DRAFT

CITY OF SAN ANTONIO

TRANSPORTATION & CAPITAL IMPROVEMENTS

DESIGN GUIDANCE MANUAL



Our Mission:

Through innovation and dedication, we build and maintain San Antonio's infrastructure.

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Front Matter

Functional Manual: City of San Antonio Design Guidance Manual

Effective Date: October 2017

Purpose

This manual is intended to provide general guidance in the management and design of horizontal civil projects for the City of San Antonio. It outlines the procedures and formats that must be followed in performing design tasks associated with roadway and drainage projects within the city.

Contents

The manual is organized in sections that cover the following topics:

- Project Management and Administration
- Surveying and Mapping
- Drainage
- Utility Coordination
- Traffic Engineering
- Roadway, Bicycle, and Pedestrian Design
- Environmental Coordination/Permitting
- CAD Standards
- Geotechnical Services
- Public Involvement
- Cost Estimating
- Quality Control/Quality Assurance

Instructions

This is a new revision and supersedes the February 2012 document, as well as any other previous versions.

Viewing the PDF Format of this Manual

The PDF format of this manual was generated using Adobe® Acrobat Pro. It contains robust navigation allowing you to quickly move throughout the manual. To utilize this feature, access the PDF format with Adobe Acrobat® Reader, or one of the Acrobat Professional versions. To download a free version of Acrobat Reader, use the following link.

https://get.adobe.com/reader/

NOTE: When viewing the manual via the TCI website or a web browser, the navigation does not display.

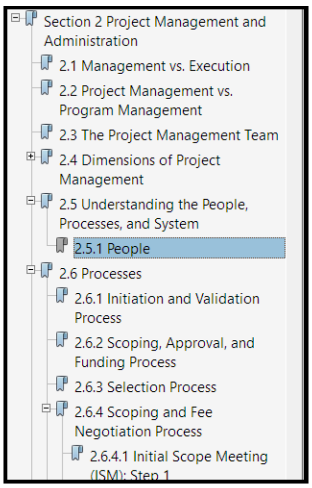

Figure 1: Navigation using Acrobat Reader

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1. Select the .pdf file.
2. Right-click.

   The drop-down menu displays.
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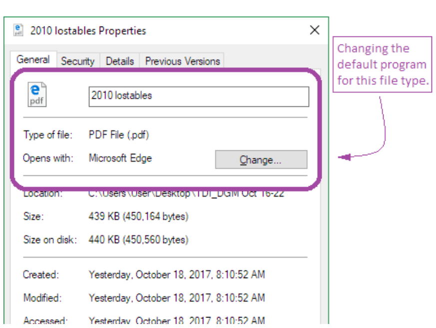

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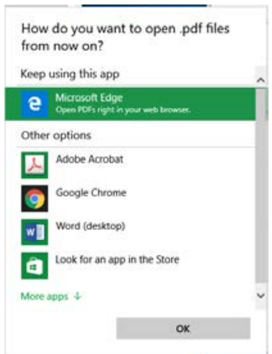

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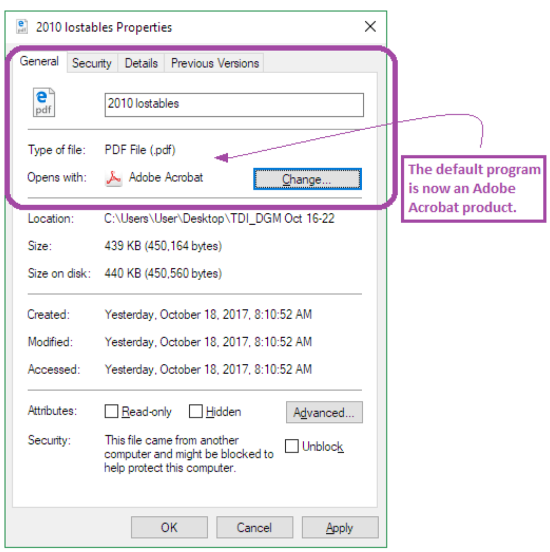

7. Click OK to save the change.

Changes from February 2012 Edition

Changes made to create the October 2017 edition of the manual include, but are not limited to, the changes listed below:

Table: Updates List (c		
Section	**Title**	**Change**
Whole Manual		Updated to include numbered headings.
Front Matter		New manual cover; Added Adobe Acrobat Reader Suggestion and link; Added Change list; Added trademark section; Moved Acronyms and Initialisms to Front Matter
	Sections	
Section 1	Introduction	Updated to reflect the 2017-2021 Bond Program.
Section 2	Project Management and Administration	Updated definition of project management; Updated figures; Updated web portal information so it now reflects COSA PRIMELink.
Section 3	Surveying & Mapping	Updated table formats; Updated checklist formats.
Section 4	Drainage	Considerable updating; please carefully read and review the entire Drainage section.
Section 5	Utility Coordination	Updated to show Spectrum rather than TWC; Updated all logo images; Added six more Common Mistakes to Avoid; Added information to Overhead Utilities; Added Utility Coordination Roles & Responsibilities section; Considerable updating to the Process section; please carefully read and review this section; Added No. 13 to 40% Design Phase portion of the Designer's Utility Coordination Scope and Checklist
Section 6	Traffic Engineering	Updated external website and document links, such as TMUTCD.
Section 7	Roadway, Bicycle, & Pedestrian Design	Updated, in Design Characteristics: Pedestrians bullet; considerable updates – please carefully read and review; Design Criteria bullet; considerable updates – please carefully read and review; Complete Street References section; updated list.

Table: Updates List (continued)		
Section	**Title**	**Change**
Section 8	Environmental Coordination & Permitting	Considerable updating; please carefully read and review the entire Environmental Coordination & Permitting section.
Section 9	CAD Standards	Updated the Estimated Quantities section.
Section 10	Geotechnical Services	Moved TCP vs. Angle of Internal Friction for Cohesionless Soils figure from Appendix 10B to this Section; therefore, Appendix 10B was removed from manual.
Section 11	Public Involvement Guidelines	Updated Checklist format.
Section 12	Cost Estimating	Introduction; considerable updating please carefully read and review this section; Deterministic Estimating Method section; added last line and table before first subsection;
Section 13	Quality Assurance / Quality Control	No significant changes.
	Appendices	
Appendix 1A	Introduction	New appendix; discusses naming convention and provides a list of appendices by number and title.
Appendix 2A	Civil Engineering Contract Template	No significant changes.
Appendix 2B	COSA Design Summary Report	No significant changes.
Appendix 2C	COSA Capital Improvement Projects Generalized Scope of Services	Construction Phase; added new 11.9. Reworded 11.10 (now 11.11).
Appendix 2D	Project Work Plan	Construction Phase; updated 13.090.
Appendix 2E	Construction Contract	No significant changes.
Appendix 2F	Bidding Process	Considerable updating; please carefully read and review the entire Bidding Process appendix.
Appendix 2G	Variance Letter	No significant changes.
Appendix 2H	Plan of Record (As-Builts) Submittal Requirements	No significant changes.
Appendix 3A	Survey Example	No significant changes.
Appendix 3B	Standard Feature Codes	No significant changes.

Table: Updates List (continued)		
Section	**Title**	**Change**
Appendix 3C	Control Sheet Example	No significant changes.
Appendix 5A	Utility Points of Contact	Considerable changes; please update your contacts list with the information provided.
Appendix 5B	Utility Conflict Matrix	No significant changes.
Appendix 5C	CPS – Things to Consider	No significant changes.
Appendix 7A	Preliminary Design Conference	No significant changes.
Appendix 7B	Preliminary Engineering Report Checklist	Reformatted; please use this version of the checklist.
Appendix 7C	COSA TCI 40% Design Checklist	Reformatted; please use this version of the checklist.
Appendix 7D	COSA TCI 70% Design Checklist	Reformatted; please use this version of the checklist.
Appendix 7E	COSA TCI 95% Design Checklist	Reformatted; please use this version of the checklist.
Appendix 7F	COSA TCI Bid Phase Checklist	Considerable changes; Reformatted; Please use this version of the checklist.
Appendix 7G	Complete Streets Assessment & Field Analysis Checklist	New Appendix; Included to provide a printed copy and explanation of the checklist; Please use the electronic version of this checklist.
Appendix 8A	Permitting Contacts	Considerable changes; please carefully read and review the entire Permitting Contacts appendix.
Appendix 10A	COSA Pavement Design Standards	No significant changes.
Appendix 10B	-Removed-	Removed Appendix 10B from this manual. Moved TCP vs. Angle of Internal Friction for Cohesionless Soils figure from Appendix 10B to Section 10, at the end of the Slopes and Embankments section.
Appendix 13A	COSA QA/QC Certification Form	No significant changes.
Appendix 13B	COSA (TCI) Comment & Resolution Form	No significant changes.
Appendix 13C	Periodic Construction Observation Report	Considerable changes; please carefully read and review the entire Periodic Construction Observation Report form.
Acronyms and Initialisms	-Removed-	Moved to front matter

Contact

For more information regarding any topic in this manual, please contact the Assistant City Engineer’s office within Transportation & Capital Improvements (TCI) department of the City of San Antonio.

- Main TCI webpage

  http://www.sanantonio.gov/TCI

- TCI Contact Us webpage

  http://www.sanantonio.gov/TCI/About/Contact/sendto/TCIContact

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Acronyms and Initialisms

Table: Acronyms and Initialisms ((	
Acronym / Initialism	**Full Name / Title**
- A -	
A2LA	American Association for Laboratory Accreditation
AACEI	Association for the Advancement of Cost Engineering International AASHTO
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines ADT
ASCE	American Society of Civil Engineers
ASCII	American Standard Code for Information Interchange
ASTM	American Society for Testing and Materials, *now* ASTM International ATMS
- B-	
BM	Benchmark
BMP	Best Management Practice
BRWM	Bexar Regional Watershed Management Partnership CAD
- C -	
CAF	Combined Surface Adjustment Factor
CBT	City Bid Tabulations
CD	Compact Disk
CI	Construction Institute (ASCE)
CIP	Capital Improvement Project
CLEC	Competitive Local Exchange Carrier CLOMR
CMAR	Construction Manager at Risk
COGO	Coordinate Geometry
CORS	Continuously Operating Reference Stations COSA
CPO	Capital Projects Officer, *also* Community Relations Planner, Capital Improvements Public Relations Officer

Table: Acronyms and Initialisms (continued)	
Acronym / Initialism	**Full Name / Title**
- D -	
DB	Design-Build
DBB	Design-Bid-Build
DC	Design Consultant
DGM	Design Guidance Manual
DMS	Dynamic Message Sign
DOD	Department of Defense
DS	Downstream
DSR	Design Summary Report
DTM	Digital Terrain Model
- E -	
E&Q	Estimate and Quantity
EGL	Energy Grade Line
EMS	Emergency Medical Service
EPA	Environmental Protection Agency, *also* USEPA
EPIC	Environmental Permits, Issues and Commitments
EMD	Environmental Management Division
- F -	
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FEMA RM	Federal Emergency Management Agency Resource Management FGCS
FHA	Federal Highway Administration, *also* FHWA FHWA
FS	Factor of Safety
- G -	
GIS	Geographic Information System
GPS	Global Positioning System
GSOS	Generalized Scope of Services

Table: Acronyms and Initialisms (continued)	
Acronym / Initialism	**Full Name / Title**
- H -	
HDPE	High-Density Polyethylene
HEC	Hydrologic Engineering Center (U.S. Army Corps of Engineers) HEC-RAS
HGL	Hydraulic Grade Line
HUD	U.S. Department of Housing and Urban Development
- I -	
ID	Identification
INA	Initial Needs Assessment
ISBN	International Standard Book Number
ISM	Initial Scope Meeting
ITS	Intelligent Transportation System
- J -	
JBSA	Joint Base San Antonio
- L -	
LAM	Local Area Management
LOMR	Letter of Map Revision
LOS	Level of Service
- M -	
MOE	Measure of Effectiveness
MPO	Metropolitan Planning Organization
MSE	Mechanically Stabilized Earth
MUTCD	Texas Manual on Uniform Traffic Control Devices NAD27
- N -	
NAD83	North American Datum of 1983
NESHAP	National Emissions Standards for Hazardous Air Pollutants NGS
NPDES	National Pollutant Discharge Elimination System

Table: Acronyms and Initialisms (continued)	
Acronym / Initialism	**Full Name / Title**
NPS	National Park Service
NTS	Not to Scale
- P -	
PC	Point of Curvature
PDF	Portable Document Format
PER	Preliminary Engineering Report
PI	Point of Intersection
PIP	Public Involvement Plan
PK	Parker-Kalon, *as in* PK nail (surveying)
PM	Project Manager
POC	Point of Commencement
POB	Point of Beginning
PS&E	Plans, Specifications, and Estimates
PT	Point of Tangency
PWP	Project Work Plan
- Q -	
QA/QC	Quality Assurance/Quality Control
QL	Quality Level (A, B, C, D)
- R -	
RACM	Regulated Asbestos-Containing Material
RAS	River Analysis System (U.S. Army Corps of Engineers) RINEX
ROE	Right of Entry
ROW	Right-of-Way
RPLS	Registered Professional Land Surveyor
RQD	Rock Quality Designation
RRA	Replacement, Relocation, or Adjustment
RTK	Real-Time Kinematic

Table: Acronyms and Initialisms (continued)	
Acronym / Initialism	**Full Name / Title**
- S -	
SAF	Surface Adjustment Factor
SARA	San Antonio River Authority
SAWS	San Antonio Water System
SCOS	Standing Committee on Surveying
SCS	Soil Conservation Service
SCS CM	Soil Conservation Service Curve Number SDMS®
SPT	Standard Penetration Test
SUE	Subsurface Utility Engineering
SW3P	Stormwater Pollution Prevention Plan
- T -	
TAS	Texas Accessibility Standards *or* Architectural Barriers Texas Accessibility Standards
TBM	Temporary Benchmark
TBD	To Be Determined
TBPLS	Texas Board of Professional Land Surveying TCEQ
TCI	Transportation and Capital Improvements
TCP	Texas Cone Penetration
TCP	Traffic Control Plan
TDLR	Texas Department of Licensing and Regulation TDS
TDSHS	Texas Department of State Health Services TER
TESS	Texas Excavation Safety System
THC	Texas Historical Commission
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TSPS	Texas Society of Professional Land Surveyors TxDOT

Table: Acronyms and Initialisms (continued)	
Acronym / Initialism	**Full Name / Title**
- U -	
UDC	Unified Development Code
UPRR	Union Pacific Railroad
US	Upstream
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency, *also* EPA
USFWS	U.S. States Fish and Wildlife Service

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Section 1 Introduction

1.1 Purpose

This *Design Guidance Manual* (manual) has been prepared to instruct design engineers on the procedures and formats to be followed in the design of capital improvement projects (CIP) for the City of San Antonio (COSA). This manual is primarily concerned with horizontal projects, which include:

- streets
- storm drainage systems
- regional drainage projects

This manual contains sections devoted to the preparation and standardization of reports, plans, specifications, cost estimates, and project and quality management. Design engineers should read and understand the manual before beginning design and should discuss any concerns with the Traffic & Capital Improvements (TCI) Department project manager, Public Works project manager, or other City of San Antonio representative prior to proceeding with design of the work.

