = 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 =	Comal		
Total project area included in plan * =	10.01	acres	
Predevelopment impervious area within the limits of the plan * =	3.78	acres	
Total post-development impervious area within the limits of the plan* =	6.98	acres	
Total post-development impervious cover fraction * =	0.70		
P =	33	inches	
$L_{M\ TOTAL\ PROJECT}$ =	2899	lbs.	
Number of drainage basins / outfalls areas leaving the plan area =	4		

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

Drainage Basin/Outfall Area No. =	I-1		
Total drainage basin/outfall area =	0.59	acres	
Predevelopment impervious area within drainage basin/outfall area =	0.26	acres	
Post-development impervious area within drainage basin/outfall area =	0.59	acres	
Post-development impervious fraction within drainage basin/outfall area =	1.00		
$L_{M\ THIS\ BASIN}$ =	396	lbs.	

3. Indicate the proposed BMP Code for this basin.

Proposed BMP =	CS	abbreviation
Removal efficiency =	85	percent

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:
$LR = (BMP\ efficiency) \times P \times (A_I \times 34.6 + A_P \times 0.54)$

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 =	0.59	acres
A_I =	0.59	acres
A_P =	0.00	acres
L_R =	539	lbs.

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

Desired $L_{M\ THIS\ BASIN}$ =	383	lbs.
F =	0.68	

6. Calculate Treated Flow required by the BMP Type for this drainage basin / outfall area.

Calculations from RG-348
Pages Section 3.4.14

Rainfall Depth =	0.73	inches
Rainfall Intensity =	0.32	inches per hour
Post Development Runoff Coefficent =	0.82	
Effective Area =	0.83	acres
Peak Flow =	0.17	cubic feet per second
Required Storage =	1,278	cubic feet
Required Storage + 20% =	1534	cubic feet

7. Storm Filter

Designed as Required in RG-348
Section 3.4.14

Cartridge Infiltration Rate =	1	GPM per ft²
Cartridge Height =	27	inches
Cartridge Capacity =	11.25	GPM

Select 1 of the 3 options to the right	Option 1. Volume Design		
	Number of Cartridges for Volume-Based Configuration =	7	
	Storage Volume for Volume-Based Configuration =	1534	cubic feet
	Option 2. Flow Through Design		
	Flow Rate for Flow-Through Configuration =	0.17	cfs
	Number of Cartridges for Flow-Through Configuration =	7	
	Volume for Flow-Through Configuration =	0	cubic feet
	Option 3. Equalization Design		
	Flow Rate for Flow-Through Configuration w/ Equalization =	0.18	cfs
	Number of Cartridges for Flow-Through Configuration w/ Equalization =	7	
	Volume for Flow-Through Configuration w/ Equalization =	0	cubic feet

April 23, 2013
P.E.

BS 46-C
WPAP LAYOUTS
BMP NO. 3 & BMP NO. 4
CALCULATION DATA

Texas Department of Transportation

FUNC. SYSTEM DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
STATE	DISTRICT	COUNTY	
TEXAS	8057®	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

SHEET 2 OF 4

FILE: C:\Dmwork\ngy1xdot\pwsouth\Dms23443\BMP CALC DATA SHTS.DGN
DATE: 4/23/2013 11:43:02 PM

BMP NO. 5 CALCULATIONS
OUTSIDE EDWARDS AQUIFER RECHARGE ZONE

Texas Commission on Environmental Quality
TSS Removal Calculations

Project Name: BS 46-C (K1)
Date Prepared: 4/8/2013

1. The Required Load Reduction for the total project:

Calculations from RG-348 Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$
Pages 3-27 to 3-30

$L_{M\ TOTAL\ PROJECT}$ = 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 =	Comal	
Total project area included in plan * =	3.24	acres
Predevelopment impervious area within the limits of the plan * =	2.87	acres
Total post-development impervious area within the limits of the plan* =	3.42	acres
Total post-development impervious cover fraction * =	0.83	
P =	33	inches
$L_{M\ TOTAL\ PROJECT}$ =	583	lbs.
Number of drainage basins / outfalls areas leaving the plan area =	3	

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

Drainage Basin/Outfall Area No. =	K-1	
Total drainage basin/outfall area =	1.40	acres
Predevelopment impervious area within drainage basin/outfall area =	0.80	acres
Post-development impervious area within drainage basin/outfall area =	1.40	acres
Post-development impervious fraction within drainage basin/outfall area =	1.00	
$L_{M\ THIS\ BASIN}$ =	539	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP =	CS	abbreviation
Removal efficiency =	85	percent

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

RG-348 Page 3-33 Equation 3.7:
LR = (BMP efficiency) x P x (A_I x 34.6 + A_P x 0.54)

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_M = TSS load removed from this catchment area by the proposed BMP

A_C =	1.40	acres
A_I =	1.40	acres
A_P =	0.00	acres
L_M =	1327	lbs.

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

Desired $L_{M\ THIS\ BASIN}$ =	882	lbs.
F =	0.66	

6. Calculate Treated Flow required by the BMP Type for this drainage basin / outfall area.

Calculations from RG-348
Pages Section 3.4.14

Rainfall Depth =	0.69	inches
Rainfall Intensity =	0.28	inches per hour
Post Development Runoff Coefficient =	0.82	
Effective Area =	1.36	acres
Peak Flow =	0.36	cubic feet per second
Required Storage =	1878	cubic feet
Required Storage + 20% =	2430	cubic feet

7. Storm Filter

Designed as Required in RG-348 Section 3.4.14

Cartridge Infiltration Rate =	1	GPM per ft²
Cartridge Height =	27	inches
Cartridge Capacity =	11.25	GPM

Select 1 of the 3 options to the right	Option 1. Volume Design		
	Number of Cartridges for Volume-Based Configuration =	13	
	Storage Volume for Volume-Based Configuration =	2340	cubic feet
	Option 2. Flow Through Design		
	Flow Rate for Flow-Through Configuration =	0.36	cfs
	Number of Cartridges for Flow-Through Configuration =	45	
	Volume for Flow-Through Configuration =	0	cubic feet
	Option 3. Equalization Design		
	Flow Rate for Flow-Through Configuration w/ Equalization =	0.38	cfs
	Number of Cartridges for Flow-Through Configuration w/ Equalization =	15	
	Volume for Flow-Through Configuration w/ Equalization =	0	cubic feet

BMP NO. 6 CALCULATIONS
OUTSIDE EDWARDS AQUIFER RECHARGE ZONE

Texas Commission on Environmental Quality
TSS Removal Calculations

Project Name: BS 46-C (SD55, SD56, SD62 & SD63 Combined at SD55)
Date Prepared: 3/27/2013

1. The Required Load Reduction for the total project:

Calculations from RG-348 Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$
Pages 3-27 to 3-30

$L_{M\ TOTAL\ PROJECT}$ = 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 =	Comal	
Total project area included in plan * =	0.47	acres
Predevelopment impervious area within the limits of the plan * =	0.23	acres
Total post-development impervious area within the limits of the plan* =	0.47	acres
Total post-development impervious cover fraction * =	1.00	
P =	33	inches
$L_{M\ TOTAL\ PROJECT}$ =	221	lbs.
Number of drainage basins / outfalls areas leaving the plan area =	1	

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

Drainage Basin/Outfall Area No. =	A	
Total drainage basin/outfall area =	0.47	acres
Predevelopment impervious area within drainage basin/outfall area =	0.23	acres
Post-development impervious area within drainage basin/outfall area =	0.47	acres
Post-development impervious fraction within drainage basin/outfall area =	1.00	
$L_{M\ THIS\ BASIN}$ =	221	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP =	CS	abbreviation
Removal efficiency =	85	percent

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

RG-348 Page 3-33 Equation 3.7:
LR = (BMP efficiency) x P x (A_I x 34.6 + A_P x 0.54)

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_M = TSS load removed from this catchment area by the proposed BMP

A_C =	0.47	acres
A_I =	0.47	acres
A_P =	0.00	acres
L_M =	442	lbs.

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

Desired $L_{M\ THIS\ BASIN}$ =	884	lbs.
F =	0.66	

6. Calculate Treated Flow required by the BMP Type for this drainage basin / outfall area.

Calculations from RG-348
Pages Section 3.4.14

Rainfall Depth =	0.69	inches
Rainfall Intensity =	0.28	inches per hour
Post Development Runoff Coefficient =	0.82	
Effective Area =	0.42	acres
Peak Flow =	0.12	cubic feet per second
Required Storage =	960	cubic feet
Required Storage + 20% =	1153	cubic feet

7. Storm Filter

Designed as Required in RG-348 Section 3.4.14

Cartridge Infiltration Rate =	1	GPM per ft²
Cartridge Height =	27	inches
Cartridge Capacity =	11.25	GPM

Select 1 of the 3 options to the right	Option 1. Volume Design		
	Number of Cartridges for Volume-Based Configuration =	5	
	Storage Volume for Volume-Based Configuration =	1153	cubic feet
	Option 2. Flow Through Design		
	Flow Rate for Flow-Through Configuration =	0.12	cfs
	Number of Cartridges for Flow-Through Configuration =	5	
	Volume for Flow-Through Configuration =	0	cubic feet
	Option 3. Equalization Design		
	Flow Rate for Flow-Through Configuration w/ Equalization =	0.13	cfs
	Number of Cartridges for Flow-Through Configuration w/ Equalization =	5	
	Volume for Flow-Through Configuration w/ Equalization =	0	cubic feet

STATE OF TEXAL
L. PAUL COX
90090
LICENSED PROFESSIONAL ENGINEER
4/23/2013
P.E.

FILE: c:\Dewrking\txdot\bexsouth\mnorend\dms23443\BMP CALC DATA SHTS.DGN
DATE: 4/23/2013 11:43:17 PM

BS 46-C
WPAP LAYOUTS
BMP NO. 5 & BMP NO. 6
CALCULATION DATA

Texas Department of Transportation
SHEET 3 OF 4

STATE	DISTRICT	COUNTY
TEXAS	SAN ANTONIO	COMAL
CONTROL	SECTION	JOB
0215	02	048

HIGHWAY NO. BS 46-C

BMP NO. 7B CALCULATIONS
OUTSIDE EDWARDS AQUIFER RECHARGE ZONE

Texas Commission on Environmental Quality
TSS Removal Calculations

Project Name: BS 46-C (SD57, SD58, SD59 & SD60: Combined at SD60)
Date Prepared: 3/27/2013

1. The Required Load Reduction for the total project:

Calculations from RG-348 Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$
Pages 3-27 to 3-30

$L_{M\ TOTAL\ PROJECT}$ = 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 =	Comal	
Total project area included in plan * =	0.49	acres
Predevelopment impervious area within the limits of the plan * =	0.38	acres
Total post-development impervious area within the limits of the plan* =	0.49	acres
Total post-development impervious cover fraction * =	1.00	
P =	33	inches
$L_{M\ TOTAL\ PROJECT}$ =	100	lbs.
Number of drainage basins / outfalls areas leaving the plan area =	1	

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

Drainage Basin/Outfall Area No. =	A	
Total drainage basin/outfall area =	0.49	acres
Predevelopment impervious area within drainage basin/outfall area =	0.38	acres
Post-development impervious area within drainage basin/outfall area =	0.49	acres
Post-development impervious fraction within drainage basin/outfall area =	1.00	
$L_{M\ THIS\ BASIN}$ =	100	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP =	CS	abbreviation
Removal efficiency =	83	percent

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:
LR = (BMP efficiency) x P_N x (A_C x 34.6 + A_P x 0.54)

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 =	0.49	acres
A_I =	0.49	acres
A_P =	0.00	acres
L_R =	461	lbs.