The manual enables uniformity of design standards and plan contents. Standardization enhances consistency in design quality and presentation, which is expected to minimize error and improve understanding of design intent, as data presentation and documentation practices become routine. Design engineers, inspectors, and contractors will benefit from the consistency of designs and plans, once they are familiar with the requirements. It is not the intent of the manual to restrict the design engineers from preparing unique or innovative solutions to specific problems. Solutions that involve new theories, processes, materials, or construction methods are essential elements of the engineering profession. However, when such solutions deviate from those proposed in the following sections, design engineers should first discuss their proposals with the TCI project manager and seek approval for variances from the City Engineer's office before beginning work.

1.2 Application of Guidelines

This manual was initially developed to provide minimum standards for design of the 2007–2012 Bond Program. However, with the inclusion of bond program changes, as well as updated information, this manual is currently intended to set the standard for all design associated with horizontal city projects. To this end, guidance is provided on the following topics:

- Section 2: Project Management and Administration
- Section 3: Surveying and Mapping
- Section 4: Drainage
- Section 5: Utility Coordination
- Section 6: Traffic Engineering
- Section 7: Roadway, Bicycle, and Pedestrian Design
- Section 8: Environmental Coordination Permitting
- Section 9: CAD Standards
- Section 10: Geotechnical Services
- Section 11: Public Involvement Guidelines
- Section 12: Cost Estimating
- Section 13: Quality Assurance/Quality Control
- Appendices: Supporting Information

The authors recognize that, for this document to achieve its purpose, the provisions herein must be used. To improve design quality and consistency, resist temptation to set aside requirements to achieve short-term goals or minimize costs.

1.3 Revisions

This manual is expected to be dynamic, and sections will be updated as the needs of the city change and improvements are identified.

The engineering community in San Antonio is encouraged to take ownership of this manual by offering ways to improve the practice of engineering within the city and documenting those improvements for subsequent editions.

1.4 Closing Comment

Succeeding sections of this manual define the administrative and technical requirements for the design of streets and roadways and storm and regional drainage systems. Unless otherwise noted, criteria and standards apply to public sector projects. Specific technical design criteria are often provided in other documents, which are referenced herein.

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Section 2 Project Management and Administration

2.1 Introduction

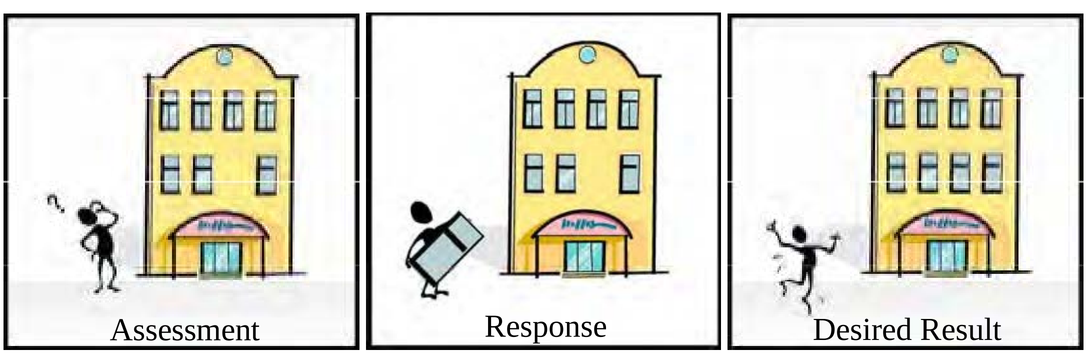
Within the field of municipal civil engineering, the term ***project management*** describes a broad spectrum of activities related to the completion of a specified scope of work. Because these descriptions vary from organization to organization, the City of San Antonio must clearly articulate and memorialize those activities it considers to be project management activities, as well as describe how those activities differ from either program management or project implementation. This section focuses on the city's expectations regarding project management as they relate to capital improvement projects undertaken by the COSA.

2.2 Basic Concepts

Let's start with basic concepts. The definition of ***project management*** in *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) Fourth Edition*[1] is "the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements." For the purposes of this manual, by project, we mean a unifying end-goal that is planned and accomplished by working *together*. End-goal implies an overall purpose associated with the project—one that inspires and informs its management team.

Project management activities can be divided into two realms: assessment and response.

- Assessment: In the first realm, we regularly assess how well a project activity or indicator compares with the planned or desired condition.
- Response: In the second realm, we take appropriate actions that move the activity or factor toward its planned or desired condition.



[1]*A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fourth Edition ©2008 Project Management Institute, 14 Campus Blvd., Newtown Square, PA 19073-3299 USA*

Figure 2-1: Assessment and Response

This implies the project manager knows from the beginning the desired condition, that the manager understands the action that will move the activity or factor closer to the desired condition (without adversely affecting other aspects of the project), and that the manager is willing and able to take that action.

Effective project managers make assessments and direct corrective action on regular intervals to avoid the need for drastic corrections that consume resources which otherwise could be used elsewhere. Moreover, effective managers evaluate whether those corrective actions produce the desired results, learning and adapting to improve their performance. Finally, effective managers are prudent in selecting factors to be assessed, focusing energy and resources on those that ensure successfully delivering a successful project.

2.3 Management vs. Execution

The people who design a project often perform the project management. This can lead to confusion about the boundary between design and execution.

- *Design*: the creation of a plan that solves one or more problems and involves inquiry and observation

  Design focuses on delivering a successful project that meets client objectives and resolves client issues.

- *Project management*: a collection of activities that ensures that resources dedicated to implementing the client's goals are employed effectively, typically with an eye toward meeting cost and schedule goals

A similar situation exists for construction. While construction involves organizing the means and methods needed to construct a successful project, project management involves accomplishing the construction successfully. If project managers do not understand the basic design and construction processes, there is risk of assessing inappropriate factors and/or directing ineffective or counterproductive corrective actions.

2.4 Project Management vs. Program Management

As the term implies, project management is related to a specific project (an undertaking requiring concerted effort), whereas program management is related to an organized collection of projects. Many of the principles that apply to project management also apply to program management, just at a higher level. A significant part of program management involves organizing the projects that comprise the program. Some of the factors considered in program management include scheduling projects to coordinate with funding availability, to accommodate special events, to identify opportunities for achieving synergies and efficiencies among projects, and to adjust project schedules and project budgets. The program manager focuses on delivering the program successfully, while the project manager is focused on successful delivery of a single project.

2.5 The Project Management Team

The management of a city capital improvement project is not the responsibility of a single person or even one entity. It is a team effort, with responsibility residing in part with the design team to which the project is assigned, in part with the contractor selected to build the project, and in part with the City of San Antonio's project manager to which the project is assigned. Effective communication among these parties is essential to achieve a successful project.

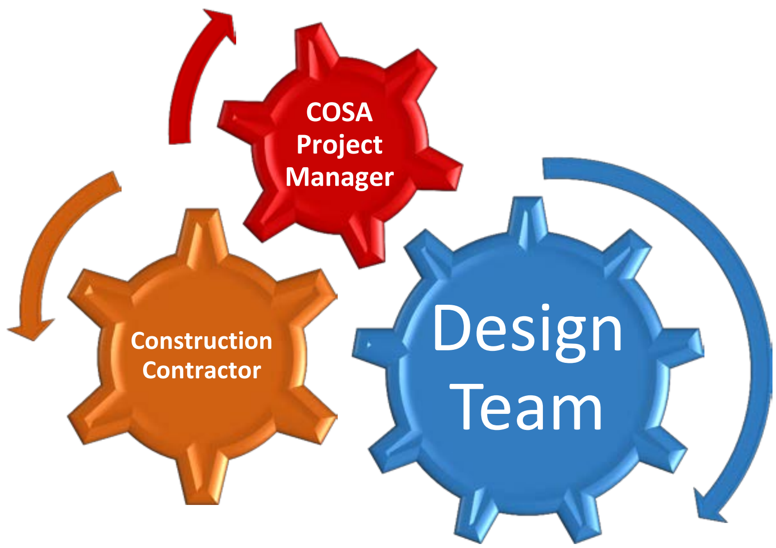


Figure 2-2: Capital Improvement Project Team

2.6 Dimensions of Project Management

In its efforts to deliver capital improvement projects, the City of San Antonio focuses on three primary factors—cost, schedule, and quality—each of which is discussed briefly as it relates to project management.

- Cost
- Schedule
- Quality

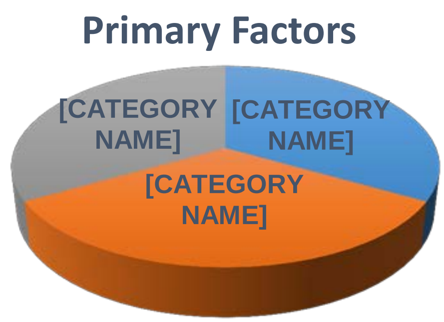


Figure 2-3: Capital Improvement Project Primary Factors

2.6.1 Cost

Costs include those for design, program management, design enhancements, right-of-way acquisition, environmental permitting and mitigation, environmental remediation, utility relocation and adjustment, infrastructure construction, and those for administering the work. The focus on cost should be for the total project, not a single component. For example, thoughtful expenditures for subsurface utility engineering during design process will clearly increase the design cost, but it is likely to reduce construction costs.

2.6.2 Schedule

There are several ways to assess the schedule of a specific project, but the most important is whether the project is completed on time. Developing a realistic schedule includes establishing prudent milestones to help the project manager make the necessary adjustments to deliver the project in accordance with the client's goals.

2.6.3 Quality

In the absence of specific standards, quality is a subjective factor, that is, it depends upon the evaluator's personal preferences and biases. Later in this section we will provide specific standards that diminish this subjectivity. For now, we will say simply that quality is a characteristic of the tangible work products, such as reports, designs, plans, specifications, estimates, invoices, pavement, concrete, etc.

Although intangible, the quality of the service provided is just as important.

- Are project delivery team members dependable?
- Do they communicate effectively with one another?
- Are they competent and cooperative?
- Are they able to adapt to changing circumstances?

In the ensuing sections, we will address these dimensions of quality in more detail.

2.7 Understanding the People, Processes, and System

As mentioned earlier, to effectively manage a project, one must understand basic design and construction processes. The TCI Department logo, reflecting people, process, and systems, establishes a logical approach to discuss how these design and construction processes work.

Figure 2-4: TCI Department Logo

2.7.1 People

Every capital improvement project involves a universe of people and organizations related to it in one manner or another. Who are these people, and what might their respective roles be?

- **Advocates**: Every project starts with one or more advocates. In many cases, these are individual or corporate members of the community who perceive or are affected by an infrastructure deficiency, such as a low water crossing, a congested roadway, an inadequate drainage facility, or the absence of a park. Their concerns are communicated to elected officials, city staff, or the volunteers of the bond committee. While not directly involved in delivering the project, advocates are important and can be a source of good information about the problem the project is to fix and, in the end, will judge whether a successful project was successfully delivered.

- **Affected residents, businesses, and traveling public**: Constructing a capital improvement project affects the people who live and work in the project area and others who travel through that area. Like advocates, these people are not directly involved in the delivery of the project but, if not satisfied, will voice their dissatisfaction to elected officials, who in turn contact appropriate city staff and petition them to make project adjustments to resolve concerns.

- **Client**: The client for the capital improvement projects for which this Design Guidance Manual is developed is the City of San Antonio. Several individuals represent the city in a variety of circumstances and for a variety of purposes.

  - *City Council Members*: Most capital improvement projects lie entirely within the geographic district of a member of City Council, and most City Council members (or their predecessors) were instrumental in the final selection of the projects that comprise the program being undertaken. The process of deciding which projects are included— and, more painfully, which projects are not included—represents a significant personal effort on the part of the council members. As a result, most have a keen interest in making sure the projects in their districts are successful, i.e., that they are completed on time and solve the relevant problems.
    Once a program of CIPs is established and approved, council members monitor progress, communicate with constituents, and, as a body, ratify certain project-related business transactions, such as approving design contracts, construction contracts, and right-of-way (ROW) and easement acquisition. Council members can act only as a body and are not authorized to act individually on behalf of the city. Nevertheless, although individual council members do not have authority to direct how a project is to be designed or built or to approve variances, additional services, change orders, and other similar maters, by working with city staff they can and do influence how a project progresses and evolves.

  - *City Manager:* The City of San Antonio uses what is referred to as a “strong city manager” form of government. Under this form, the City Council acts as a body on policy matters and certain statutory items, such as approving annual budgets, contracts, and the purchase of goods and supplies. The city manager executes the directives of the council through his or her staff. Either directly or through designated representatives, he or she is responsible for the formation of a budget, the development and negotiation of contracts, and all other day-to-day operations of the city, including the execution of capital improvement projects.
    Because the City of San Antonio is such a large enterprise, the city manager accomplishes his or her responsibilities by appropriately assembling and organizing resources into departments, then delegating performance to individuals who are chosen to lead and manage those departments. In addition, he or she may have one or more assistant managers or deputy managers to help monitor, oversee, and evaluate the departments. Although the city manager will not normally participate in day-to-day project management or execution activities, he or she has the ultimate authority to direct how a project will be delivered.

  - *TCI Staff*: The department of the City of San Antonio that has been assigned the responsibility to successfully deliver Bond Programs, CIP Projects, and Storm Water Revenue Bond Projects.

- **Program Manager**: To help the TCI staff manage the overall Bond Program, the City of San Antonio may contract with a firm to serve as executive program manager. The role of the executive program manager is to assist the TCI staff with project scheduling, project delivery, budget, performance measurement, PRIMELink support, design and construction management, and public relations.
- **Bond Oversight Commission**: The commission advises city and county elected officials and staff regarding recommended processes for delivery of CIPs, including review of scope, cost estimates, budget, schedule, public input, alternative delivery systems, and program management.
- **Design Consultant**: Most capital improvement projects undertaken by the city involve the use of a design consultant. The relationship between a design consultant and the City of San Antonio is governed by a Professional Services Agreement, a copy of which is included in this manual as Appendix 2A. Historically, most capital improvement projects were delivered using the traditional Design-Bid-Build (DBB) method of project delivery. Going forward, other delivery methods, such as Competitive Sealed Proposals, Construction Manager at Risk (CMAR), or Design-Build (DB), may be used with increasing frequency. In these cases, modifications to the standard professional services contract will be needed.
- **Construction Contractor**: Each capital improvement project is a construction project and requires the selection of a construction contractor to build the work. The relationship between the construction contractor and the City of San Antonio is governed by a construction contract, a copy of which is included in this manual as Appendix 2E. Again, most projects will be delivered using the traditional DBB method of project delivery, and projects will be awarded based on low-bid or competitive sealed proposals. In certain cases, CMAR or DB methods may be chosen, in which cases, modifications to the standard professional services contract will be needed.
- **Utility Companies**: Many utilities have infrastructure located within the rights-of-way and easements of projects to be built. Some of these utilities are public organizations, whose primary motivation is providing service at a low cost; some are private businesses whose primary motivation is to provide service while generating profit and shareholder return.

  One of the criticisms most commonly aimed at CIPs regards failure to facilitate utility construction in advance of or in coordination with street and drainage construction. Such failures undermine the public's trust and confidence in local government, which are essential to the approval of future bond programs. Therefore, all participants must cooperate to minimize the likelihood that newly constructed infrastructure will be damaged by utility work soon after completion. Utility work can be organized into three categories: functional replacement, relocation, and adjustment.

- **Functional Replacement** involves replacing a utility line that is not otherwise in conflict with proposed infrastructure construction due to the line's condition, obsolescence, or inadequate capacity. The line can be put back in the same place or in another location that is not in conflict with a proposed improvement. An example of this would be to replace a sewer line that is in poor condition to avoid the need to replace it three years after other improvements are complete.

  Relocation involves installing a new line or lines in a different location due to the existing line's conflict with proposed infrastructure construction. An example is to install a water line in a new location to facilitate construction of a large storm drainage trunk line in a street.

  Adjustment involves minor changes to accommodate proposed infrastructure construction. An example is the installation of a relatively short section of water line to facilitate the construction of a drainage lateral or a storm drainage inlet.

  The utility companies involved in the delivery of City of San Antonio capital improvement projects include:

  - San Antonio Water System: sanitary sewer, potable water, and recycled water
  - CPS Energy: natural gas and electricity
  - AT&T: cable television, telephone, and internet service
  - Spectrum: cable television, telephone, and internet service
  - Grande Communications: cable television, telephone, and internet service
  - Other utilities: "cross country" pipelines, local water supply companies, and competitive local exchange carriers (CLEC), among others

  A brief look at each of these entities helps better understand whether and how they are typically involved with City of San Antonio Capital Improvement Projects.

San Antonio Water System

- *San Antonio Water System (SAWS)*: SAWS is a public utility owned by the City of San Antonio. It operates water supply and distribution facilities, sewage collection and treatment facilities, and treated wastewater transmission and distribution facilities. SAWS is governed by a seven-member Board of Trustees, responsible for overall policy and management of the system. Board members are appointed by City Council and include the Mayor of San Antonio.
  SAWS may agree to allow evaluation and design of any replacement, relocation, or adjustment (RRA) of its facilities to be performed by the design

consultant pursuant to its professional services contract with the city and to have any RRA work be done by the construction contractor pursuant to its construction contract with the city.[1]

- *CPS Energy*: CPS Energy (CPS) is the largest municipally owned energy company in the nation; it provides both natural gas and electric service. Its five-member board, comprises the Mayor of San Antonio and four members who represent the quadrants of the city. Any vacancy in the four non-mayoral positions is filled by majority vote of the remaining board members, subject to formal confirmation by City Council, as evidenced by resolution or ordinance. The board employs a general manager and staff, who conduct the day-to-day operations.

  CPS facilities include natural gas transmission and distribution facilities and both underground and overhead high-voltage electrical transmission. CPS may agree to allow evaluation and design of any RRA of its gas and underground electric facilities to be performed by the design consultant, pursuant to its professional services contract with the city, and may have any RRA work be done by the construction contractor, pursuant to its construction contract with the city. Implied in this is that CPS staff may facilitate any RRA work related to its overhead and underground electrical facilities.

- *AT&T*: AT&T, Inc. (AT&T) is a holding company whose subsidiaries and affiliates provide both wireline and wireless telecommunications services and equipment. The services and products offered by AT&T that are most vulnerable to being affected by CIPs include local-exchange services, long-distance services, and data/broadband and Internet services, using underground, overhead, and wireless technology infrastructure.

  AT&T operates many of its facilities within the rights-of-way and easements owned by the city, pursuant to a franchise agreement, some sections of which govern how AT&T's facilities are to be adjusted and relocated to accommodate capital improvement projects.

- *Spectrum*: Spectrum is a company created through the merger of Charter, Time Warner Cable®, and Bright House Networks. Spectrum provides cable television, Internet, and digital telephone service through a network of underground, overhead, and wireless technology infrastructure, operating within rights-of-way and easements, pursuant to a franchise agreement with the city. The company typically manages design and construction of RRA work in advance of or concurrent with construction of capital improvement projects.

- *Grande Communications*: Grande Communications is a Texas-based communications system providing high-speed Internet, local and long-distance telephone service, and digital cable services through a fiber optic network. Grande operates its facilities within rights-of-way and easements, pursuant to a franchise agreement with the city, and typically manages design and construction of any RRA work in advance of or concurrent with capital improvement project construction.

- *Other utilities*: Other utilities that may be encountered include the following:
    - fiber optic and copper wire lines owned by entities other than AT&T, such as Sprint, Verizon, and a host of competitive local exchange carriers (CLECs)
    - underground pipelines owned and operated by a variety of entities, such as Valero and Coastal States, typically conveying petroleum products
    - private lines and tunnels operating in City of San Antonio ROW, both with and without benefit of formal approval

- **Municipal, Emergency, and Postal Service Providers**: Rounding out the cast of those involved in, or affected by, CIPs are entities that provide services to those who live and work in the area. These entities are responsible for providing services that are either critical to the health, safety, and welfare of people in the project area or are so fundamental that they are considered essential. These include VIA public transportation, trash and recycling collection, emergency medical services (EMS), fire, police, the United States Postal Service, and local school districts.

Undertaking a capital improvement project is a complicated endeavor with the potential to affect many people and organizations. Undertaking a large number of such projects simultaneously increases that complexity, straining the resources of all involved. To mitigate this, participants typically strive to execute projects using consistent processes and protocols. Project managers who study, become familiar with, and adapt their design approach to conform to the processes described in this manual are more likely to achieve success. However, effective project managers are also alert for and open to innovation and change that will improve the efficiency and effectiveness of the overall effort, and they work within the system to improve it.

2.8 Processes

A number of processes are executed in order to deliver a capital improvement. Some affect the design, construction, and maintenance of the work, while others are administrative. One might say that the former influence the success of the project, while the latter influence how successfully the project is delivered. An effective project manager understands both kinds of processes, how they work, how they influence each other, and, of course, how to manage them. Let's look first at those processes that influence the project itself.

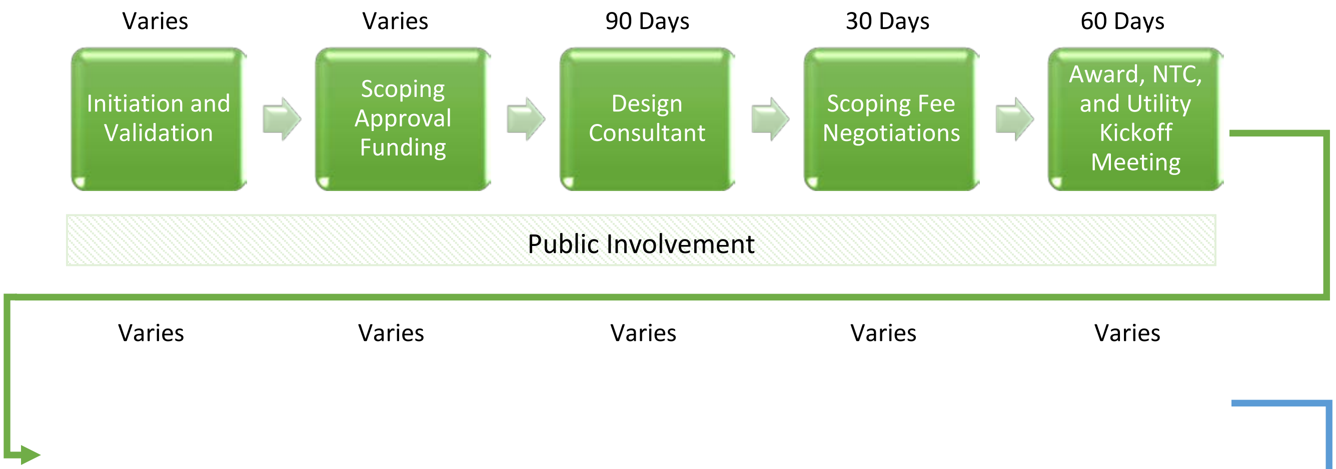


Figure 2-5: City of San Antonio Capital Improvement Project Process

2.8.1 Initiation and Validation Process

A capital improvement or Bond project begins when an advocate identifies a problem to be solved and gains the attention of the city. This can occur in one of several ways, including a call to a City Council member, city manager, or staff; testimony before City Council; coordination with citizen committees; a 3-1-1 call; or, of course, city staff addressing an infrastructure deficiency.

Typically, a city staff member with technical expertise evaluates the initial request and determines what potential solution or range of solutions might be appropriate. Sometimes this is part of the normal course of business, and sometimes this work is outsourced to an engineer under contract to assist city staff in this effort. Actions at this stage include:

- determining in which council district(s) the project is located
- proposing a preliminary scope of work (street, drainage, etc.) and preliminary project limits and boundaries
- making a preliminary determination of whether the subject project is affected by or affects one or more other approved or potential projects
- identifying major problems that might be encountered (e.g., hazardous materials, managing traffic during construction, utility complications, inadequate ROW, etc.)
- identifying potential sources of funds to design and build the project
- establishing a preliminary estimate of the cost to execute the project
- documenting the month and year this information was assembled

One could refer to the collection of this information for a large number of projects as a “wish list.” Ideally, a record is created to preserve this information, since many projects that survive the initiation and validation process do not move forward immediately due to lack of funding, priority, or other reasons. If the initiation and validation work is lost or poorly organized, that same work must be repeated when someone raises the concern again, wasting precious resources. Conversely, if the information is well organized, maintained, and clearly recorded, the work simply needs to be updated to move to the next stage.

The initiation and validation work for most of the bond projects is placed in a document called Potential Capital Improvement Projects–Level 1, which is used internally by the TCI department.

2.8.2 Scoping, Approval, and Funding Process

During scoping, approval, and funding, a project moves closer to implementation. Along the way, more in-depth (though still preliminary) investigations are conducted, some refinements may be made, cost estimates are updated and/or refined, the project is approved by the City Council for inclusion in the capital improvement program, and the program financing arrangement is approved by City Council or the voters. This process is not linear, but iterative and collaborative, involving the project's advocates, City Council (and their appointees), all levels of city staff, and design consultants selected to provide technical support.

There are many ways to accomplish this process, but little consensus about which is most effective. This is ironic because both basic project parameters and expectations with regard to cost, schedule, and quality are established during this phase. Whether they are reasonable or not, these parameters will be used to determine a project's success. Since 2002, the city has significantly improved the scoping, approval, and funding process.

The most recent and, thus far, the most successful example of this is the scoping, approval, and funding process leading up to the 2007–2012 Bond Program. Having been advised of its prudent debt capacity by the city manager, the City Council resolved to formulate and secure voter approval of bond issuance to finance a major capital improvement program. In November 2006, the Council created four advisory committees to recommend a program of capital improvement projects to be included in the 2007–2012 General Obligation Bond Program. The four committees created were streets and sidewalks, drainage, parks, and community initiatives. Each committee comprised 32 individuals, three members from each council district, and two co-chairs appointed by City Council. Each bond committee was provided an initial "straw-man bond program proposal" that had been prepared by city staff, and each committee also received public comments. As a result of the committees' deliberations, some projects moved from the straw-man list to the deferred list, some moved the other direction, and some were scaled back or otherwise modified, all with technical input from city staff and their consultants. Eventually, the committees forwarded their recommendations to the City Council, and council then deliberated over the course of two months. After making a few changes to some specific projects, City Council approved the program and called for an election. Voters approved the sale of bonds to pay for the projects.

The additional investigations, refinements, and cost estimates (referred to as level 2 estimates) were placed in a document called Potential Capital Improvement Projects–Level 2. Level 2 estimates prepared earlier in the process were more likely to be carefully prepared than those proposed or modified late in the formulation process. Nevertheless, Level 2 estimates lay the foundation for project implementation.

A word regarding bond covenants — When bonds are sold, the issuer (in this case the City of San Antonio) pledges or covenants to do certain things and to avoid doing other things. While many of these covenants relate to how the issuer manages its financial affairs, others relate specifically to the projects themselves. For example, a covenant might say that the issuer will not expend any of the proceeds from the sale of the bond on any project other than those described in the bond. Depending on how this is worded, this could prevent the use of bond funds to reconstruct intersecting streets to the limits of the utility RRA work. Another common covenant relates to the use of surplus bond proceeds and how and when they can be expended: never, after all projects are substantially complete, etc. Early in the design process a prudent project manager will learn how any bond covenants might affect the design.

2.8.3 Selection Process

The city will pursue the selection through its normal process, which generally involves the widespread notification of the city’s intent to award contracts to design consultants.

Design consultants respond by submitting statements of interest in certain projects and their qualifications to design them and the associated utilities. The city then will select a design consultant for each project and will begin the process of negotiating a Professional Services Contract.

An important part of the selection process is identifying the first two members of the project management team: the city project manager (PM) and the design consultant project manager. Ideally, both team members will serve in those capacities through both the design and construction stages of the project.

The city project manager is typically known prior to requesting statements of interest, and ideally the city PM should be identified in the request for interest statements. This affords the design consultant the opportunity to select the design consultant project manager who offers the best combination of technical and non-technical qualifications to manage the project, with one of those qualifications being a good relationship with the city PM.

The relationship between the two PMs is one of the most critical elements for the project team. If they perform competently, treat each other with fairness and respect, communicate well, and cooperate, there is a strong probability that they will successfully deliver the project, even despite adversities that may arise. Otherwise, there is a strong likelihood that the project will suffer, even under the best of conditions.

2.8.4 Scoping and Fee Negotiation Process

The decisions, agreements, and commitments made in this process are significant in determining whether the design consultant will have the financial resources to successfully design the project. Accordingly, it is important that the two PMs have sufficient experience in delivering similar projects, understand the history of the project, and understand not only the assumptions on which the design budget has been based, but also the risks associated with relying on imperfect or incomplete information.

A key goal of most capital improvement programs is to deliver the projects on time. Accordingly, a primary focus of the project management team should be to optimize the time needed to complete the scoping and fee negotiation process. In other words, consuming excessive amounts of time to gain a few dollars or reduce a fee by a few dollars is unwise. The negotiations should be about coming to an agreement that both parties can support as expeditiously as possible, not about winning the negotiation. In addition, effective negotiations establish a framework for managing the project. The following process has proven effective for a number of agencies and will be used by the City of San Antonio to negotiate the design fee for its capital improvement projects:

2.8.4.1 Initial Scope Meeting (ISM): Step 1

The first step is the initial scope meeting. Participants should include the city project manager, the design consultant project manager, appropriate discipline specialists and sub-consultants, SAWS, CPS and all utility representatives. Depending on the circumstances, company representatives and any agency partners, such as the Texas Department of Transportation (TxDOT) that may be involved in the project may attend.

The scope and magnitude of the project should determine the duration and formality of the ISM, but the goal of the ISM is to develop and agree on a definitive scope of work. In preparation for the meeting, the city PM and the design consultant PM should review the information from Potential Capital Improvement Projects—Level 2, visit the project site, and take necessary actions to independently complete the Generalized Scope of Services (GSOS) form (see 2C.2). During the first part of the ISM, those attending should review the GSOS form and resolve all discrepancies with regard to the services to be provided.