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

Desired $L_{M\ THIS\ BASIN}$ =	320	lbs.
F =	0.69	

6. Calculate Treated Flow required by the BMP Type for this drainage basin / outfall area.

Calculations from RG-348
Pages Section 3.4.14

Rainfall Depth =	0.75	inches
Rainfall Intensity =	0.34	inches per hour
Post Development Runoff Coefficient =	0.82	
Effective Area =	0.42	acres
Peak Flow =	0.15	cubic feet per second
Required Storage =	1080	cubic feet
Required Storage + 20% =	1296	cubic feet

7. Storm Filter

Designed as Required in RG-348 Section 3.4.14

Cartridge Infiltration Rate =	1	GPM per ft²
Cartridge Height =	27	inches
Cartridge Capacity =	11.25	GPM

Select 1 of the 3 options to the right	Option 1. Volume Design		
	Number of Cartridges for Volume-Based Configuration =	6	
	Storage Volume for Volume-Based Configuration =	1296	cubic feet
	Option 2. Flow Through Design		
	Flow Rate for Flow-Through Configuration =	0.15	cfs
	Number of Cartridges for Flow-Through Configuration =	6	
	Volume for Flow-Through Configuration =	0	cubic feet
	Option 3. Equalization Design		
	Flow Rate for Flow-Through Configuration w/ Equalization =	0.18	cfs
	Number of Cartridges for Flow-Through Configuration w/ Equalization =	6	
	Volume for Flow-Through Configuration w/ Equalization =	0	cubic feet

BMP NO. 7A CALCULATIONS
OUTSIDE EDWARDS AQUIFER RECHARGE ZONE

Texas Commission on Environmental Quality
TSS Removal Calculations

Project Name: BS 46-C (SD63, SD64, SD65, SD66 & SD67: Combined at SD67)
Date Prepared: 3/27/2013

1. The Required Load Reduction for the total project:

Calculations from RG-348 Page 3-29 Equation 3.3: $L_M = 27.2(A_N \times P)$
Pages 3-27 to 3-30

$L_{M\ TOTAL\ PROJECT}$ = 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 =	Comal	
Total project area included in plan * =	0.47	acres
Predevelopment impervious area within the limits of the plan * =	0.44	acres
Total post-development impervious area within the limits of the plan* =	0.47	acres
Total post-development impervious cover fraction * =	1.00	
P =	33	inches
$L_{M\ TOTAL\ PROJECT}$ =	25	lbs.
Number of drainage basins / outfalls areas leaving the plan area =	1	

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

Drainage Basin/Outfall Area No. =	A	
Total drainage basin/outfall area =	0.47	acres
Predevelopment impervious area within drainage basin/outfall area =	0.43	acres
Post-development impervious area within drainage basin/outfall area =	0.47	acres
Post-development impervious fraction within drainage basin/outfall area =	1.00	
$L_{M\ THIS\ BASIN}$ =	25	lbs.

3. Indicate the proposed BMP Code for this basin.

Proposed BMP =	CS	abbreviation
Removal efficiency =	83	percent

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:
LR = (BMP efficiency) x P_N x (A_C x 34.6 + A_P x 0.54)

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 =	0.47	acres
A_I =	0.47	acres
A_P =	0.00	acres
L_R =	442	lbs.

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

Desired $L_{M\ THIS\ BASIN}$ =	293	lbs.
F =	0.66	

6. Calculate Treated Flow required by the BMP Type for this drainage basin / outfall area.

Calculations from RG-348
Pages Section 3.4.14

Rainfall Depth =	0.69	inches
Rainfall Intensity =	0.28	inches per hour
Post Development Runoff Coefficient =	0.82	
Effective Area =	0.42	acres
Peak Flow =	0.12	cubic feet per second
Required Storage =	958	cubic feet
Required Storage + 20% =	1149	cubic feet

7. Storm Filter

Designed as Required in RG-348 Section 3.4.14

Cartridge Infiltration Rate =	1	GPM per ft²
Cartridge Height =	27	inches
Cartridge Capacity =	11.25	GPM

Select 1 of the 3 options to the right	Option 1. Volume Design		
	Number of Cartridges for Volume-Based Configuration =	8	
	Storage Volume for Volume-Based Configuration =	1149	cubic feet
	Option 2. Flow Through Design		
	Flow Rate for Flow-Through Configuration =	0.12	cfs
	Number of Cartridges for Flow-Through Configuration =	8	
	Volume for Flow-Through Configuration =	0	cubic feet
	Option 3. Equalization Design		
	Flow Rate for Flow-Through Configuration w/ Equalization =	0.13	cfs
	Number of Cartridges for Flow-Through Configuration w/ Equalization =	8	
	Volume for Flow-Through Configuration w/ Equalization =	0	cubic feet

4/23/2013

Linda Cox, P.E.

BS 46-C

WPAP LAYOUTS

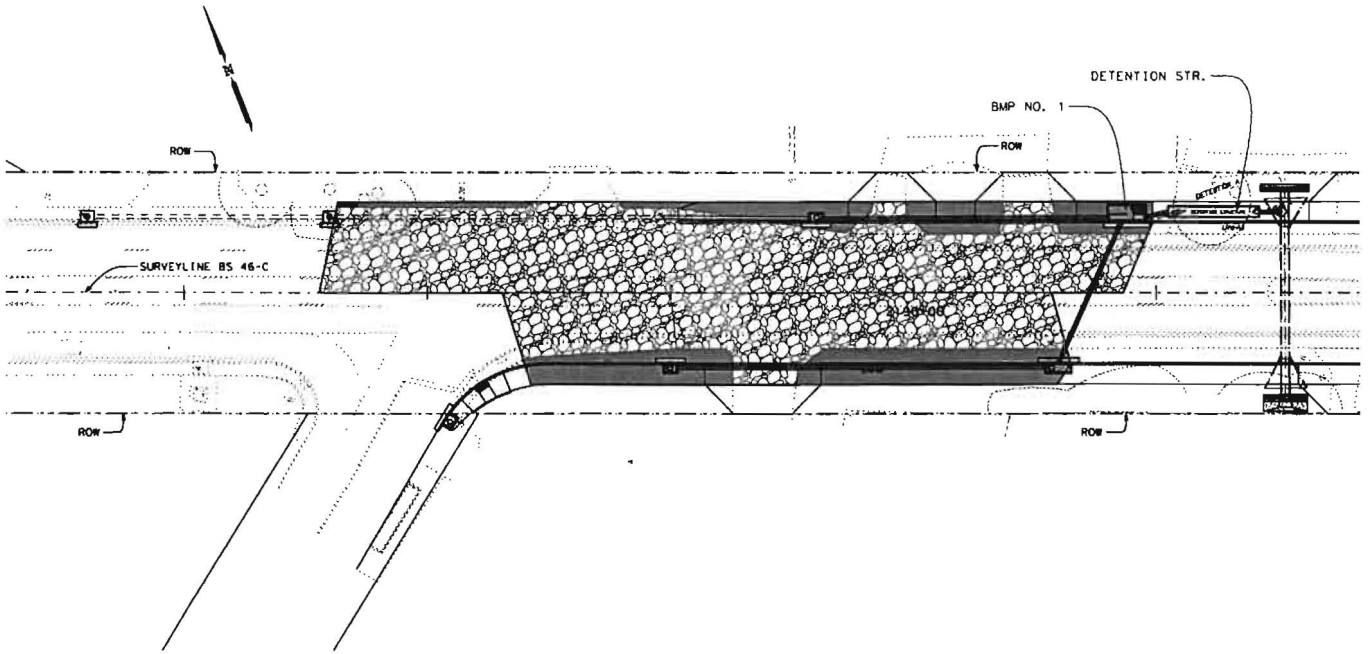
BMP NO. 7A AND BMP NO. 7B CALCULATION DATA

Texas Department of Transportation

SHEET 4 OF 4

DIST	COUNTY
TEXAS	COMAL
CONTROL	SECTION
0215	02
JOB	HIGHWAY NO.
048	BS 46-C

FILE: c:\Dpwork\ing\tx\sat\pw\south\manrend\dms23443\BMP CALC DATA SHTS.DGN
DATE: 4/23/2013 11:43:25 PM



LEGEND

- BASIN DRAINAGE AREA
- EXIST IMPERVIOUS COVER AREA
- ADDITIONAL IMPERVIOUS COVER AREA

BS 46-C
WPAP LAYOUTS
BASIN NO. 1 AREAS
(INSIDE EDWARDS AQUIFER RECHARGE ZONE)

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

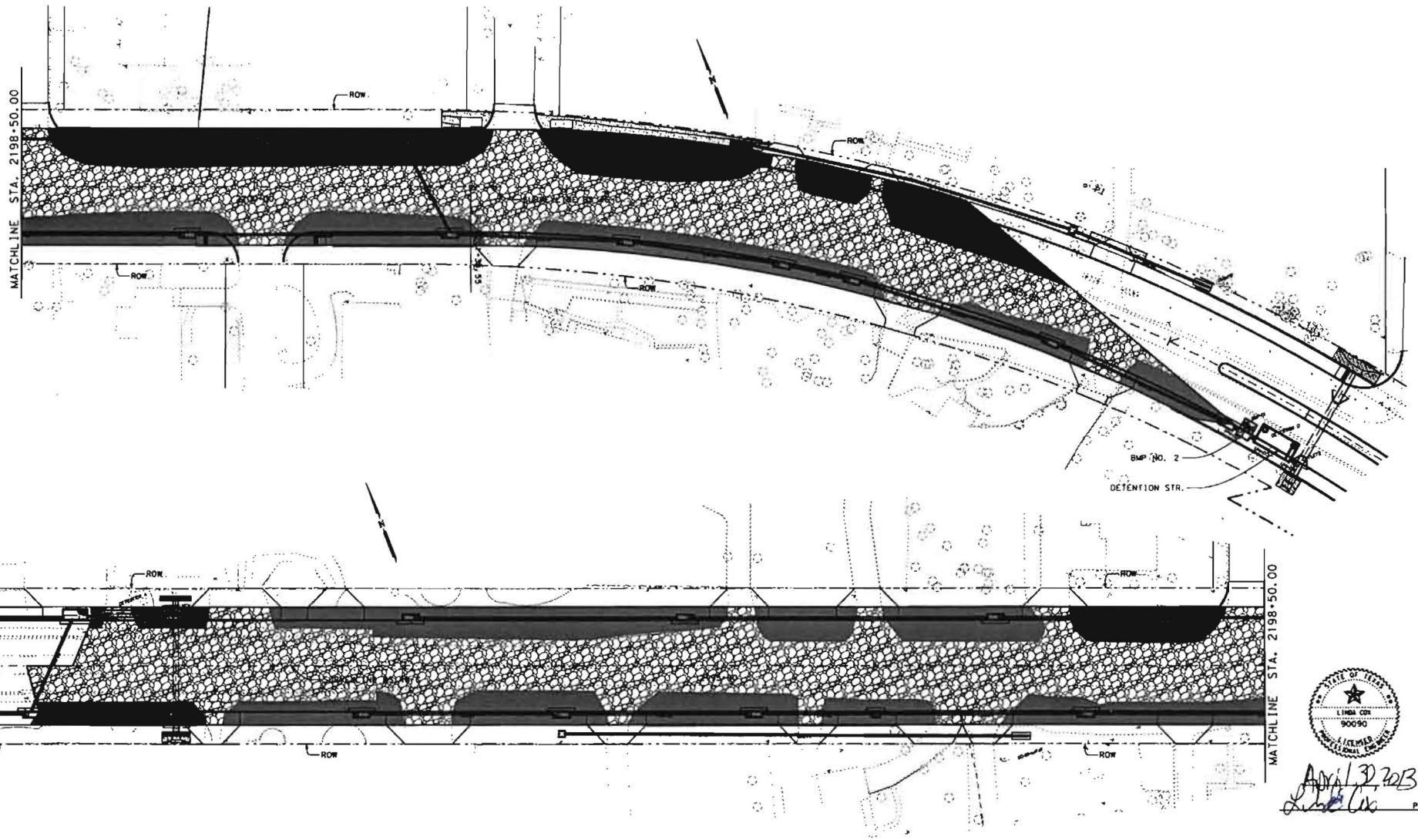
April 30, 2013
Linda Cox P.E.

© 2013 Texas Department of Transportation

SHEET 1 OF 7

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\jwebsouth\jmorgan\cms21304\WPAP001.dgn
DATE: 4/30/2013 9:09:21 AM



BS 46-C

WPAP LAYOUTS

BASIN NO. 2 AREAS

(INSIDE EDWARDS AQUIFER RECHARGE ZONE)

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 30, 2013

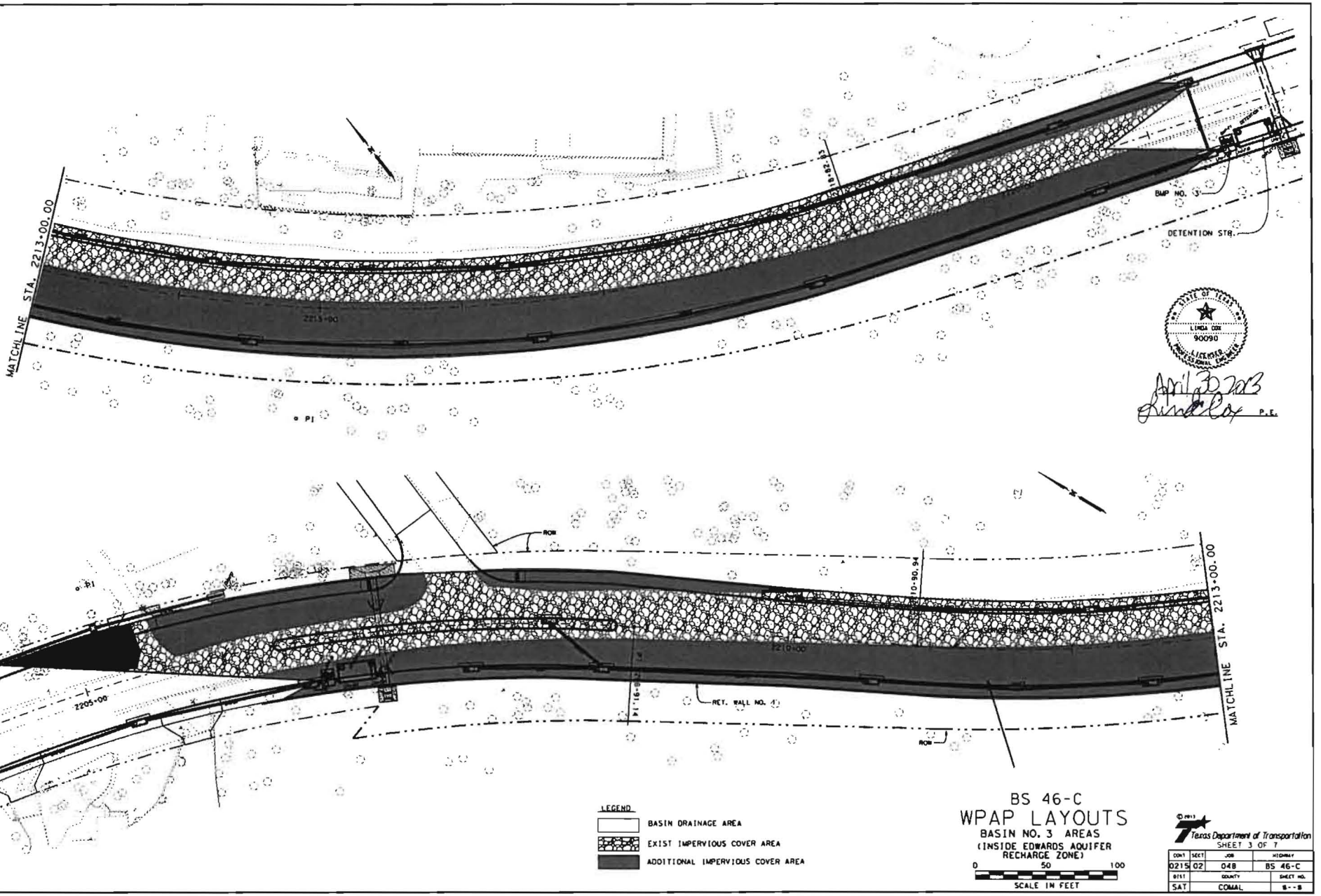
Linda Cox P.E.

Texas Department of Transportation

SHEET 2 OF 7

CONT	SECT	JOB	HIGHWAY
0215	02	048	BS 46-C
DIST	COUNTY		SHEET NO.
SAT	COMAL		8--8

FILE: J:\Projects\0215-02-048\south\miner end\dms213041\WPAP002.dgn
DATE: 4/30/2013 10:39:48 AM



STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

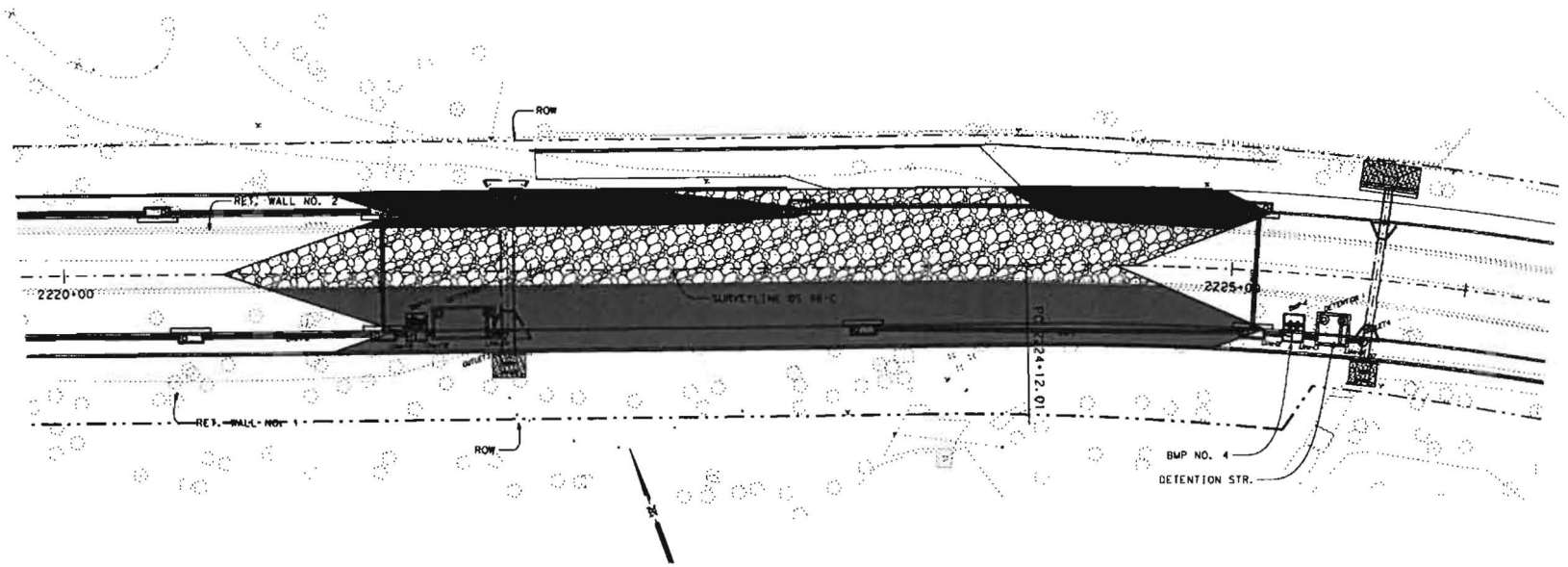
April 20 2023
P.E.

BS 46-C
WPAP LAYOUTS
BASIN NO. 3 AREAS
(INSIDE EDWARDS AQUIFER RECHARGE ZONE)

Texas Department of Transportation
SHEET 3 OF 7

CONT	SECT	JOB	HIGHWAY
0215	02	048	BS 46-C
DIST	COUNTY		SHEET NO.
SAT	COMAL		6--8

FILE: ...\wpap003.dgn
DATE: ...



LEGEND

- BASIN DRAINAGE AREA
- EXIST IMPERVIOUS COVER AREA
- ADDITIONAL IMPERVIOUS COVER AREA

BS 46-C
WPAP LAYOUTS
BASIN NO. 4 AREAS
(INSIDE EDWARDS AQUIFER RECHARGE ZONE)

0 50 100
SCALE IN FEET

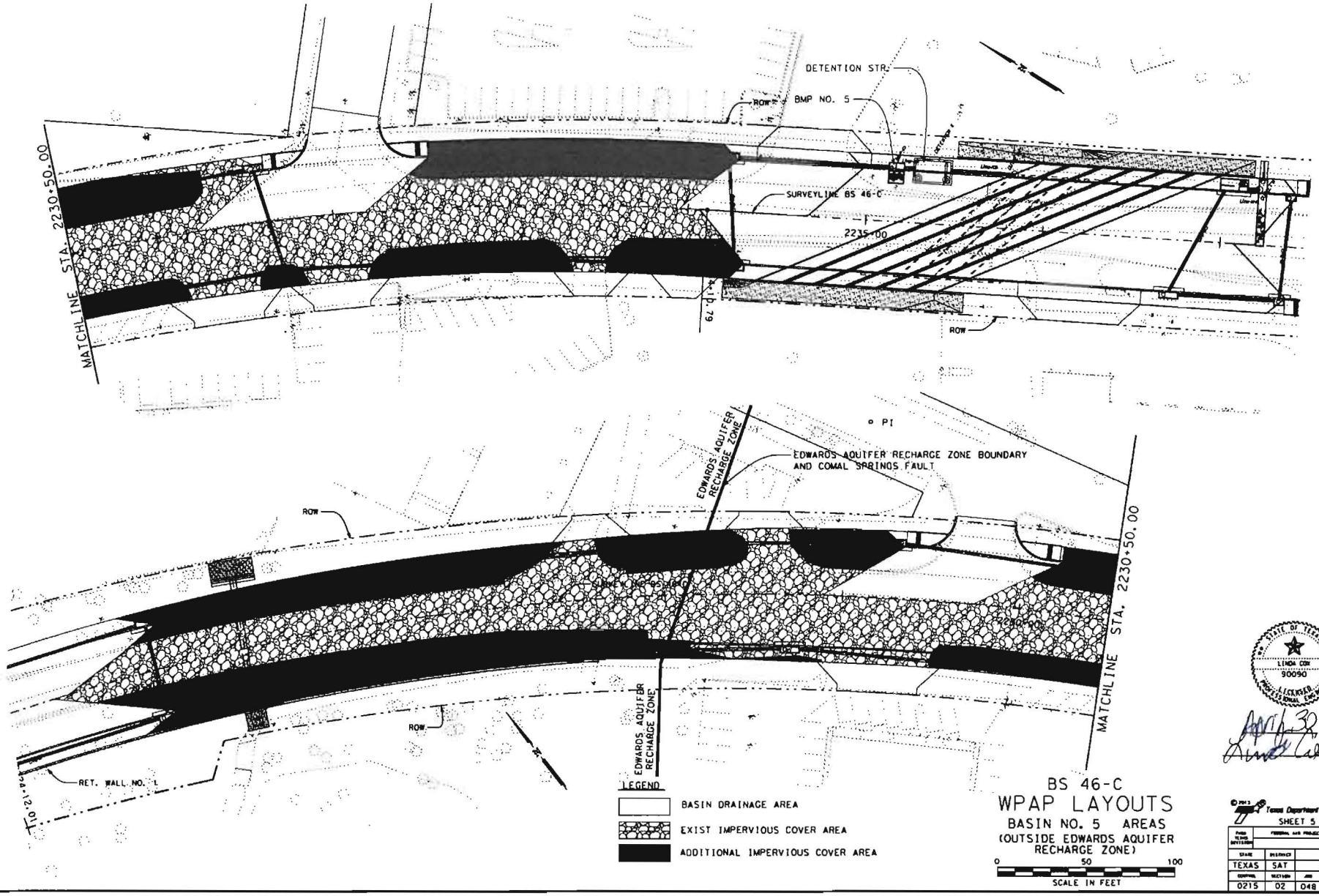
STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 30, 2013
Linda Cox P.E.

SHEET 4 OF 7

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\pwsouth\mmarend\dms21304\WPAP004.dgn
DATE: 4/30/2013 9:21:35 AM



BS 46-C

WPAP LAYOUTS

BASIN NO. 5 AREAS (OUTSIDE EDWARDS AQUIFER RECHARGE ZONE)

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 30 2013

P.E.