2.8.4.2 Initial Scope Meeting (ISM): Step 2

In the second part of the ISM, the project team will discuss plan presentation format, design criteria, and other items that may influence the design consultant's fee proposal. This information will be recorded in the City of San Antonio Design Summary Report (DSR), a copy of which is included in Appendix 2B.

The design consultant should bring a copy of the DSR to the ISM, including as much information as is available and highlighting areas that warrant discussion and resolution. Following the ISM, the design consultant should update the DSR to reflect the results of the ISM discussions. It is not uncommon for some items included in the DSR to be unknown even after the ISM is complete. These items should be noted as “TBD” (to be determined), and a process should be agreed upon to resolve them.

It is noted that the DSR is intended to be a living document, evolving as the project progresses and serving as a record of that evolution. While decisions about what is in the DSR are to be made by the city PM or the project team, it is the design consultant’s responsibility to maintain the DSR, including republication to all team members whenever significant changes occur.

2.8.4.3 Initial Scope Meeting (ISM): Other Topics

Other topics of discussion at the ISM include:

- utility coordination and subsurface utility engineering requirements
- plans for joint bidding with utilities or other design consultants
- city preferences for traffic control, environmental responsibilities, project sequencing, complete streets and public information efforts
- expectations and submittal requirements for the preliminary engineering report (PER), 40 percent, 70 percent, 95 percent, and bid documents phases
- CAD standards, drawing standards, and file-management standards
- standard specifications that will govern the construction of the project
- desired overall project schedule and duration of time required by the city to review each milestone submittal

Finally, administrative and management issues will be discussed, including the following:

- invoicing requirements and normal turnaround time for payment
- change management procedures
- communication procedures

2.8.4.4 Fee Negotiations

Following the ISM, the design consultant PM will take the agreed- upon GSOS and develop a Project Work Plan (PWP) spreadsheet (see Appendix 2D), including estimates of the number of sheets to be prepared and the hours of the various categories of labor needed to complete the work. By applying the design consultant’s standard hourly billing rates to the various categories of labor, a total preliminary fee proposal can be developed.

The city PM will review the fee proposal and determine whether the fee is acceptable or further negotiation is required. Because the Level 2 Cost Estimates were developed through a generally thoughtful and deliberate process, there is a natural tendency for them to drive the development of the scope of work and associated fee. The project management team is encouraged to use the Level 2 estimates as only one measure of the fee proposal.

The final fee for each project can be considered a function of the manner in which these major variables are combined:

- the scope of work, as reflected in the detailed task listing
- the estimated hours for various types of personnel to complete the tasks
- the billing rates for these personnel

Addressing each of these major items in a deliberate and methodical fashion can expedite successful negotiations. When a fee has been agreed upon, the design consultant can prepare a preliminary cost-loaded schedule that can be used to manage the project design.

Once negotiations are complete, the design consultant will develop minutes of the ISM and any subsequent meetings, including the DSR, GSOS, and PWP, and transmit them to the city PM for inclusion in the design contract. If major changes to the scope of work occur after contract execution, the design consultant should update the DSR, GSOS, and PWP and include the updated documents in the design contract amendment.

Scoping and negotiating the professional services agreement is integral to the project delivery and project management process. When done properly, it greatly enhances the efficiency of the rest of the project delivery and management process, helping projects to be completed more expeditiously and efficiently.

2.8.5 Design Processes

Once a Professional Services Contract has been negotiated, it is submitted to City Council and the design consultant is notified in writing to proceed with the design of the project. (See Professional Services Contract — Section IV.4.1.) The design consultant PM should pursue the completion of the project design in accordance with the milestones described in the Professional Services Contract. The typical design milestones are:

- preliminary engineering report (only if required by city)
- 40 percent design
- 70 percent design
- 95 percent design

- bid documents

In general, the design consultant PM should regularly assess the progress of the design team against the planned progress, in terms of both effort expended and completion status, and take necessary action to stay on or ahead of schedule. In addition, on a monthly basis, the design consultant PM should prepare a brief summary of the status of the design effort indicating the following:

- whether the project is essentially behind, on, or ahead of schedule
- whether any significant variance exists and, if so, an explanation of the source or cause
- if appropriate, measures being taken to mitigate adverse variances
- any other matters that are anticipated to affect the design consultant's ability to meet the project schedule

See Appendix 2G for an example Variance Letter.

2.8.6 Administrative Processes

In addition to actual design and construction, all CIPs involve a variety of administrative processes. These administrative processes do not generally have direct influence the design or construction of the project. Still, they are important in that they facilitate the flow of information and resources that sustain the various members of the project delivery team, and when these processes fail or falter, progress on the project may be impeded.

In general, these processes include communication, documentation, change management, and invoicing and payment. The City of San Antonio developed COSA PRIMELink, a web-based project management tool, to make these administrative processes more efficient. The COSA PRIMELink User's Guides, found on the PRIMELink Help Desk, details these administrative processes. Design consultant PMs should become familiar with using this communication and collaboration tool.

2.8.7 Construction Processes

Although the emphasis of this Design Guidance Manual, as the name indicates, is on the design of capital improvement projects, the design consultant's responsibilities extend beyond the design phase, into the bidding, construction, and closeout phases of a project. While the design consultant's efforts during these phases are not design activities, they can influence project delivery.

2.8.7.1 Bidding

During the bidding phase, the design consultant issues bid documents, including plans, specifications, and addenda. Good records must be kept to ensure that all potential bidders are afforded equal access to the same information.

From time to time, a potential bidder will ask the design consultant questions outside of the pre-bid conference. Sometimes these are simple questions intended to help the bidder understand the project better to prepare his or her best bid. In other cases, the questions may be intended to afford a contractor competitive advantage over other bidders. For example, a question about whether the design consultant would support making a certain change to the work, if is the bidder were awarded the contract. If answered affirmatively, that bidder would have information other bidders do not have. The design consultant must exercise good judgment in these situations, extending cooperation where it facilitates fair competition among bidders, while avoiding preferential treatment of any potential bidders.

The design consultant should attend the bid opening and, after the opening, secure a copy of each responsive bidder's proposal. The design consultant should then evaluate each bidder's proposal, checking to ensure that all bidders used the same bid forms and quantities and verifying that unit prices were correctly extended and totaled. In addition, the design consultant should scrutinize the unit prices and note any that are unusually high or low. In such cases, it is a good idea to double check the quantities for these items to assess the possibility that a bid is "unbalanced." Should quantity mistakes be discovered, the design consultant should determine which bid will likely result in the lowest cost with the corrected quantity, then confer with the city PM to determine how to proceed.

A more detailed listing of the bidding process responsibilities and activities is found in Appendix 2F of this manual.

2.8.7.2 Construction

The responsibilities of the design consultant during the construction of a project are specified in the design contract. While these responsibilities are clearly articulated in that contract, the design consultant should recognize that it is uniquely positioned to serve as a valuable resource to the City of San Antonio and, as their agent, a resource to the construction contractor. As the entity most familiar with the project, the design consultant is usually in the best position to evaluate and respond to requests for information, changed conditions, and proposed design changes. In this capacity, the design consultant should provide a timely response to all requests, after a careful, thorough, and expeditious review.

See Appendix 2H for information regarding Plan of Record (As-Builts) submittal requirements.

2.8.7.3 Closeout

During the closeout phase of the project, the design consultant's purpose is to update and annotate the plans to depict the project as constructed. In performing this work the design consultant relies on information developed and supplied by the construction contractor, inspectors, and, in some cases, by material and equipment suppliers. Where information supplied by a third party appears ambiguous, incorrect, or incomplete, the design consultant should exercise reasonable efforts to resolve the discrepancies through discussions with appropriate parties. Where discrepancies cannot reasonably be resolved, the design consultant should clearly state the nature of the discrepancies on the plans.

In addition, during project closeout, the design consultant should participate in any evaluation efforts undertaken by the city or the contractor. In the absence of such efforts, the design consultant should conduct an independent evaluation of the project, noting successes, failures, and opportunities for improvement.

2.8.7.4 Operations and Maintenance

Once a project has been closed out and accepted by the City of San Antonio, it becomes part of the city's overall infrastructure and is operated and maintained accordingly. Although operations and maintenance of recently completed projects can provide insight and information that may lead to improved planning and design-phase processes for future projects, there is no formal process in place to accomplish this.

2.9 Systems

2.9.1 City of San Antonio Design Summary Report

One of the ways to deliver projects more efficiently is to use consistent, thoughtful systems, such as the City of San Antonio Design Summary Report.

The DSR is a tool intended to be used by the project management team to anticipate and record basic project information, with the objective being to minimize or eliminate rework, last minute surprises, and the associated costs and delays.

Although the DSR addresses a wide range of issues that can affect the design and delivery of a project, every project is unique and, as such, warrants thoughtful consideration of how its design and construction will be accomplished. Not all factors identified in the DSR will apply to each project, and issues will arise on some projects that are not addressed in the standard DSR. Those contributing to the DSR are encouraged to think comprehensively and tailor their use of the DSR form to meet the unique needs of the project. If a PER is to be prepared for a project, most of the information can be derived from the DSR, even if it is not complete.

It is likely that the DSR will be partially completed prior to the ISM and updated from time to time as the project progresses. As information is added or revised, it is strongly recommended that the additions, modifications, and deletions be associated with a date and the author of the change. Outdated information should not be deleted, rather, it should be stricken, to preserve a more complete record of the progression of the project design.

The responsibility for maintaining the DSR is shared by the design consultant PM and the city PM. Initially, the city will use the form to communicate its preferences and special information about the project. It is recommended that the city PM complete the initial DSR and store it on PRIMELink. After that, the design consultant PM will assume responsibility for updating the DSR to reflect the results of the ISM, as well as any subsequent changes in preferences, scope, schedule, and other information. The DSR should be available for viewing by all who have roles in the project, but the ability to modify it should be limited to the city and design consultant PMs.

The DSR, found in Appendix 2B, is organized into five sections:

- scheduling, funding, and delivery
- existing conditions
- base mapping, geotechnical and environmental, permitting, and community relations
- design issues
- project journal.

2.9.1.1 Completing the DSR Form Electronically

1. Open the document.
2. Save the document as <DSRForm.[project name].doc>, using the name of the project in place of [project name].
3. Right click the Permission Button on the Tool Bar or Right Click on any blank area of the Tool Bar.
4. Left click “Forms.”
5. Engage the “Protect Form” icon (pad lock).
6. Complete as much of the form as possible, and resave the file.

2.9.1.2 Expanding the DSR Form

For some projects, parts of the form will need to be expanded. For example, on page 3, under Existing Conditions, it may be necessary to list more than one set of existing typical roadway conditions. In this circumstance, the user is encouraged to expand the form using the following procedure.

1. Open the document.
2. Right click the Permission Button on Tool Bar or Right Click on any blank area of the Tool Bar.
3. Left click “Forms.”
4. Disengage the “Protect Form” icon (pad lock).
5. Highlight the part of the form that needs to be duplicated.
6. Copy the highlighted area (depress the Control button while hitting the “c” key, or left click the “Copy” button in tool bar).
7. Move the cursor to the correct location.
8. Paste the copied text (depress the Control button while hitting the “v” key, or left click “Paste” button in tool bar)
9. Right click the Permission Button on the Tool Bar or Right Click on any blank area of the Tool Bar.
10. Left click “Forms.”
11. Engage the “Protect Form” icon (pad lock).
12. Resave the file.

2.9.1.3 Adding Supplemental Information

More information is generally better than less information, and adding explanatory text at certain items will make the DSR more effective. Following is the procedure to add text:

1. Open the document.
2. Right click the Permission Button on the Tool Bar or Right Click on any blank area of the Tool Bar.
3. Left click “Forms.”
4. Disengage the “Protect Form” icon (pad lock).
5. Move the cursor to correct location.
6. Type the comments desired. It is recommended that the author of any supplemental text use italicized Times New Roman font (12 pt), indicate author, and date added.

7. Right click the Permission Button on the Tool Bar or Right Click on any blank area of the Tool Bar.
8. Left click “Forms.”
9. Engage the “Protect Form” icon (pad lock).
10. Resave the file.

2.9.2 City of San Antonio Generalized Scope of Services

Most of the capital improvement projects undertaken by the City of San Antonio involve a similar set of design and analysis activities. These are included in the Generalized Scope of Services found in Appendix 2C. The GSOS should be used during the ISM to identify the activities, work products, and other issues that influence the level of effort associated with designing capital improvement projects. From the completed GSOS, the design consultant will develop a Project Work Plan (PWP) spreadsheet (see Appendix 2D), including estimates of the required number of sheets to be prepared and of the hours of various categories of labor required to complete the work.

By using the GSOS and PWP forms consistently over time, the City of San Antonio can establish the range of costs associated with certain design activities, begin to make informed decisions regarding the costs and benefits of these activities, and become a more successful negotiator.

2.9.3 City of San Antonio Project Reporting Integrated Management Enterprise Link (COSA PRIMELink)

The City of San Antonio has adopted a web-based project management tool set based on Oracle’s Primavera® Unifier. This tool set provides:

- collaborative document control software for contract administration and contract management
- planning and scheduling software

These tools have been configured and customized for use on City of San Antonio projects, and the comprehensive tool set is commonly known as COSA PRIMELink. While some existing projects may be executed without benefit of these tools, all future CIPs will be managed using COSA PRIMELink. Note, however, that COSA PRIMELink was developed primarily for city project and program managers, not the design consultant project managers.

Nevertheless, the COSA PRIMELink does allow all project and program managers to assess the status of a project or program with regard to schedule and cost. The cost status is reported as the Cost Performance Index (CPI), while the schedule status is reported as the Schedule Performance Index (SPI).

- Cost Performance Index (CPI): The Cost Performance Index is the ratio of the Earned Value of a particular effort to the Actual Cost of that effort on a particular date known as the "Data Date."
- Schedule Performance Index (SPI): The Schedule Performance Index is the ratio of the Earned Value to the Planned Value.

COSA PRIMELink provides cost and schedule information for only the Professional Services Contract and Construction Contract. Other costs, such as administration, program management, and right-of-way acquisition, are not captured. Therefore, city staff and/or program managers monitor these costs and schedules separately and develop a separate, more comprehensive reporting format for the particular program being managed.

The COSA PRIMELink General Guide is located on the TCI website under Current Vendor Resources.

Figure 2-6: COSA PRIMELink

2.10 Conclusion

Effective project management is essential for delivering successful capital improvement projects on time and on budget. The project management effort for City of San Antonio capital improvement projects is a team effort with responsibilities shared among the city project manager, the design consultant project manager, and the construction contractor project manager.

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Section 3 Surveying and Mapping

3.1 Introduction

The following section presents a wide range of survey activities that may be undertaken on capital improvement projects. Not all activities described in this section will be needed for each project. Instead, the city and design consultant project managers should use the DSR and the GSOS to develop a scope of the surveying work that is appropriate for the project they are managing.

3.2 Surveying the ROW

One of the critical decisions that must be made in scoping the survey work involves the extent to which the ROW will be surveyed. At one end of the spectrum is to survey the apparent ROW, using fences, existing roadway centerlines, block maps, and other readily available information (Apparent ROW Survey). At the other end of the spectrum is to prepare a full-blown boundary survey of the ROW (ROW Boundary Survey). The following should be used as a guide in deciding which approach to use.

The Apparent ROW Survey should be considered the typical or default approach. However, if it is known that the existing ROW is inadequate and that ROW acquisition will be required throughout a significant part of the project, a ROW Boundary Survey should be specified in the DSR and GSOS. On some projects, an intermediate condition may exist that requires the acquisition of isolated parcels, for example, the inclusion of corner clips or isolated parcels that have not dedicated additional ROW. In these cases, some additional plats and field notes may be required, but a full-scale survey of the entire ROW would not be required. While the city PM has the responsibility for proposing the initial approach for the ROW survey, the finally agreed upon approach should be the result of discussions between the design consultant PM and the city PM.

There may be instances in which both PMs initially agree that the prudent approach is to do an Apparent RPW Survey, but for which further investigation reveals a ROW Boundary Survey to be more appropriate. One example of this would be when a significant discrepancy is discovered between the block map ROW width and what exists on the ground. In such cases, the PMs should expeditiously negotiate the additional services required to provide the appropriate survey work.

3.3 Minimizing ROW Acquisition Related Delays

ROW acquisition is frequently the cause of not meeting a project delivery schedule. In some cases, this delay is related to failure to begin ROW acquisition early enough to be finished by the time design and permitting activities are completed. In other cases, the delay is related to utility companies' inability to relocate their facilities to the newly acquired ROW in a timely manner. The project management team should thoughtfully scope and schedule the survey work to facilitate the completion of ROW acquisition at the earliest possible time, and in no event should ROW acquisition begin later than the 40 percent design milestone. Furthermore, if a project involves consideration of alternate alignments that may influence ROW acquisition, the project management team should consider a special interim submittal (between the PER and the 40 percent design submittals) that is focused on alignment selection. This will allow the ROW acquisition to proceed well ahead of the 40 percent submittal.

3.4 Boundary Surveying

Boundary surveying is performed when it is necessary to establish real property boundary locations to secure additional right-of-way and or easements and to avoid constructing public improvements on private property without the consent of the owner.

Boundary surveying is regulated by the State of Texas through the Texas Board of Professional Land Surveying (TBPLS), in accordance with the Professional Land Surveying Practices Act and General Rules of Procedures and Practices. Boundary survey work products include right-of-way maps and parcel descriptions.

3.5 Project Control and Base Mapping

3.5.1 Project Control

Each project must have a locative frame of reference to which all pertinent existing and proposed physical features relate. The frame of reference is three dimensional, comprising horizontal and vertical control. To facilitate coordinating one project with another, the City of San Antonio requires all future capital improvement projects to be based on the same control system. Three levels of project control should be established for each project: primary control, secondary control, and the stationing systems.

Primary control establishes the fundamental geometric basis for the secondary project control and stationing systems. The primary control system consists of three or four relatively stable monuments established outside of the project area, all of which have published horizontal coordinates and vertical. Secondary control and the stationing systems can be reestablished or verified at all times using the primary control system.

Secondary control is like primary control, except the monuments are located within the project area and, as such, are more vulnerable to disturbance and even destruction as a result of the project. In general, secondary control monuments are relatively stable monuments established at 800 to 1,000-foot intervals throughout the project, again all with published horizontal coordinates and vertical elevations. Secondary control can be used to locate evidence of boundaries and ROW lines, to locate topographic information for base mapping, to lay out stationing systems, and to lay out construction work.

Stationing systems form the geometric basis for the design and construction of the project and consist of appropriately marked centerlines, baselines, or coordinate systems and local benchmarks, all referenced to the primary or secondary project controls. Appropriate stationing system marks can be nail and shiner, PK nails, wooden stakes, or similar indicators. The markers should be identified with guard stakes or paint marks on pavements identifying the stationing system and indicating the station. Examples would be: “Centerline Station 2+00” or “Baseline G Station 4+37.35.”

Stationing systems can be used to locate topographic information for base mapping and, with some discretion, to lay out construction work. Depending on the nature of the project being undertaken, stationing systems can be based on the apparent ROW; the resolved ROW; a physical feature, such as a drainage channel; or anything else that serves the engineer’s purposes. Because of their physical locations, stationing system markers are almost always destroyed during construction.

3.5.2 Base Mapping

Base mapping involves developing a picture of the project area that provides sufficient information to design the project and can be presented in a number of ways, including:

- ground surveyed planimetric mapping (with or without contours)
- aerial planimetric mapping (with or without contours)
- orthophotogrammetric photos (with or without contours)
- Digital Terrain Model (DTM)
- cross sections and spot elevations
- detailed measurements (structures, etc.)

Base mapping should reflect existing underground utility information sufficient to facilitate the design. Often base mapping evolves as the project design progresses. This is particularly true as it relates to subsurface utility engineering (SUE). Frequently, the early rounds of base mapping reflect the surveyed location of the surface evidence of underground utilities. Later, if the design engineer realizes a proposed facility may jeopardize an existing underground utility, the engineer may have the utility located using Quality Level B or A methods, updating the base mapping to reflect the new information.

Care should be taken in depicting underground utility information, and base maps should include a statement indicating the general quality level of the information shown. In addition, notes should be added to reflect higher or lower quality information.

3.6 Construction Layout

Construction layout involves providing detailed layouts for the locations and elevations of the proposed facilities, such as utility and drainage lines, box culverts, curb inlets and junction boxes, street centerlines, curbs, retaining walls, columns, bent and abutment caps, bridge decks, etc. Care and common sense should be taken in laying out the construction to ensure that the control system used is appropriate for the type of construction and that monuments and benchmarks referenced have not been disturbed.

3.7 General Guidelines

The following section describes surveying and mapping activities in more detail and serves as the standard for surveying and mapping for City of San Antonio CIPs. Surveying and mapping forms the essential foundation on which a project is designed and built. A complete, accurate survey and base mapping effort will allow the design engineer to make the sound decisions needed to solve design problems. Moreover, good documentation of the surveying and base mapping effort, including comprehensive, clear survey notes, well-organized correspondence and electronic files, and other techniques, can help avoid rework, successfully defend claims, and otherwise help deliver the project on time and on budget.

3.8 Boundary and Right-of-Way Guidelines

3.8.1 Survey Guidelines

The following information shall be used as survey guidelines:

- Texas Board of Professional Land Surveying (TBPLS) Practices Act and General Rules of Procedures & Practices
- Texas Society of Professional Surveyors (TSPS Manual of Practice Category 1A and Category 7)

- Units: U.S. Survey Feet

  There is a unit of measure called the “U.S. Survey Foot.” It is almost exactly equal to a standard foot, but its definition is slightly different:

  - Standard (or “international”) foot = .3048 meters.
  - U.S. Survey Foot = 1200/3937 meters.

  In other words, one is defined in relation to the meter by a decimal expression; the unit of measure for the other is defined by a fraction.

- Horizontal Datum: NAD 83(93) or NAD 83(CORS): Texas State Plane Coordinate System, South Central Zone.
- Surface Adjustment Factor: Reciprocal value of the Combined Adjustment Factor. The Surface Adjustment Factor for projects within Bexar County will be 1.00017.

3.8.2 Survey Safety: Required Items for Project Safety

- Proper traffic control devices in accordance with the *Texas Manual on Uniform Traffic Control Devices* (Texas MUTCD) shall be used when instruments/equipment are on or adjacent to the roadway.

  (http://www.txdot.gov/government/enforcement/signage/tmutcd.html)

- A set of warning signs will be used to warn that survey crews are working in or next to the roadway and should measure 48"x48" when working on major highways (Texas MUTCD). Survey personnel will wear safety vests at all times. Company vehicle(s) will have safety flasher (strobe) lights.
- If additional work is required outside of the right-of-way, prepare and send right-of-entry letters to all landowners affected by the survey.
- Before setting any subsurface monuments, such as Global Positioning System (GPS) points or benchmarks, all utilities in the area of proposed points must be located by calling 1-800-344-8377 (DIG-TESS).

3.8.3 Project Primary Control

A pair of project primary control points will be constructed at the beginning and end of the project, approximately 300 feet outside the project limits to avoid being disturbed or destroyed. Each of the primary control monuments will be a three-inch diameter aluminum disk on a ¾" rebar driven a minimum of 24 inches into the ground (it can be shorter if in natural rock) or a three-inch disk set in concrete or rock with epoxy. The disk will be stamped "COSA CONTROL," with a project number and point number provided by the City of San Antonio (COSA) survey division. The primary control recovery sketches will be provided on an 11"x17" Mylar sheet. Each control sketch will provide the northing(y), easting(x), latitude and longitude, and elevation, with a tie to the closest street intersection. (See Appendix 3C.)

Three primary project monuments can be employed when the project length is less than 1,500 feet.

3.8.4 General Guidelines for a Boundary Survey

Information contained within this section is excerpted in its entirety and/or adapted for this manual from the Texas Board of Professional Land Surveying (TBPLS), the Texas Department of Transportation (TxDOT) *Survey Manual* (Revised 4/11), and the Texas Society of Professional Land Surveyors (TSPS) *Manual of Practice* available for purchase.

3.8.4.1 Preliminary Research

The foundation of any land survey is record research. According to the current rules of the Texas Board of Professional Land Surveying (TBPLS), the land surveyor must perform research adequate for the assignment.

3.8.4.2 22 Texas Administrative Code §663.16 (c). Boundary Construction

A land surveyor assuming the responsibility of performing a land survey also assumes the responsibility for such research of adequate thoroughness to support the determination of the location of intended boundaries of the land parcel surveyed. The surveyor may rely on record data related to the determination of boundaries furnished for the registrant's use by a qualified provider, provided the registrant reasonably believes such data to be sufficient and notes, references, or credits the documentation by which it is furnished.

3.8.4.3 Related Boundary Construction Information

Some sources of record data are:

- Texas General Land Office

  Field Notes, Roll Sketches, County Maps, Working Sketches, Correspondence, Survey Reports, Patents

- County Clerk

  Deed Records, Plat Records, Court minutes, Patent Records, County Surveyor's Records

- Bexar Appraisal District

  Tax Parcel Maps

- City Archives
- District Court Clerk
- San Antonio River Authority
- Irrigation Districts
- Utility Companies
- Municipal

  Planning, Public Works, Engineering, Geographic Information System (GIS)

- Oil Companies, Lumber Companies, Railroads
- Private Surveyors

An abstract of title or a title run sheet may be of great assistance in determining which conveyances affect the land. The purpose of the title search for the land surveyor is not to determine title from a legal standpoint, but to retrace the history of the land as it affects the boundaries. The title must be searched sufficiently back in time to uncover all of the pertinent information. In many cases, this will be to the sovereignty of the soil.

According to the *22 TAC §663.16 (a)*, when delineating a property or boundary line as an integral portion of a survey, the surveyor shall respect junior/senior property rights, footsteps of the original surveyor, intent of the parties involved, the proper application of the rules of dignity or the priority of calls, and applicable statutory and case law of Texas

3.8.4.4 Fieldwork

All fieldwork will be related to the NAD 83(93) or NAD 83(CORS) datum, Texas State Plane Coordinate System, South Central Zone, through a control network of National Geodetic Survey (NGS), Continuously Operating Reference Stations (CORS), and TxDOT regional reference survey points established before the commencement of the boundary survey. Surveys may be performed by global positioning system (GPS) techniques, such as static and/or Real-Time Kinematic (RTK) methods in terrain suitable for their employment.

Conventional survey methods may be needed in wooded, urban, or mountainous environments, or a mixture of GPS receivers and conventional total stations. Survey techniques shall comply with the procedures specified in the TSPS Manual of Practice. The surveyor will compute state plane coordinates on the Texas State Plane Coordinate System, South Central Zone, for all survey primary control. Surface coordinates will be computed by multiplying the state plane grid values by the Surface Adjustment Factor (SAF) of 1.00017 within Bexar County.

3.8.4.5 Final Right-of-Way Survey

The survey map will show record and calculated dimensions to facilitate the comparison of deeds with the survey construction. A background map of available aerial photography and digital orthophotographs will aid in delineating lines of occupation and natural terrain features having a locative effect.

Once the boundary construction of the lands affected by the project has been finalized, the location of the proposed acquisitions may proceed. At this stage, an initial overlay of the proposed takings may point out areas where the proposed ROW may be questioned.

The surveyor will consult with COSA’s project manager to minimize uneconomic remainders and the taking of small slivers of land. The cost of acquiring miniscule gores of land from a parent tract can far exceed the value of the property. If possible, these parcels will be eliminated from the final ROW footprint. In addition, the review should examine the mitigation of utility adjustments through possible modification of the proposed ROW.

After the right-of-way is approved by the city project manager, the surveyor will prepare parcel plats with metes and bounds descriptions. The plats and field notes comprise together the property description. Permanent parcel corners will be set in compliance with Texas Board of Professional Land Surveying (TBPLS) rules.

Company plastic caps with ½" diameter rebar will be set at all property corners, angle points, and points of curvature and tangency. Relative locations of the corner monuments set shall comply with the positional tolerance established by the TBPLS rules. A parcel strip map will be prepared from the property descriptions.

The parcel strip map will satisfy the current COSA requirements. The map will utilize MicroStation® computer graphics software currently required by COSA.

The parcel strip map is not a survey plat and therefore is not certified by a Registered Professional Land Surveyor (RPLS). It is a graphic representation of right-of-way conveyances in relation to the proposed roadway alignment. Appraisers, negotiators, right-of-way administrators and attorneys, and other staff involved in the acquisition of right-of-way will use the parcel strip map. The surveyor must take into consideration this fact in the preparation of the parcel strip map. As such, the parcel strip map functions not as a survey plat, but as a graphic index map to the parcels to be acquired by the city.

3.8.5 Fieldwork Instructions

Information contained within this section of the manual is excerpted in its entirety and/or adapted by the Standing Committee on Surveying (SCOS) from the TxDOT *ROW Manual Volume 1 – Procedures Preliminary to Release*.

http://onlinemanuals.txdot.gov/txdotmanuals/ppr/index.htm.

3.8.5.1 Conflicts

A conflict is defined as any intrusion or protrusion upon the property of another. A conflict may indicate the existence of an unwritten right that may evolve into a title right. Under the Texas and United States Constitutions, it is a fundamental duty to determine and compensate the owners for all rights acquired in the taking of property. Describe and tie all conflicts or possible conflicts in the survey field record.

Exercise special care in observing aerial conflicts such as overhead electric and telephone lines with cross-arms. Record these items in the field record. Other conflicts may include:

- fences
- rock walls
- power poles
- guy wires
- driveways
- buildings, structures, basements, monitoring wells, irrigation canals, and sprinkler systems
- underground utilities, including water, sanitary sewer, communication, electricity, oil and gas pipelines, etc.
- sidewalks

- persons occupying the tract
- clearing in the trees
- disturbed ground

Roads and driveways crossing the subject tract shall be noted. These roads may be used by adjoining landowners for access to their property. Locate all dirt roads, as they may lead to a cemetery or be ingress and egress to another tract.

All improvements within, along, beside, or up to 25 feet outside the right-of-way lines must be located in relation to a property line, identified, and dimensioned.