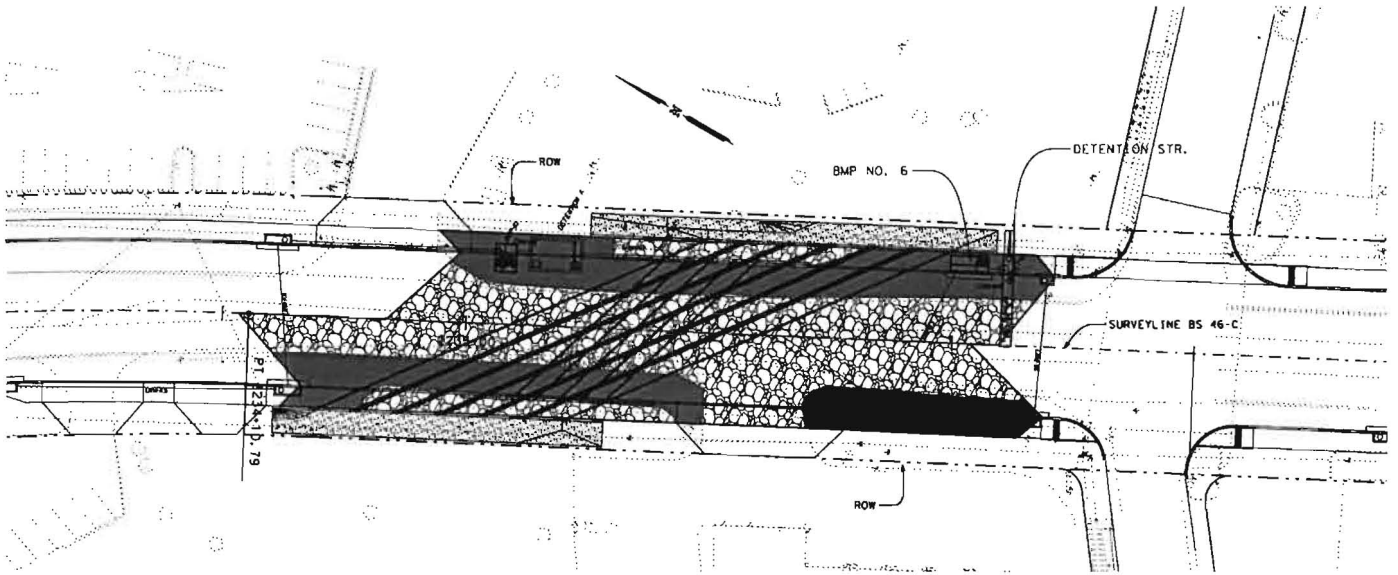
© 2013 Texas Department of Transportation

SHEET 5 OF 7

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

HIGHWAY NO. BS 46-C

FILE: c:\projects\root\projsouth\umarendons2130a\WPAP005.dgn
DATE: 4/30/2013 9:21:01 AM



LEGEND

- BASIN DRAINAGE AREA
- EXIST IMPERVIOUS COVER AREA
- ADDITIONAL IMPERVIOUS COVER AREA

BS 46-C
WPAP LAYOUTS
BASIN NO. 6 AREAS
(OUTSIDE EDWARDS AQUIFER RECHARGE ZONE)

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

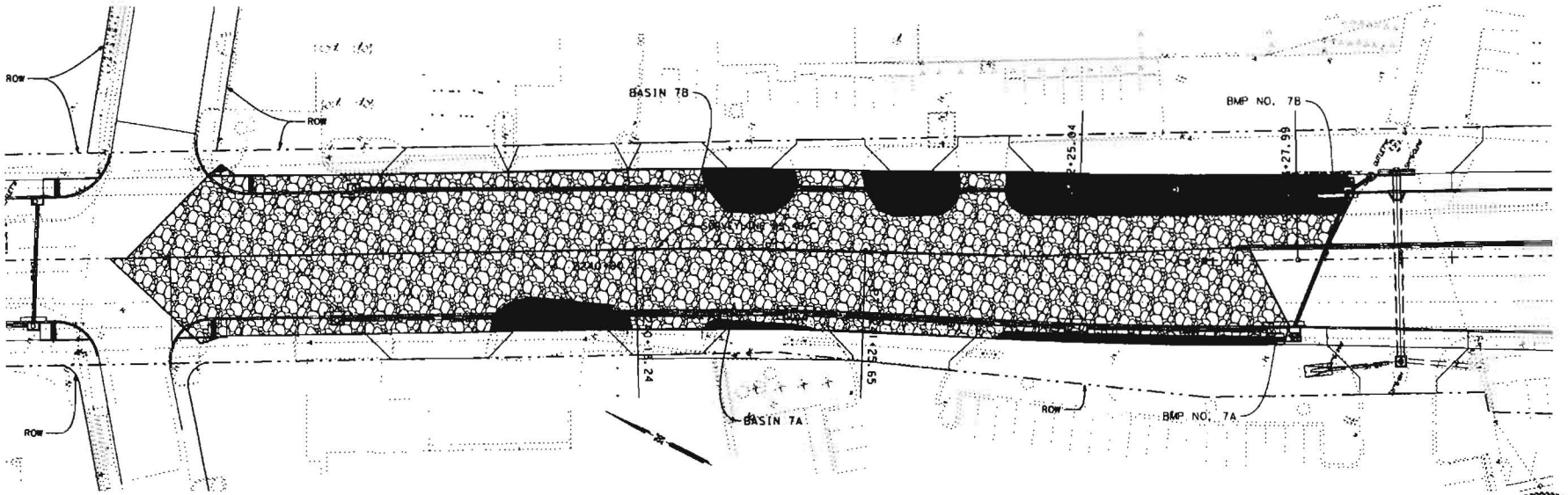
April 30 2013
P.E.

Texas Department of Transportation

SHEET 6 OF 7

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\pwsouth\mmorenoh\dms21304\WPAP056.dgn
DATE: 4/30/2013 9:20:34 AM



RECEIVED
MAY 13 2013
COUNTY ENGINEER

LEGEND

- BASIN DRAINAGE AREA
- EXIST IMPERVIOUS COVER AREA
- ADDITIONAL IMPERVIOUS COVER AREA

BS 46-C
WPAP LAYOUTS
BASIN NO. 7 AREAS
(OUTSIDE EDWARDS AQUIFER RECHARGE ZONE)

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

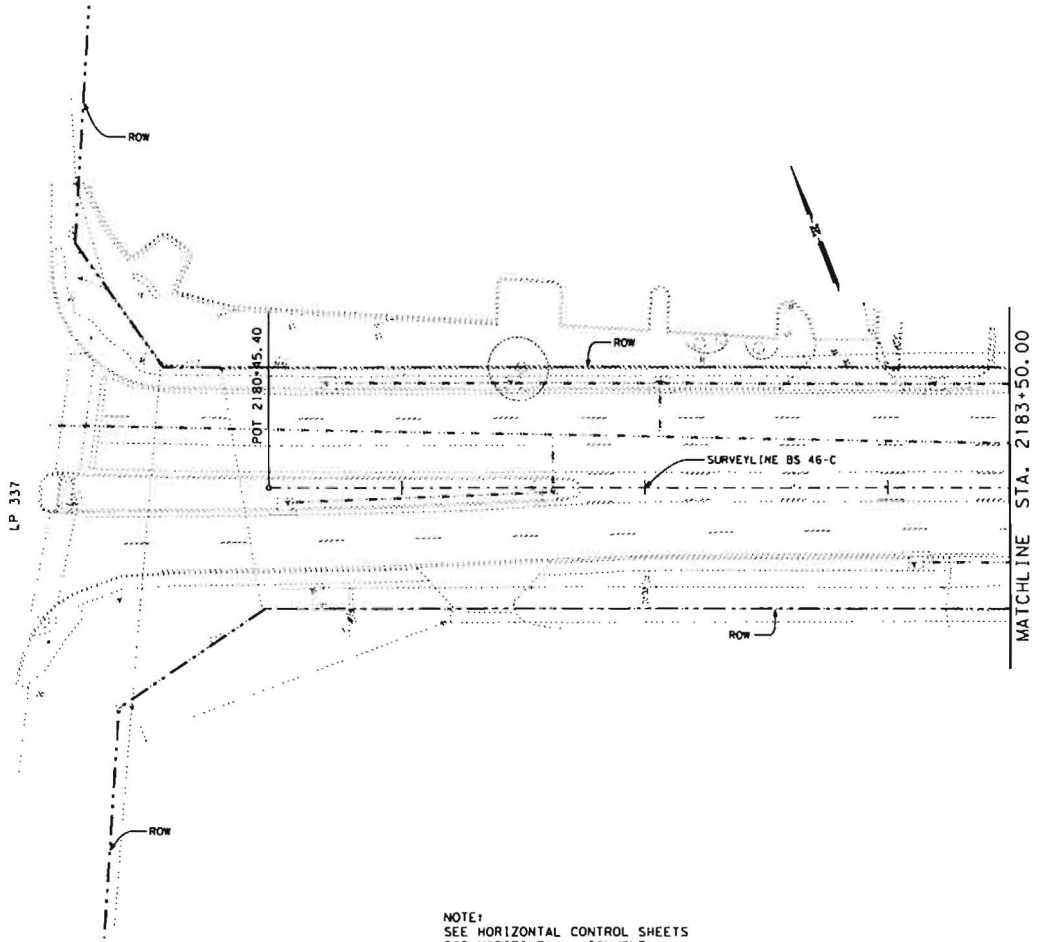
April 30, 2013
P.E.

Texas Department of Transportation
SHEET 7 OF 7

DIST	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\pwbsouth\smorano\dms211304\WPAP007.dgn
DATE: 4/30/2013 9:20:05 AM

MATCHLINE
STA. 2180+45.40 EXT. -295.40



LEGEND

- COMPOST MANFU TPSL BLOCK SODDING
- COMPOST MANFU TPSL SEEDING SOIL RETENTION BLANKETS
- CONSTRUCTION PERIMETER FENCE

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE PLAN SHEETS FOR RIPRAP AND GABION MATTRESS QUANTITIES.

TREES SHOWN ARE TO REMAIN, UNLESS DENOTED AS REMOVE. REMOVAL OF REMAINING TREES ONLY AS APPROVED/DIRECTED BY THE ENGINEER.

TREE REMOVAL IS SUBSIDIARY TO PREP. ROW.

BS 46-C LANDSCAPE LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
P.E.

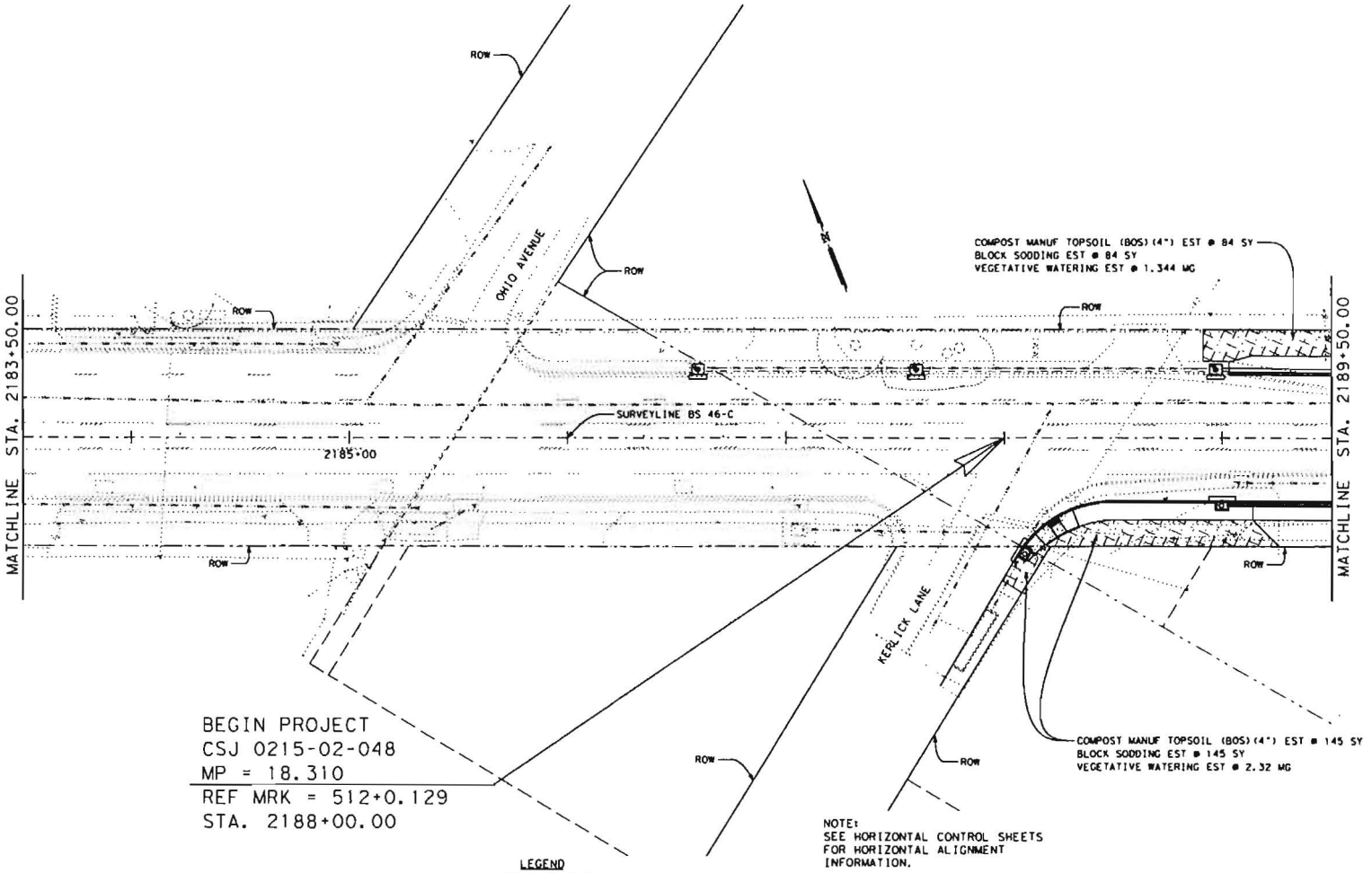
Texas Department of Transportation

SHEET 1 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\pwsouth\mnarend\dmal8995\LNDSCP001.dgn
DATE: 4/18/2013 10:08:05 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
COMPOST MANUF TOPSOIL (BOS) (4")	229	SY
BLOCK SODDING	229	SY
VEGETATIVE WATERING	3.664	MG



BEGIN PROJECT
CSJ 0215-02-048
MP = 18.310
REF MRK = 512+0.129
STA. 2188+00.00

LEGEND

- COMPOST MANFU TPSL / BLOCK SODDING
- COMPOST MANFU TPSL / SEEDING / SOIL RETENTION BLANKETS
- CONSTRUCTION PERIMETER FENCE

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE PLAN SHEETS FOR RIPRAP AND GABION MATTRESS QUANTITIES.