3.8.5.2 Fence Ties

Property line fences shall be accurately located. Ties will be made as needed. The field survey record will note:

- age of fence
- type of fence
- condition of fence

The intersection of cross fences with property line fences shall be located. A sketch of cross fences in the interior of a tract shall be made if an aerial photograph is unavailable. Cross fences in the interior of a tract shall not be surveyed unless requested by the RPLS in responsible charge.

Adjoining fences along the property line shall be located in the survey field record. A sketch of such fences will be made if low-level high-resolution aerial photography is unavailable.

Wire fences that meander from tree to tree shall not be located unless they are boundary division fences. When tying tree-to-tree fences, note in the survey field record as to where the fence begins to go from tree to tree and where the fence ends from tree to tree with periodic ties to fence from a traverse line. Each individual tree does not need to be tied unless required by the RPLS in responsible charge.

3.8.5.3 Easements

An easement is “an interest in land created by grant or agreement which confers a right upon owners (private or public) to some profit, dominion, or lawful use of the estate of another.” All surface evidence of utilities corresponding to known easements of record shall be located in the field survey record. Locate all easements that are within and abut the project limits.

The surveyor will locate all facilities crossing the subject tract to verify the location of the object in relation to the location of a recorded easement.

The surveyor will note:

- new excavations
- pipeline markers
- buried cable route signs
- cleared routes across property
- manholes
- any feature that suggests aerial or buried utilities, whether or not they were constructed under benefit of an easement of record

Evidence of all cemeteries or possible cemeteries will be located and noted in the survey field record. Gates found on the perimeter of the tract shall be located. Apparent frequency of use and condition shall be noted. Sketches of roads entering and exiting the tract shall be made. Aerial photographs may be used as a base map to approximate the location of roads or trails across the property.

3.8.5.4 Boundary Checklist

Table 3-1 shall be reviewed before the beginning and end of a boundary survey:

Table 3-1: Boundary Checklist (	
Boundary	**Checklist Items**
Fences	☐ Are all boundary fences located?
	☐ Note fence type, approximate age, type of wire.
	☐ Locate all significant angle points in fences and plot on sketch and/or aerial photographs.
	☐ Prepare detailed sketch of fence at major corners.
	☐ Locate intersection of cross fences at division fences.
Utilities	Use the quality level recommended by the engineer/owner as defined by ASCE Standard 38-02, Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data, CI/ASCE 38-02.
	☐ Locate serial electric, telephone, and cable TV lines (unless previously located by topographic survey).
	☐ Locate all utilities flagged by one call system.
	☐ Note the number of wires and brief description of cross bar poles with pole ID number.
	☐ Locate all guy wires and down guys.
	☐ Locate all sanitary sewer manholes, water valves, water meters and fire hydrants.
	☐ Locate all inlets.
	☐ Locate all underground pipelines, communication, electric lines (locate route signing and vents of underground utilities), and vaults.
	☐ Locate all above ground pipeline and oil or gas well appurtenances such as valves, cathodic protection facilities, tank batteries, pumps, etc., if not previously surveyed.
	Locates shall include invert elevations, top of manhole elevations, meter and valve elevations, etc. See Appendix 3C.
Property Corners	☐ Locate all monuments on points of curvature, points of intersection, and points of tangency of right-of-way fronting tract.
	☐ Locate sufficient monuments of right-of-way adjacent to and on either side of tract, and across public roadways, to determine location of tract to adjoining tracts of right- of-way taking.
	☐ Prepare detailed description of property corners located and survey control points set (½" IRON ROD FOUND, 1" IRON PIPE FOUND, 2X2 HUB AND TACK SET, ⅜" IRON ROD IN ROCK MOUND FOUND, etc.); it is essential to note any

Table 3-1: Boundary Checklist (continued)	
Boundary	**Checklist Items**
	markings of found monuments.
	☐ Set survey control points in places that will be undisturbed in the future.
	☐ Ensure there is sufficient information from deed plot or subdivision plats to tie in to adjoining property.
Locate Structures in Interior of Parcel Near Proposed Taking	☐ Barns
	☐ Concrete slabs, sidewalks, and foundations
	☐ Houses or any permanent structures
	☐ Water wells
	☐ Signs
Locate Natural Features Referred to in Deeds	☐ Drainage features
	☐ Ridge lines or summits
	☐ Woods/prairie boundaries
	☐ Trees six inches in diameter and larger
Locate Roadways Entering and Exiting the Property	☐ Any dirt or gravel roads or driveways being used for access to adjacent properties
	☐ Any abandoned roadways
Flag All Survey Points	☐ Guard stake and lath set on property corners of the subject parcel
	☐ Control points
	☐ Survey control points shall be set in such locations to facilitate setting calculated corners in the near future to complete the boundary survey

3.8.5.5 TSPS Survey Categories

Information in this subsection is excerpted and/or adapted for this manual from the Texas Society of Professional Surveyors (TSPS) Manual of Practice.

The Texas Society of Professional Surveyors has published the Manual of Practice for many years. Although aimed at the surveyor in the private sector, this manual contains much information useful to the COSA surveyor. In particular, Table 3-2 may be appended to a Work Authorization as a survey specification. The manual contains categories of surveys and tolerances, or specifications, for each category of survey. The categories are further subdivided into conditions.

- Category 1: Provides specifications for a Land Title Survey. It is designed to fulfill the normal requirements of all title insuring agencies.
- Category 1B: Specified as a Standard Land Survey. A Standard Land Survey is not intended to support title insurance activities. Category 1B surveys will be used to locate real property, to write legal descriptions, or for platting.
- Category 2: Defined as a Route Survey. This type of survey is used for the planning of the location and the acquisition of property for rights-of-way.

Table 3-2: Chart of Tolerances for Conditions (

Condition	**IV**	**III**	**II**	**I**	**Remarks & Formulae**
	Rural	**Suburban**	**Urban**	**Urban Business District**	
Error of Closure	1:5,000	1:7,500	1:10,000	1:15,000	Loop or between Control Monuments
Angular Closure	30” √N	25" √N	15" √N	10" √N	N = Number of Angles in Traverse
* Accuracy of Bearing in Relation to Source	± 40 sec.	± 30 sec.	± 20 sec.	± 15 sec.	Sin α = denominator in Error of Closure Divided into 1 (approx.)
Linear Distances Accurate to:	± 0.2 ft. per 1,000 ft.	± 0.15 ft. per 1,000 ft.	± 0.1 ft. per 1,000 ft.	± 0.05 ft. per 1,000 ft.	Sin α x 1000 (approx.) where ± = Accuracy of Bearing

Table 3-2: Chart of Tolerances for Conditions (continued)					
Condition	IV	III	II	I	Remarks & Formulae
	Rural	Suburban	Urban	Urban Business District	
Positional Error of Any Monument	AC 5,000	AC 7,500	AC 10,000	AC 15,000	AC = Length of Any Course in traverse
Calculation of Area - Accurate and Carried to:	0.001 .01 .1 .3	0.001 .01 .1 .2	0.0001 .001 .01 .1	0.0001 .001 .01 .1	To 1 acre To 10 acres To 100 acres To 1000 acres
Elevations for Boundaries by Tides, Contours, Rivers, etc. Accurate to:	± 0.2 ft.	± 0.1 ft.	± 0.05 ft.	± 0.03 ft.	Based on sea level datum
Location of Improvements Structures, Paving, etc.	± 1.0 ft.	± 0.5 ft.	± 0.2 ft.	± 0.1 ft.	Tie Measurements
Scale of Maps Sufficient to Show Detail but no less than Plotting not to Exceed:	1"= 2,000'	1"= 1,000'	1"=400'	1"=200'	(National Map accuracy calls for 1/50th inch).
(Applies to Original only)	50 ft. 1"= 2,000'	25 ft. 1"= 1,000'	10 ft. 1”= 400’	5 ft. 1”= 200’	
Adjusted Mathematical Closure of Survey no less than	1:50,000	1:50,000	1:50,000	1:50,000	

NOTE: COSA policy requires all bearings or angles to be based on the following source:

Grid bearing of the Texas State Plane Coordinate System, South Central Zone of NAD 1983 (93) or NAD 1983 (CORS)

3.8.5.6 Information Provided by COSA for Right-of-Way Mapping

- An example of a right-of-way map, traverse closure sheet, and property description
- Existing horizontal control information to the surveyor (if available)
- Existing applicable right-of-way maps of the project area, if available to the surveyor

3.8.6 Final Submittal Requirements

This section discusses the requirements for a final submittal.

3.8.6.1 Right-of-Way (ROW) Acquisition Document Submission

Include the following documentation in the right-of-way acquisition document submission:

- Prepare and furnish three strip maps (if two or more parcels are required) in plan sheet or similar style indicating the proposed right-of-way acquisitions, including fee simple parcels, permanent easement parcels, and temporary easement parcels.
- Prepare a parcel plat, as well as a metes and bounds description, for every proposed parcel: fee simple, permanent easement, and temporary easement. If there is more than one acquisition within the same tract of land, indicate and label all proposed acquisitions and easements on the same plat. A metes and bounds description and closure computation for each acquisition is required. Submit seven copies with at least two original copies. The parcel plat and metes and bounds description will be in whole, one document, and provided on letter size (8½"x11") paper, with pages numbered (i.e., Page 1 of 3, Page 2 of 3, etc.). Submit the metes and bounds description in Microsoft Word format.

3.8.6.2 Metes and Bounds Descriptions, Plats, and Field

(See Appendix 3A)

Include the following items on plats, as well as metes and bounds descriptions:

Table 3-3: Metes & Bounds, Plats, and Fields (	
Subject	**Requirement**
Metes & Bounds	☐ Heading shall identify every description: fee simple, permanent easement, or temporary easement.
	☐ Must include the parcel number from the range of numbers given to the project manager/consultant by the City Real Estate Section.
	☐ All survey marks shall be described on the written description. Provide a reference to and a description of the survey markers as shown on the plat.
	☐ All metes and bounds descriptions prepared for easements shall be tied to physical monuments of record related to the boundary of the affected tract.
	☐ A registered or licensed surveyor must seal, sign, and date every written description.
	☐ All boundaries shall be connected to identifiable physical monuments related to corners of record.
	☐ Include the New City Block (NCB), Block, and Lot(s) as well as any other subdivision name, volume, and page.
	☐ Note showing bearing basis: NAD 83/93 or NAD 83 (CORS) surface coordinates, which can be converted to grid coordinates, dividing by a combined adjustment factor of 0.999830029.
	☐ Provide field notes description in Microsoft Word format on a compact disk (CD).
Plats	☐ Must include the parcel number from the range of numbers given to the project manager/consultant by the City Real Estate Section.
	☐ Identify and depict all improvements that are either located within the taking, including the fee simple, the permanent easement, and the temporary easement, or located within 20 feet from the taking. Include the distance the improvement is located from the proposed right-of-way line which is required for all improvements outside the taking and within the 20 feet. This is essential for preparation of valid appraisals.
	☐ Indicate the whole property with its land area out of which the fee simple or easement is to be taken. Broken lines on large properties are acceptable as long as all overall dimensions are shown.

Table 3-3: Metes & Bounds, Plats, and Fields (continued)	
Subject	**Requirement**
	☐ Indicate all existing easements on and adjacent to the tract on the plat.
	☐ If there is more than one acquisition within the same tract of land, indicate proposed acquisitions and easements on the same plat and only highlight and detail the area the written description describes. For example, there are two proposed acquisitions within Lot 8: fee simple and temporary easement. The Surveyor will need to provide a plat and a written description for the fee simple and use the same plat with another written description for the temporary easement. Show both areas on the same plat, but only highlight and detail the area that matches the written description for that taking. Likewise, if two to three (or more) contiguous lots or tracts are in the same ownership, this constitutes only one parcel whether different Bexar Appraisal District accounts or not.
	☐ The surveyor shall note upon the survey plat which monuments were found and which monuments were placed as a result of his/her survey.
	☐ When appropriate, reference shall be cited in the description prepared to record instrument that defines the locations of adjoining boundaries.
	☐ Floodplain Areas: Always indicate the Federal Emergency Management Agency Map number, date, and floodplain boundary on the plat, and provide the square footage of the floodplain area within and outside of the fee title, permanent easement, and temporary easement individually. This is essential for preparation of valid appraisals.
	☐ Indicate location(s) of any underground storage tanks, drums, pipelines, above ground storage tanks, obvious surface stains, etc. Contact the COSA project manager assigned to that project with any questions and/or concerns.
Field	☐ Set an iron pin with company cap on every corner of the fee simple taking and the permanent easement, except where monuments exist. Show all iron pins on the plat and call them out on the written description.
	☐ Stake every corner (inflection point) of the temporary easement that is not a right-of- way corner.

3.8.6.3 Requirements

All survey work shall meet the requirement as described in the latest version of the Professional Land Surveying Practices Act and General Rules of Procedure and Practices adopted by the Texas Board of Professional Land Surveying and conform to the Texas Society of Professional Land Surveyors *Manual of Practice* for a Category 1A Land Title Survey and Category 7 Horizontal Control Survey. Ensure part to be taken has not been dedicated via plat dedication.

3.8.6.4 Quality Assurance/Quality Control

The Project Surveyor will be responsible for reviewing and checking the control standards and mapping standards.

3.8.7 Right-of-Way Map Components

Information contained within this section is excerpted in its entirety and/or adapted and modified by the Standing Committee on Surveying (SCOS) for this manual from the TxDOT *ROW Manual Volume 1 - Procedures Preliminary to Release.*

(http://onlinemanuals.txdot.gov/txdotmanuals/ppr/index.htm)

3.8.7.1 Title Sheet

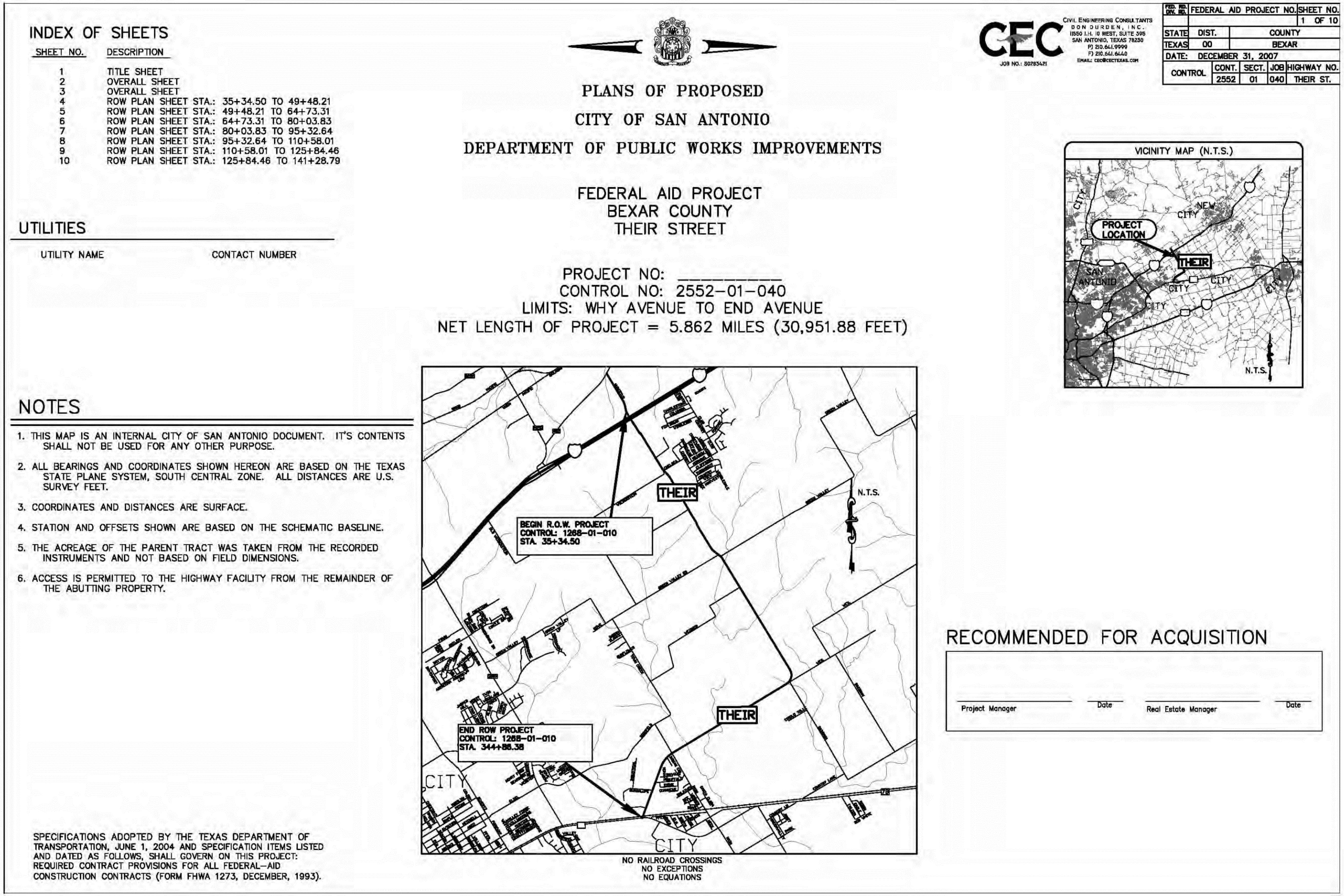
On the title sheet (see **Error! Reference source not found.**), include the following:

- Layout map large enough to show project location and nearest major collector streets
- Highway numbers and street name
- City project number and name (if applicable)
- Vicinity map
- Authorized right-of-way project limits
- Scale of the layout map
- North arrow
- Station numbers for the beginning and ending of the project, and station equations
- Datum statement including the basis of bearings and coordinates, adjustment factor used for converting from grid coordinates to surface coordinates and theta (true-to-grid rotation) angle, if applicable
- Signatures of appropriate signing authorities:

- For initial submission: the city surveyor or right-of-way administrator will sign recommending acquisition after a technical review for compliance with COSA procedures and Texas Board of Professional Land Surveying rules is completed.
- The city engineer or project manager will sign and date recommending acquisition after a review for conformance with the design schematic and verifying the proposed acquisition is adequate to build the proposed transportation facility. For final right-of-way map submission: the project manager and real estate manager will sign and date for final approval, verifying right-of-way activities are complete as shown on the final right-of-way map.

Standard symbols shall be used to the greatest extent possible. See **Error! Reference source not found.** on page **Error! Bookmark not defined.** for an example of a title sheet.

At the bottom center of the title sheet, directly under the note on station equations, include a statement labeled “NO EXCEPTIONS.” Normally, there will be no exceptions on a right-of-way project. If there are areas where no new right-of-way will be purchased, insert a note on the title sheet stating that “NO ADDITIONAL ROW WILL BE REQUIRED FROM STATION TO STATION.”



INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	OVERALL SHEET
3	OVERALL SHEET
4	ROW PLAN SHEET STA.: 35+34.50 TO 49+48.21
5	ROW PLAN SHEET STA.: 49+48.21 TO 64+73.31
6	ROW PLAN SHEET STA.: 64+73.31 TO 80+03.83
7	ROW PLAN SHEET STA.: 80+03.83 TO 95+32.64
8	ROW PLAN SHEET STA.: 95+32.64 TO 110+58.01
9	ROW PLAN SHEET STA.: 110+58.01 TO 125+84.46
10	ROW PLAN SHEET STA.: 125+84.46 TO 141+28.79

PLANS OF PROPOSED
CITY OF SAN ANTONIO
DEPARTMENT OF PUBLIC WORKS IMPROVEMENTS

FEDERAL AID PROJECT
BEXAR COUNTY
THEIR STREET

PROJECT NO: __________
CONTROL NO: 2552–01–040
LIMITS: WHY AVENUE TO END AVENUE
NET LENGTH OF PROJECT = 5.862 MILES (30,951.88 FEET)

CIVIL ENGINEERING CONSULTANTS
DON DURDEN, INC.
11550 I.H. 10 WEST, SUITE 395
SAN ANTONIO, TEXAS 78230
P) 210.641.9999
F) 210.641.6440
EMAIL: CEC@CECTEXAS.COM
JOB NO.: S0283421

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			SHEET NO.
				1 OF 10
STATE	DIST.	COUNTY		
TEXAS	00	BEXAR		
DATE:	DECEMBER 31, 2007			
CONTROL	CONT.	SECT.	JOB	HIGHWAY NO.
	2552	01	040	THEIR ST.

UTILITIES

UTILITY NAME	CONTACT NUMBER

VICINITY MAP (N.T.S.)

NOTES

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3. COORDINATES AND DISTANCES ARE SURFACE.
4. STATION AND OFFSETS SHOWN ARE BASED ON THE SCHEMATIC BASELINE.
5. THE ACREAGE OF THE PARENT TRACT WAS TAKEN FROM THE RECORDED INSTRUMENTS AND NOT BASED ON FIELD DIMENSIONS.
6. ACCESS IS PERMITTED TO THE HIGHWAY FACILITY FROM THE REMAINDER OF THE ABUTTING PROPERTY.

NO RAILROAD CROSSINGS
NO EXCEPTIONS
NO EQUATIONS

RECOMMENDED FOR ACQUISITION

Project Manager	Date	Real Estate Manager	Date

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, JUNE 1, 2004 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL–AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, DECEMBER, 1993).

Figure 3-1: Title Sheet

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3.8.7.2 Parcel Index Sheet

For larger projects containing four (4) or more plan sheets, this sheet will show map sheets and parcels as a large-scale overview of the project. The sheet may also include a chart identifying parcel numbers, land owners, and plan sheet numbers where parcels may be easily located.

3.8.7.3 Control Sheet

The control sheet may be used to identify the primary control used in preparation of the project. Include the following: the basis of datum, any monuments set for control, the baseline data throughout the project, and any other relevant metadata (i.e., history data). (See Appendix 3C.)

3.8.7.4 Plan Sheets

The most important factor in preparing a plan sheet is legibility and clarity of information, even to a person with limited surveying or engineering experience. (See **Error! Reference source not found.**, on page **Error! Bookmark not defined.**.)

Plan sheets shall be drafted at a scale of 1" = 100' (rural) or 1" = 50' (urban), unless a different scale is required for legibility. A planimetric plan sheet developed from aerial photography may be used for the base map of a right-of-way plan sheet. Plan sheets shall depict existing right-of-way, adjacent properties, and proposed parcels.

3.8.7.5 Existing Information

The following shall be shown on each plan sheet:

- Existing right-of-way (by bearing and distance) through the entire project length, even in areas where no new right-of-way is needed. In areas where new right-of-way is needed on only one side, the right-of-way on both sides of the new facility shall be delineated and monuments set at PCs, PTs, and angle points.
- Existing right-of-way monuments.
- Record ownership data of adjacent properties.
- Points of curvature, points of tangency, and points of intersection (show and label).
- If appropriate, existing utility lines and easements (deed reference, if known).
- Existing improvements such as buildings, fences, trees (contact City Arborist's office), etc., within the existing and proposed right-of-way.
- Potential obstructions and/or conflicts. (Locate any improvements within 25 feet of the new right-of-way line. This will assist appraisers in determining damages to the remainders of properties.)

- Parent survey lines (show and label).
- City limit lines (show and label).
- Existing public roads, streets, and alleys (including recorded plat or deed reference).
- Existing drainage or channel easements (include recorded plat or deed reference).
- Whole property relative to existing and proposed right-of-way. If the whole property is too large to fit on the map sheet at the sheet scale, draw an inset at a smaller scale or not to scale with a note stating “N.T.S.”

3.8.7.6 Proposed Information

On each plan sheet, show the following (see Figure 3-3: Station and Offset Ties - Identify Stationing Source, on page59):

- New right-of-way lines.
- New right-of-way markers with point number. Provide a chart on each plan sheet with point number, coordinates (y, x), and description.

3.8.7.7 Parcel Information

For each right-of-way parcel acquired, show the following information:

- Property owner name.
- Parcel number.
- Parent tract.
- Type of conveyance (e.g., deed, judgment)—for final right-of-way map
- Recording information (after acquisition)—for final right-of-way map
- Station to station.
- Area in acres and/or square feet (utilize the TSPS Manual of Practice to determine the accuracy used for calculating square footing based on the category and condition of survey); limits and offset to new right-of-way line.
- Area of remainder (calculated from deed).
- Property lines (show and define by bearing and distance relative to existing and new right-of-way lines); reference only.
- Bearing and distance to a monument found or set at a corner outside the area to be acquired. If the corner is defined as a point of commencement (POC) in a property description, then show the letters POC on the map to reference the corner.

- Remainder chart for right-of-way plan sheets is as displayed in Figure 3-2: Remainder Chart for Right-of-Way Plan Sheets:

PARCEL NO.	DEED ACREAGE	PROPERTY OWNER	TYPE OF CONV.	CONVEYANCE		TAKING PROP. CENTERLINE STATIONS		TAKING ACRES	REMAINDER	
				VOLUME	PAGE	FROM	TO		LEFT	RIGHT
1	28.793	SCHERTZ BANK & TRUST				35+74.97	37+78.82	0.087		28.706
2	2.484	RANDOLPH-BROOKS FEDERAL CREDIT UNION				35+74.97	37+93.46	0.115	2.369	
3	0.856	FUEL DISTRIBUTORS, INC.				43+63.50	45+29.78	0.119		0.737
4 PART 1	10.881	US HOLDINGS, LTD.				43+64.38	47+92.71	0.363	10.518	
4E PART 1	10.881	US HOLDINGS, LTD.				46+54.93	46+77.31	0.010	10.881	

Figure 3-2: Remainder Chart for Right-of-Way Plan Sheets

3.8.7.8 Property Descriptions

In contrast to right-of-way maps being an internal departmental document, property descriptions (including parcel plats) are prepared as exhibits for the conveyance of a property interest. The property descriptions and parcel plats reflect a boundary survey and must be signed and sealed by a registered professional land surveyor (RPLS). Property descriptions prepared for right-of-way projects consist of a heading with a metes and bounds description and parcel plats prepared on letter-size (8½" x 11") sheets. Letter- size sheets allow the descriptions and plats to be filed with the County Clerk's office without reducing copies. See Appendix 3A for examples of property descriptions and parcel plats.

NOTE: Use a one-inch border on all sides of the property description.

Items to be included on property descriptions and parcel plats, in addition to Texas Board of Professional Land Surveying standards, include:

- All property descriptions and parcel plats must be tied to the Texas State Plane Coordinate System, South Central Zone, and reference metadata used in preparing the survey.
- A Texas state plane coordinate should be given for at least one point on the plat. This practice is optional for the metes and bounds description.
- Ownership information shall specify the type of public record referenced, for example, deed records, official records, real property records, or plat records, as well as the volume and page citation.
- Parcel plats are required for all property descriptions.
- For all partial acquisitions, at least one reference tie must be made to an established corner outside the parcel area, preferably to the nearest public street intersection.
- It is acceptable to use a set corner on the remainder or adjoiner in cases where no found corners exist, although the surveyor may be assuming liability for the remainder as well as for the adjoiner tract.

- This outside tie should be made to a boundary corner monument that will remain after construction.
- Centerline station ties may, or may not, be of value to the property description, but may be a convenient reference.
- A station and offset tie at both the beginning and end of each parcel is of value to engineers and designers for the construction of a centerline or survey baseline.
- Station and offset ties in a parcel description, right-of-way map, and parcel data should identify the source of the stationing.
- If the parcel is located in more than one county or land grant survey, show the land area in each county or land grant.
- Control of access lines

Parcels consisting of more than one part must include a summary at the end of the property description as follows:

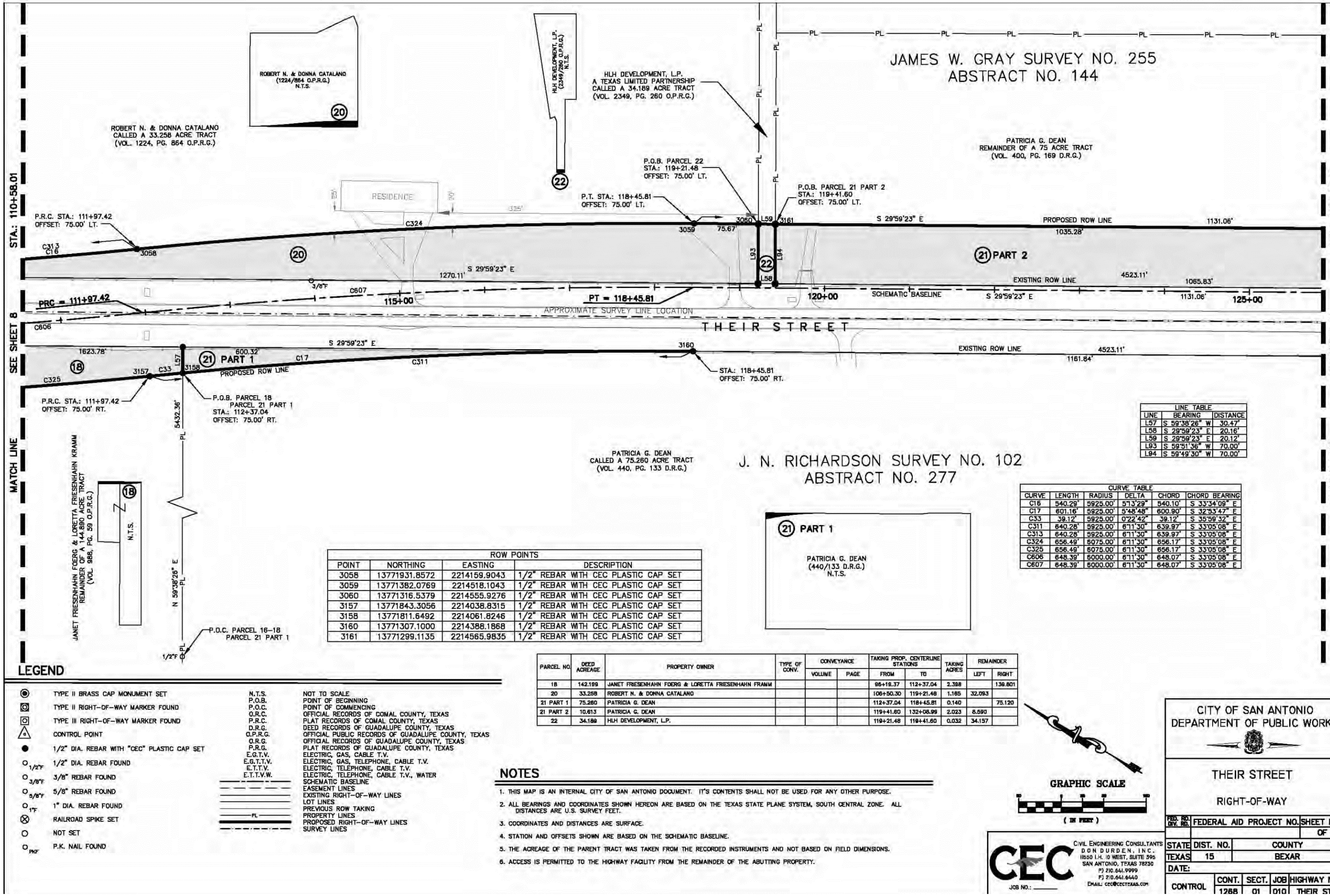
Summary:

Part 1 = 4.333 Acres (188,745 square feet)

Part 2 = 2.667 Acres (116,174 square feet)

Total = 7.000 Acres (304,919 square feet)

Acreages will normally be carried out to three (3) decimal places. However, on large rural parcels that may have lengthy boundary segments, it is acceptable to truncate acreage figures to two (2) decimal places, which better reflects the accuracy of the surveyed line.