TREES SHOWN ARE TO REMAIN, UNLESS DENOTED AS REMOVE. REMOVAL OF REMAINING TREES ONLY AS APPROVED/DIRECTED BY THE ENGINEER.

TREE REMOVAL IS SUBSIDIARY TO PREP. ROW.

BS 46-C LANDSCAPE LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

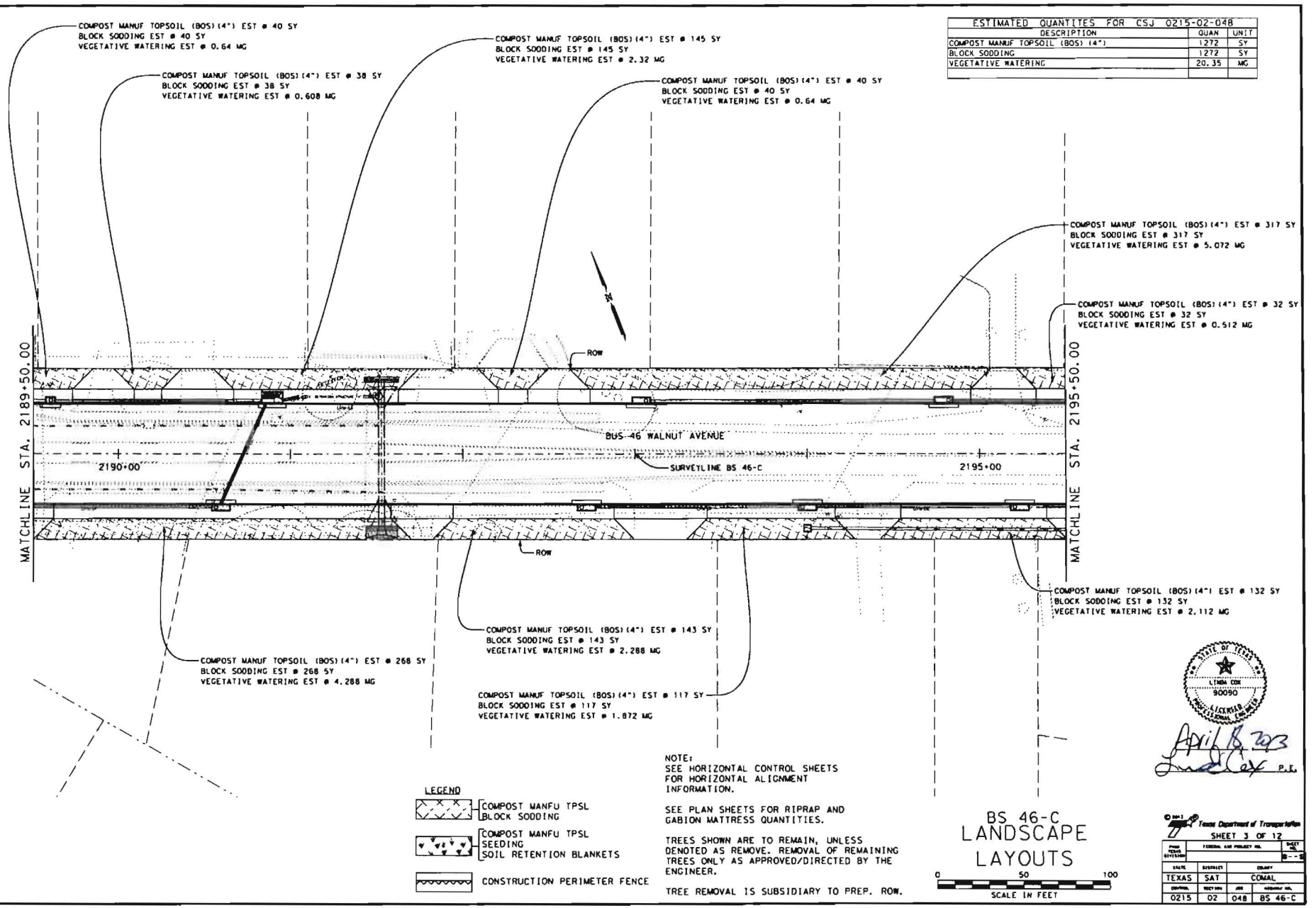
April 18, 2013
Linda Cox P.E.

SHEET 2 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

BS 46-C

FILE: C:\Users\kjohnston\Desktop\mnorend\dms18995\LMOSCP002.dgn
DATE: 4/18/2013 10:08:27 AM



ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
COMPOST MANUF TOPSOIL (BOS) (4")	1272	SY
BLOCK SODDING	1272	SY
VEGETATIVE WATERING	20.35	MG

LEGEND

- COMPOST MANFU TPSL BLOCK SODDING
- COMPOST MANFU TPSL SEEDING SOIL RETENTION BLANKETS
- CONSTRUCTION PERIMETER FENCE

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE PLAN SHEETS FOR RIPRAP AND GABION MATTRESS QUANTITIES.

TREES SHOWN ARE TO REMAIN, UNLESS DENOTED AS REMOVE. REMOVAL OF REMAINING TREES ONLY AS APPROVED/DIRECTED BY THE ENGINEER.

TREE REMOVAL IS SUBSIDIARY TO PREP. ROW.

BS 46-C LANDSCAPE LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LYNDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 18, 2013
P.E.

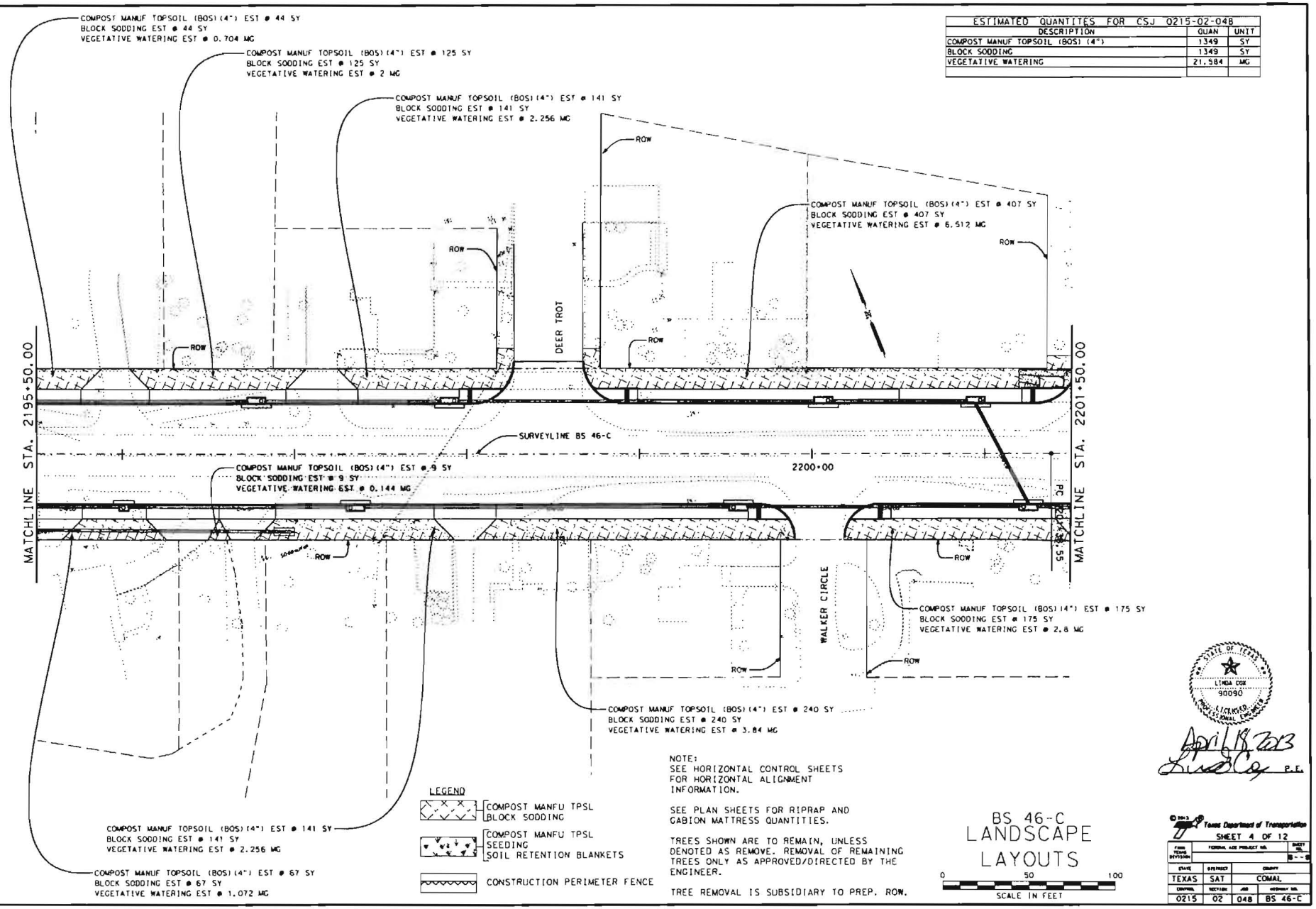
Texas Department of Transportation

SHEET 3 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

BS 46-C

FILE: c:\projects\ngy\txdot\bs46south\roadway\sheets\1895slMDSCP003.dgn
DATE: 4/18/2013 10:08:44 AM



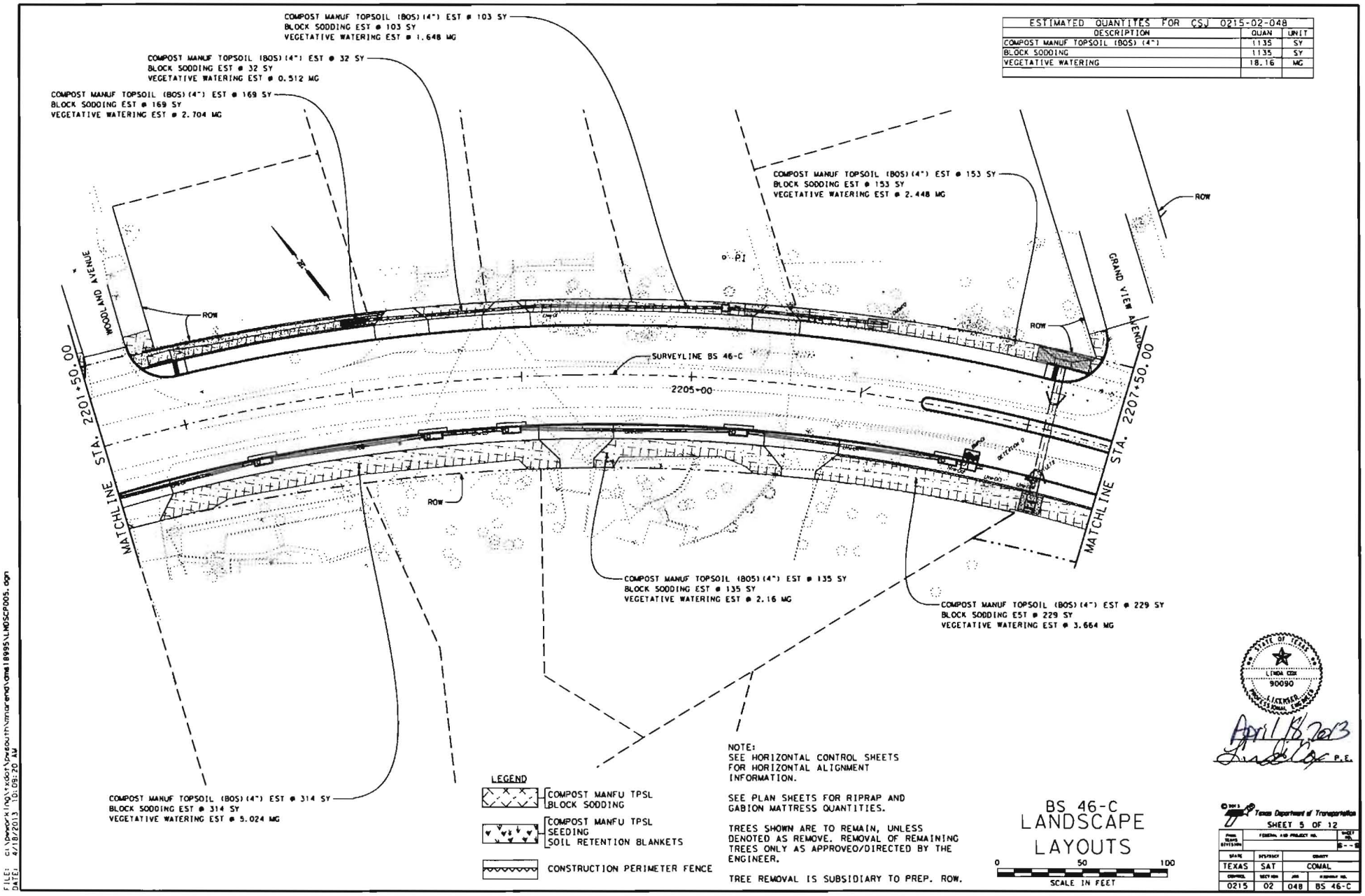
ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
COMPOST MANUF TOPSOIL (BOS) (4")	1349	SY
BLOCK SODDING	1349	SY
VEGETATIVE WATERING	21.584	MG

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER
April 18, 2013
P.E.

BS 46-C LANDSCAPE LAYOUTS

SHEET 4 OF 12			
FROM TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO. 5 - - B
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\pwsouth\pmorend\pms18995\LNDSCP004.dgn
DATE: 4/18/2013 10:09:00 AM



ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
COMPOST MANUF TOPSOIL (BOS) (4")	1135	SY
BLOCK SODDING	1135	SY
VEGETATIVE WATERING	18.16	MG

BS 46-C LANDSCAPE LAYOUTS

STATE OF TEXAS
LINDA COX
90090
LICENSED
PROFESSIONAL ENGINEER

April 18, 2013
P.E.

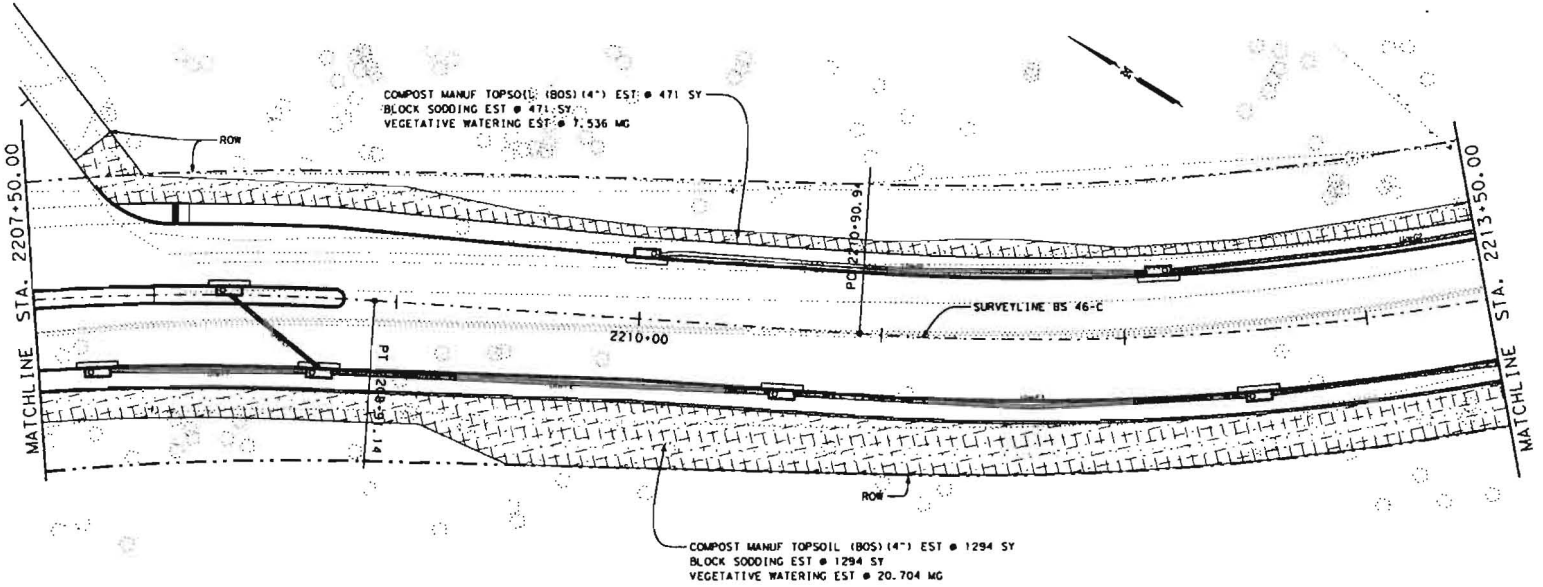
Texas Department of Transportation

SHEET 5 OF 12

DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\projects\txdot\pregsouth\comal8995\LNDSCP005.dgn
DATE: 4/18/2013 10:09:20 AM

ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
COMPOST MANUF TOPSOIL (BOS) (4")	1765	SY
BLOCK SODDING	1765	SY
VEGETATIVE WATERING	28.24	MG



LEGEND

COMPOST MANFU TPSL
BLOCK SODDING

COMPOST MANFU TPSL
SEEDING
SOIL RETENTION BLANKETS

CONSTRUCTION PERIMETER FENCE

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE PLAN SHEETS FOR RIPRAP AND GABION MATTRESS QUANTITIES.

TREES SHOWN ARE TO REMAIN, UNLESS DENOTED AS REMOVE. REMOVAL OF REMAINING TREES ONLY AS APPROVED/DIRECTED BY THE ENGINEER.

TREE REMOVAL IS SUBSIDIARY TO PREP. ROW.

BS 46-C LANDSCAPE LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013
P.E.

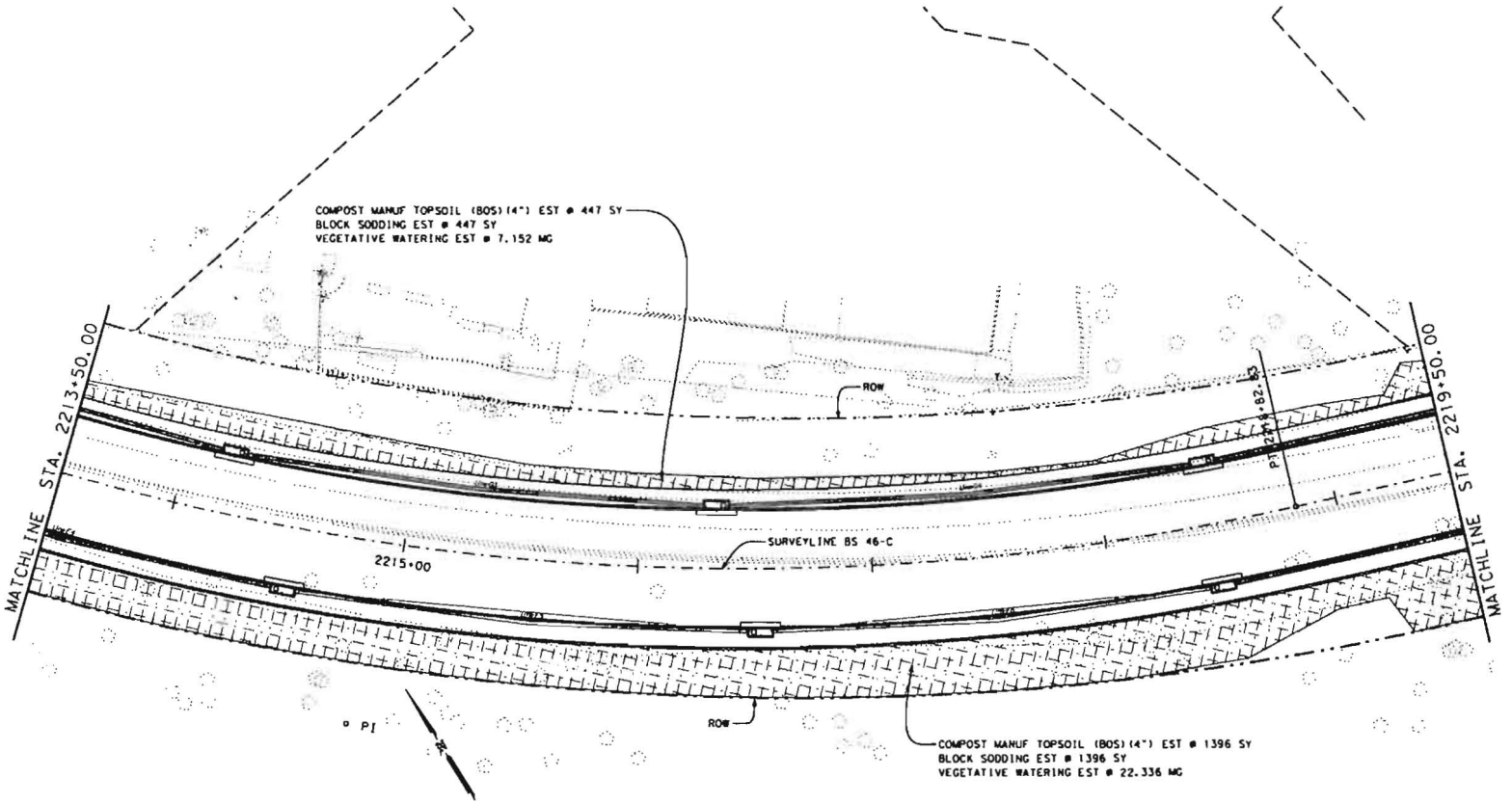
© 2012 Texas Department of Transportation

SHEET 6 OF 12

FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
			B - 8
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\txdot\txdot\besouth\anderson\dms18995\LNDSCP006.dgn
DATE: 4/18/2013 10:09:37 AM

ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
COMPOST MANUF TOPSOIL (BOS) (4")	1843	SY
BLOCK SODDING	1843	SY
VEGETATIVE WATERING	29.488	MG



LEGEND

COMPOST MANFU TPSL
BLOCK SODDING

COMPOST MANFU TPSL
SEEDING
SOIL RETENTION BLANKETS

CONSTRUCTION PERIMETER FENCE

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE PLAN SHEETS FOR RIPRAP AND GABION MATTRESS QUANTITIES.

TREES SHOWN ARE TO REMAIN, UNLESS DENOTED AS REMOVE. REMOVAL OF REMAINING TREES ONLY AS APPROVED/DIRECTED BY THE ENGINEER.

TREE REMOVAL IS SUBSIDIARY TO PREP. ROW.

BS 46-C LANDSCAPE LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER

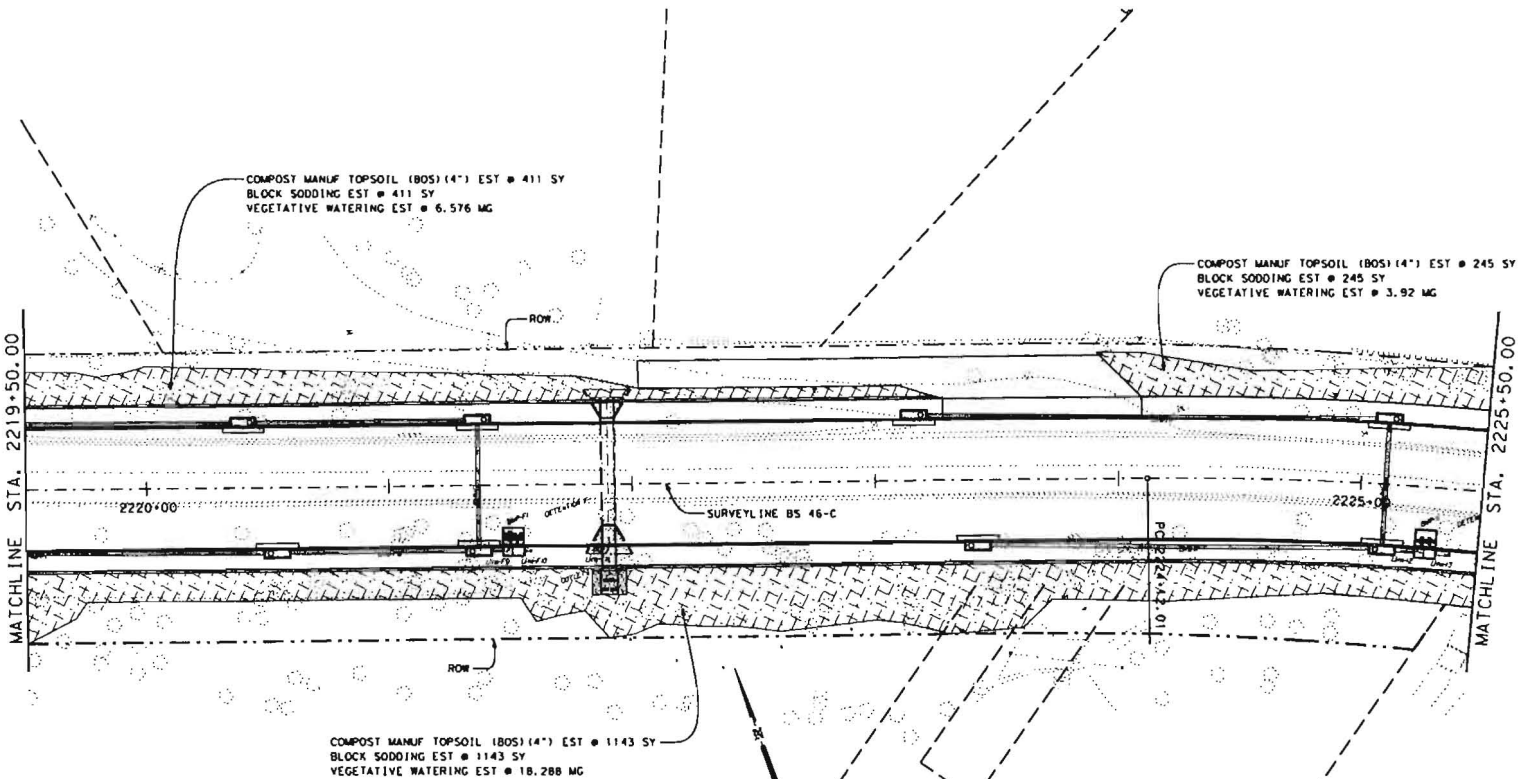
4/18/2013
P.E.

SHEET 7 OF 12

FED. ROAD DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO. 5 -- 5
STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: d:\pwwork\ngt\tx6dot\bsaustin\mmorendo\dms18995\LNDSCP007.dgn
DATE: 4/18/2013 10:09:52 AM

ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
COMPOST MANUF TOPSOIL (BOS) (4")	1799	SY
BLOCK SODDING	1799	SY
VEGETATIVE WATERING	28.784	MG



LEGEND

- COMPOST MANFU TPSL BLOCK SODDING
- COMPOST MANFU TPSL SEEDING SOIL RETENTION BLANKETS
- CONSTRUCTION PERIMETER FENCE

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE PLAN SHEETS FOR RIPRAP AND GABION MATTRESS QUANTITIES.

TREES SHOWN ARE TO REMAIN, UNLESS DENOTED AS REMOVE. REMOVAL OF REMAINING TREES ONLY AS APPROVED/DIRECTED BY THE ENGINEER.

TREE REMOVAL IS SUBSIDIARY TO PREP. ROW.

BS 46-C LANDSCAPE LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER
April 18, 2013
P.E.

© 2013 Texas Department of Transportation

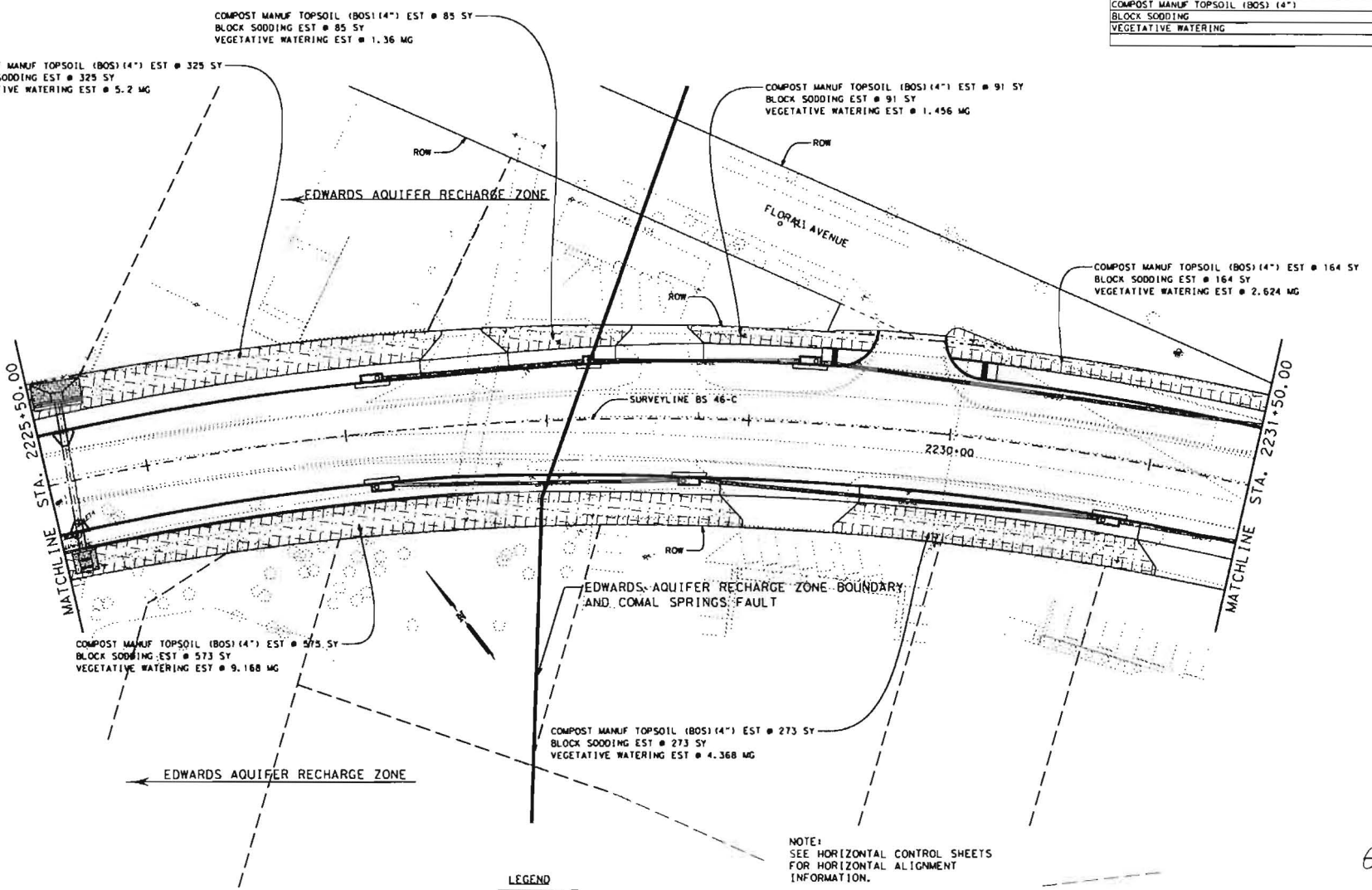
SHEET 8 OF 12

FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.	SHEET NO.
		8 - - S

STATE	DISTRICT	COUNTY	
TEXAS	SAT	COMAL	
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\projects\hydrotech\bexar\mmorand\cms18995\LNDSCP008.dgn
DATE: 4/18/2013 10:10:10 AM

ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
COMPOST MANUF TOPSOIL (BOS) (4")	1511	SY
BLOCK SODDING	1511	SY
VEGETATIVE WATERING	24.176	MG



LEGEND

- COMPOST MANFU TPSL BLOCK SODDING
- COMPOST MANFU TPSL SEEDING SOIL RETENTION BLANKETS
- CONSTRUCTION PERIMETER FENCE

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE PLAN SHEETS FOR RIPRAP AND GABION MATTRESS QUANTITIES.

TREES SHOWN ARE TO REMAIN, UNLESS DENOTED AS REMOVE. REMOVAL OF REMAINING TREES ONLY AS APPROVED/DIRECTED BY THE ENGINEER.

TREE REMOVAL IS SUBSIDIARY TO PREP. ROW.

BS 46-C LANDSCAPE LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER
April 18, 2013
P.E.

Texas Department of Transportation

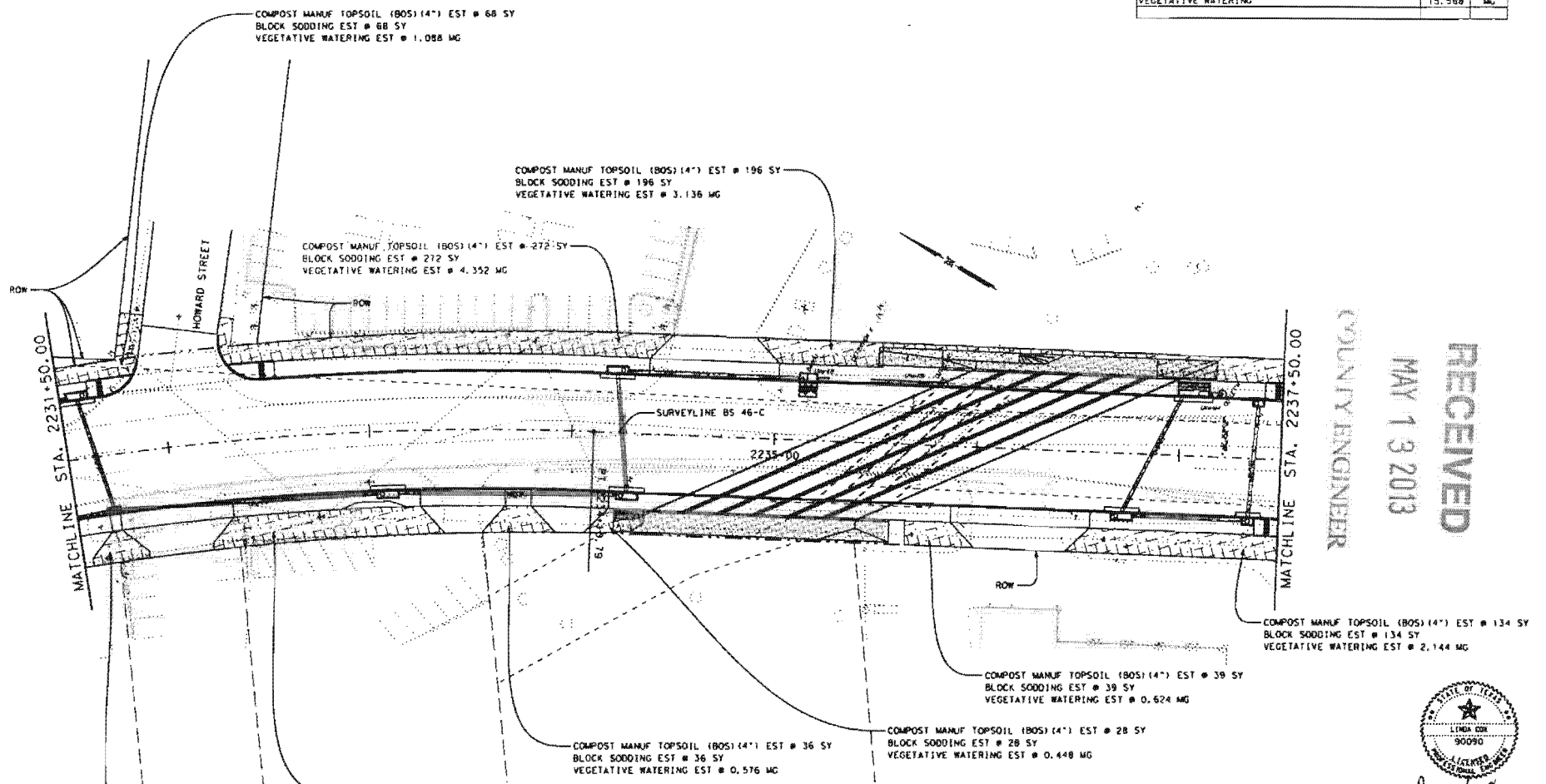
SHEET 9 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

HIGHWAY NO. BS 46-C

FILE: c:\pwworking\txdot\pwsouth\pwsaren01\dms18995\LNDSCP009.dgn
DATE: 4/18/2013 10:10:30 AM

ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
COMPOST MANUF TOPSOIL (BOS) (4")	973	SY
BLOCK SODDING	973	SY
VEGETATIVE WATERING	15.568	MG



LEGEND

COMPOST MANFU TPSL BLOCK SODDING

COMPOST MANFU TPSL SEEDING SOIL RETENTION BLANKETS

CONSTRUCTION PERIMETER FENCE

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE PLAN SHEETS FOR RIPRAP AND GABION MATTRESS QUANTITIES.

TREES SHOWN ARE TO REMAIN, UNLESS DENOTED AS REMOVE. REMOVAL OF REMAINING TREES ONLY AS APPROVED/DIRECTED BY THE ENGINEER.

TREE REMOVAL IS SUBSIDIARY TO PREP. ROW.

BS 46-C LANDSCAPE LAYOUTS

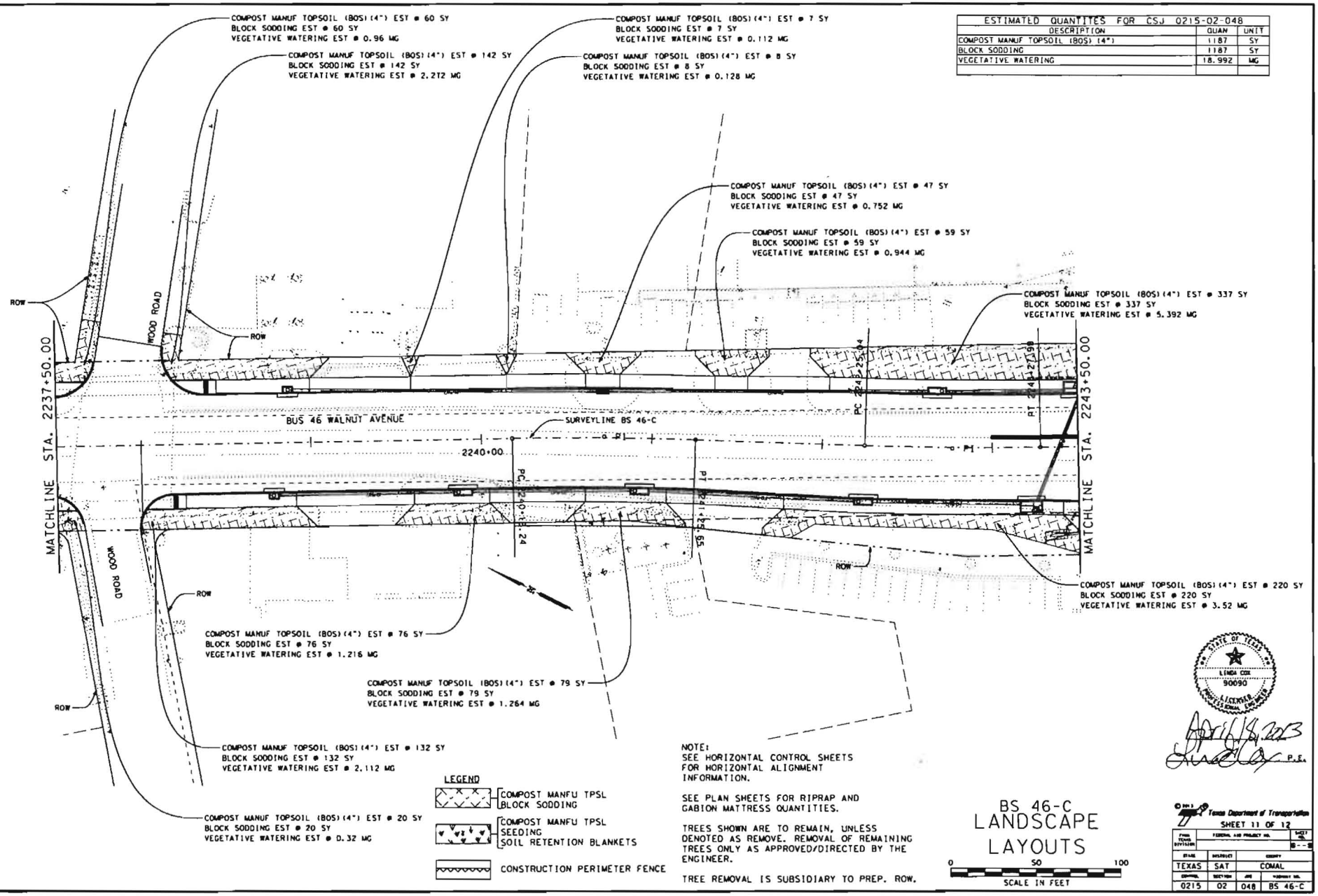
0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER
April 18, 2013

Texas Department of Transportation
SHEET 10 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: c:\pwworking\pgl\txdot\desauth\versionandcma18995xldwgscp010.dgn
DATE: 4/18/2013 10:10:50 AM



ESTIMATED QUANTITIES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
COMPOST MANUF TOPSOIL (BOS) (4")	1187	SY
BLOCK SODDING	1187	SY
VEGETATIVE WATERING	18.992	MG

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE PLAN SHEETS FOR RIPRAP AND GABION MATTRESS QUANTITIES.

TREES SHOWN ARE TO REMAIN, UNLESS DENOTED AS REMOVE. REMOVAL OF REMAINING TREES ONLY AS APPROVED/DIRECTED BY THE ENGINEER.

TREE REMOVAL IS SUBSIDIARY TO PREP. ROW.

BS 46-C LANDSCAPE LAYOUTS

0 50 100
SCALE IN FEET

STATE OF TEXAS
LINDA COX
90090
LICENSED PROFESSIONAL ENGINEER
4/16/2013
P.E.

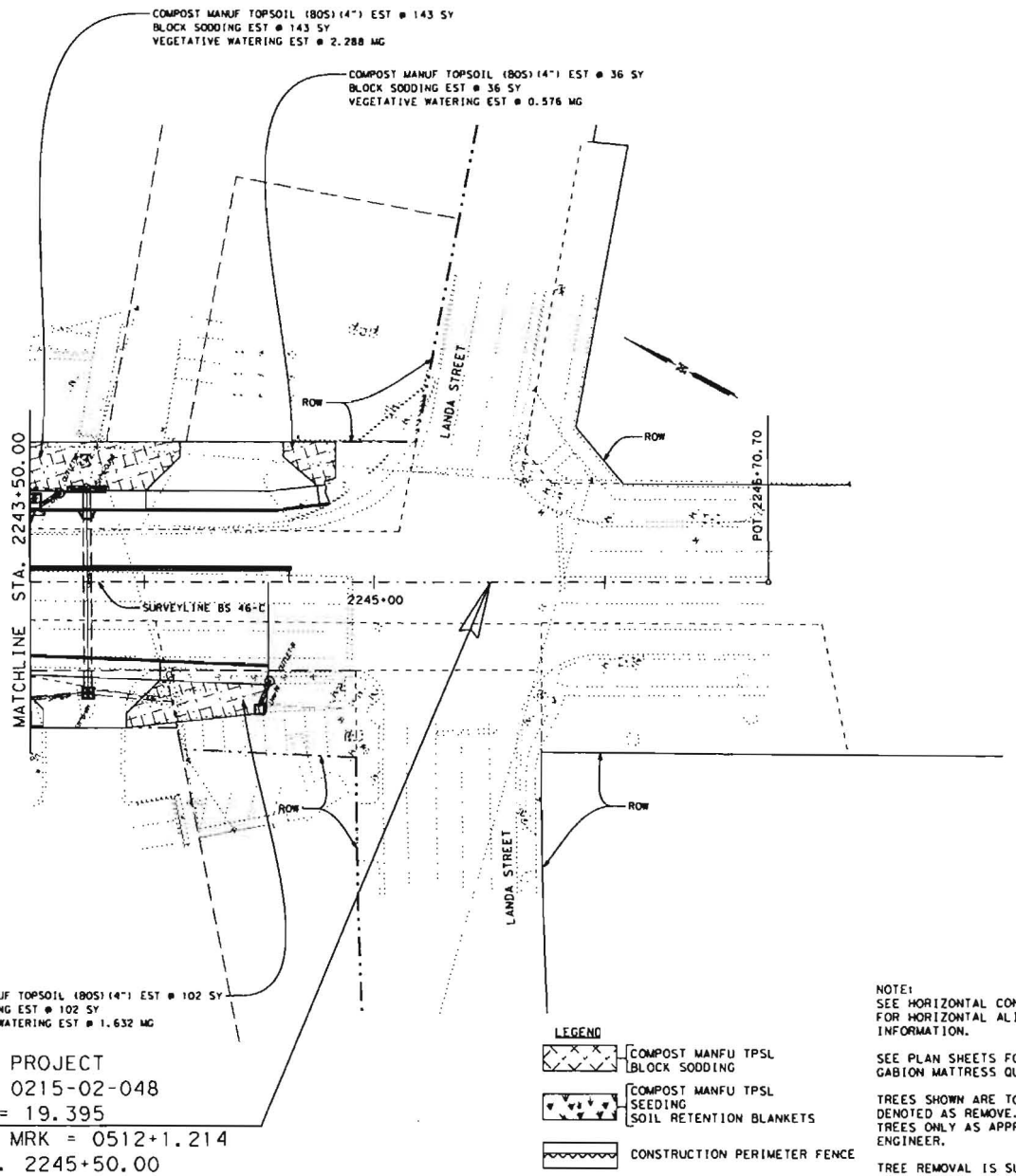
© 2013 Texas Department of Transportation

SHEET 11 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB
0215	02	048

HIGHWAY NO. BS 46-C

FILE: c:\projects\proj\xdot\sat\south\comal\cms18995\LNDSCP011.dgn
DATE: 4/16/2013 10:11:08 AM



ESTIMATED QUANTITES FOR CSJ 0215-02-048		
DESCRIPTION	QUAN	UNIT
COMPOST MANUF TOPSOIL (BOS) (4")	281	SY
BLOCK SODDING	281	SY
VEGETATIVE WATERING	4.496	MG

LEGEND

- COMPOST MANFU TPSL BLOCK SODDING
- COMPOST MANFU TPSL SEEDING SOIL RETENTION BLANKETS
- CONSTRUCTION PERIMETER FENCE

NOTE:
SEE HORIZONTAL CONTROL SHEETS FOR HORIZONTAL ALIGNMENT INFORMATION.

SEE PLAN SHEETS FOR RIPRAP AND GABION MATTRESS QUANTITIES.

TREES SHOWN ARE TO REMAIN, UNLESS DENOTED AS REMOVE. REMOVAL OF REMAINING TREES ONLY AS APPROVED/DIRECTED BY THE ENGINEER.

TREE REMOVAL IS SUBSIDIARY TO PREP. ROW.

STATE OF TEXAS
LENDA COX
90090
LICENSED PROFESSIONAL ENGINEER

April 18, 2013

BS 46-C LANDSCAPE LAYOUTS

0 50 100
SCALE IN FEET

Texas Department of Transportation
SHEET 12 OF 12

STATE	DISTRICT	COUNTY
TEXAS	SAT	COMAL
CONTROL	SECTION	JOB	HIGHWAY NO.
0215	02	048	BS 46-C

FILE: d:\pwworking\txdot\txsouth\vnorand\dms18995\LNDSCP012.dgn
DATE: 4/18/2013 10:11:26 AM