ROW POINTS			
POINT	NORTHING	EASTING	DESCRIPTION
3058	13771931.8572	2214159.9043	1/2" REBAR WITH CEC PLASTIC CAP SET
3059	13771382.0769	2214518.1043	1/2" REBAR WITH CEC PLASTIC CAP SET
3060	13771316.5379	2214555.9276	1/2" REBAR WITH CEC PLASTIC CAP SET
3157	13771843.3056	2214038.8315	1/2" REBAR WITH CEC PLASTIC CAP SET
3158	13771811.6492	2214061.8246	1/2" REBAR WITH CEC PLASTIC CAP SET
3160	13771307.1000	2214388.1868	1/2" REBAR WITH CEC PLASTIC CAP SET
3161	13771299.1135	2214565.9835	1/2" REBAR WITH CEC PLASTIC CAP SET

LINE TABLE		
LINE	BEARING	DISTANCE
L57	S 59°38'26" W	30.47'
L58	S 29°59'23" E	20.16'
L59	S 29°59'23" E	20.12'
L93	S 59°51'36" W	70.00'
L94	S 59°49'30" W	70.00'

CURVE TABLE					
CURVE	LENGTH	RADIUS	DELTA	CHORD	CHORD BEARING
C16	540.29'	5925.00'	5°13'29"	540.10'	S 33°34'09" E
C17	601.16'	5925.00'	5°48'48"	600.90'	S 32°53'47" E
C33	39.12'	5925.00'	0°22'42"	39.12'	S 35°59'32" E
C311	640.28'	5925.00'	6°11'30"	639.97'	S 33°05'08" E
C313	640.28'	5925.00'	6°11'30"	639.97'	S 33°05'08" E
C324	656.49'	6075.00'	6°11'30"	656.17'	S 33°05'08" E
C325	656.49'	6075.00'	6°11'30"	656.17'	S 33°05'08" E
C606	648.39'	6000.00'	6°11'30"	648.07'	S 33°05'08" E
C607	648.39'	6000.00'	6°11'30"	648.07'	S 33°05'08" E

PARCEL NO.	DEED ACREAGE	PROPERTY OWNER	TYPE OF CONV.	CONVEYANCE		TAKING PROP. CENTERLINE STATIONS		TAKING ACRES	REMAINDER	
				VOLUME	PAGE	FROM	TO		LEFT	RIGHT
18	142.199	JANET FRIESENHAHN FOERG & LORETTA FRIESENHAHN FRAMM				96+19.37	112+37.04	2.398		139.801
20	33.258	ROBERT N. & DONNA CATALANO				106+50.30	119+21.48	1.165	32.093	
21 PART 1	75.260	PATRICIA G. DEAN				112+37.04	118+45.81	0.140		75.120
21 PART 2	10.613	PATRICIA G. DEAN				119+41.60	132+08.99	2.023	8.590	
22	34.189	HLH DEVELOPMENT, L.P.				119+21.48	119+41.60	0.032	34.157	

LEGEND

- TYPE II BRASS CAP MONUMENT SET
- TYPE II RIGHT-OF-WAY MARKER FOUND
- TYPE III RIGHT-OF-WAY MARKER FOUND
- CONTROL POINT
- 1/2" DIA. REBAR WITH "CEC" PLASTIC CAP SET
- 1/2"F 1/2" DIA. REBAR FOUND
- 3/8"F 3/8" REBAR FOUND
- 5/8"F 5/8" REBAR FOUND
- 1"F 1" DIA. REBAR FOUND
- RAILROAD SPIKE SET
- NOT SET
- PKF P.K. NAIL FOUND

N.T.S. NOT TO SCALE
P.O.B. POINT OF BEGINNING
P.O.C. POINT OF COMMENCING
O.R.C. OFFICIAL RECORDS OF COMAL COUNTY, TEXAS
P.R.C. PLAT RECORDS OF COMAL COUNTY, TEXAS
D.R.G. DEED RECORDS OF GUADALUPE COUNTY, TEXAS
O.P.R.G. OFFICIAL PUBLIC RECORDS OF GUADALUPE COUNTY, TEXAS
O.R.G. OFFICIAL RECORDS OF GUADALUPE COUNTY, TEXAS
P.R.G. PLAT RECORDS OF GUADALUPE COUNTY, TEXAS
E.G.T.V. ELECTRIC, GAS, CABLE T.V.
E.G.T.T.V. ELECTRIC, GAS, TELEPHONE, CABLE T.V.
E.T.T.V. ELECTRIC, TELEPHONE, CABLE T.V.
E.T.T.V.W. ELECTRIC, TELEPHONE, CABLE T.V., WATER
SCHEMATIC BASELINE
EASEMENT LINES
EXISTING RIGHT-OF-WAY LINES
LOT LINES
PREVIOUS ROW TAKING
PL PROPERTY LINES
PROPOSED RIGHT-OF-WAY LINES
SURVEY LINES

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3. COORDINATES AND DISTANCES ARE SURFACE.
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5. THE ACREAGE OF THE PARENT TRACT WAS TAKEN FROM THE RECORDED INSTRUMENTS AND NOT BASED ON FIELD DIMENSIONS.
6. ACCESS IS PERMITTED TO THE HIGHWAY FACILITY FROM THE REMAINDER OF THE ABUTTING PROPERTY.

Figure 3-3: Station and Offset Ties - Identify Stationing Source

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3.8.7.9 Certification and Monuments

Refer to 22 TAC §663.11 of the General Rules of Procedures and Practices of the TBPLS Act for certification and monumentation of surveys.

Each parcel corner on a project must have a survey marker on the ground to represent that corner. A ½" iron rebar with a company plastic cap, shall be placed flush with the ground at all points of curvature, points of tangency, angle points, and points having a maximum interval of 1,500 feet along tangent segments of the right-of-way, and shall be placed at the intersections of the new right-of-way line and individual property lines.

3.8.7.10 Public Roads and Alleys

Existing public roads or alleys that abut or pass through a right-of-way parcel need to be investigated carefully to determine the source of title. If a recorded instrument such as a right-of- way deed, dedication by subdivision plat or donation deed can be found, this title should be shown on the right-of-way map and parcel plats.

If no record can be located, a note should be added stating the existing right-of-way shown was determined by occupation. If included in the adjacent landowner’s deed, the existing right-of-way should be included in the parcel area but cannot be included for payment.

For existing roadway, areas that do not appear in any conveyance to a public entity or adjacent property owner, a quitclaim deed from the local public agency occupying the facility should be obtained and filed with the County Clerk.

3.8.7.11 Original Submission to a City

The surveyor should complete and submit preliminary maps, parcel plats, property descriptions, and closure sheets to the city for review. The city will determine the size, type, and number of submittals to be used for review purposes. These maps shall be prominently marked as PRELIMINARY.

The city surveyor or appropriate personnel must review the submission for compliance with COSA policy and Texas Board of Professional Land Surveyors standards. The design engineer or appropriate personnel must review the map for compliance with the design schematic and to verify that the area to be acquired and all easements are adequate to build the transportation facility.

3.8.7.12 Finalizing Maps after Project Acquisition

Once right-of-way map revisions are complete, all new right-of-way is acquired, and all documents are recorded, the project surveyor will send an 11" x 17" original of the right-of-way map marked “FINAL MAP” on bond paper and a completed electronic graphics file (if available), including all revisions, to the city for the permanent file. For the final map to be complete, it must contain:

- all project numbers
- grantors’ names
- areas of acquired parcels
- recording information
- names of the utility owner(s) and graphic depiction of the easement or right-of-way on the ROW Map Plan Sheet
- all signature blocks completed
- graphics file (if available) including all revisions

3.8.7.13 Standardized MicroStation® Graphic Files

Due to the multitude of formats used in the consulting industry, COSA has recognized a need for standardization in the creation and manipulation of MicroStation Graphic Files. The following guidelines should be used to assist MicroStation users in the development of graphic files that are compatible with COSA’s MicroStation files.

Base Files

All geometry and line work is done in this file. Points, property lines, centerline information, etc., should be done on assigned levels. Any text/labels in this file should be for the user's own use on separate levels from the line work, so they may be turned off when the base file is used as a reference file for a sheet (map sheet) file.

Topographic Files

No work may be done in these files. The user may turn on or off any level as required in a topographic file when it is used as a reference file. When used as a reference file, all line work should be shown as zero line weight, dotted line symbology, and white or gray in color.

Sheet Files (Map Sheets)

These are the files where the drafting work is done. Text/labels, whole property sketches, enlarged details, north arrow, and bar scale are shown here. The base file and topographic file are referenced to the sheet file. In addition, other appropriate files showing new buildings and/or utilities shall be referenced. Then the appropriate levels are turned on or off in both reference files to show the line work and topographic features that will appear on the finished plan sheet. A COSA standard size plan sheet (11" x 17") must be used to define the working area. You may move or rotate the sheet cell as required.

DO NOT MOVE, ROTATE, COPY, OR IN ANY WAY ALTER THE ATTACHED REFERENCED BASE OR TOPOGRAPHIC FILES FOR USE IN YOUR SHEET FILES. (Users may, for their own use rotate the view they are working in.)

When numbering map sheets, always begin with number 2, as sheet number 1 is reserved for the title sheet. The map sheet is "finished" by fencing the appropriate area and performing a clip boundary operation on the reference base and topographic files.

Title Sheet Files

A standard COSA title sheet must be used. This sheet contains the following information:

- highway number or street name
- project number (if needed)
- project limits description
- length in feet and miles
- legend of standard utility and mapping symbols
- utility table
- vicinity map (when appropriate)

The title sheet will always be numbered as sheet one of the set of maps (see page 3-17, Example ROW Map Title Sheet).

Text and Labels

See the **Error! Reference source not found.**, on page 64, for COSA standard size, font, line spacing, and weight for text and labels.

Line Weight and Line Symbology

See Table 3-5, on page 65, for a chart of COSA standard line weight and line symbology.

Whole Property Sketches and Enlarged Details

These should always be created as “saved views,” referenced from the base file to the sheet file. This will ensure that changes or updates made in the base file will always be accurately reflected in the saved view(s). All labeling on the saved view(s) should be done in the appropriate sheet file.

Level Map

See Table 3-6 on page 65, for information on COSA standard levels for horizontal alignment, proposed and existing right- of-way lines, property lines, found points, survey lines, county lines, city limit lines, text and labels, easements, platted/subdivision properties, etc. Any level not designated for use on the level map sheet may be used at the MicroStation® user’s discretion.

NOTE: A copy of your completed project level map sheet must accompany any electronic file sent to COSA.

Table 3-4: Text Style and Weight Chart (			
Subject	**Style**	**Line Type**	**Weight**
Dimension	1	6	1
Lot Number	1		1
Block Number	20		1
Owner Name	15		1
Remainder	12		1
Station	15	10	1
Subdivision Name	24	16	1
Survey Grantee	24	12	2
Street Name	15		1
Highway	20		2
Notes	20	12	1

Table 3-5: Line Weight and Symbology Chart (		
Line Detail	**Specification**	**Example**
Weight (WT)	1	
	2	
	3	
	4	
	5	
	6	
	7	
Symbology (Displayed WT = 1)	Solid	
	Dotted	
	Medium Dashed	
	Long Dashed	
	Dash-Dot	
	Short Dashed	
	Dash-Dot-Dot	
	Long Dashed Short Dashed	

Table 3-6: Levels and Weights for Right-of-Way (ROW) Mapping Chart (						
Level	**Description**	**Weight**	**Line Style**	**Color**	**Text Style**	**Text Size**
1	Proposed Centerline	2	4	Gray		
1	Centerline Text / PC, PT	2	0	Gray	1	10
1	Parcel Number	2	0	Gray	23	14
2	Centerline Curve Data	1	0	Gray	23	7
4	Point Numbers (Field Located)	1	0	Orange	23	7
4	Descriptions (Field Located)	1	0	Gray	23	5
5	Point Numbers (Calc.)	1	0	Yellow	23	5

Table 3-6: Levels and Weights for Right-of-Way (ROW) Mapping Chart (continued)						
Level	**Description**	**Weight**	**Line Style**	**Color**	**Text Style**	**Text Size**
5	Descriptions (Calc.)	1	0	Gray		
12	Volume & Page of Original ROW	0	0	Gray	23	5
12	Ownership Data	0	0	Gray	23	5
13	Road & Street Names	2	0	Gray	23	10
14	Subdivision Names	2	0	Blue	23	14
14	Block Numbers	2	0	Blue	23	10
14	Lot Numbers	1	0	Blue	23	7
15	Measured Parcel Data Text, Station Offset	1	0	Gray	23	7
15	Record Deed Data	0	0	Gray	23	5
15	Dim Arrows / Fee Hook / Etc.					
16	Existing ROW	1	0	Purple		
16	Property Lines	1	0	Purple		
16	Exist. ROW / Prop. Line	1	0	Orange		1
17	Proposed ROW	6	0	Red		
17	Proposed ROW Circles	1	0	Red		1
18	Survey / Abstract Names	3	0	Green	23	21
18	Survey / Abstract Lines	2	6	Green		
20	Monuments Found / Set Text	0	0	Gray	23	5
62	Roll Sheet Data					
63	Notes	2	4	Gray		

All calculated corners should begin with a point number large enough to ensure there is no conflict with surveyed points, i.e., 2000. Miscellaneous points calculated to determine a boundary corner should be deleted and only the final location used.

3.8.7.14 Final Check List

PROJECT NO.: ______________________

HIGHWAY: ______________________

COUNTY: ______________________

LIMITS: ______________________

COSA-P.M.: ______________________

Table 3-7: Right of Way Maps Final Check List ((				
Sheet / Requirement	☐	**No.**	**Description**	
General	☐	1	All map sheet prints are legible, not light or faded.	
	☐	2	All map sheets will be 11" x 17".	
	☐	3	Text size is legible when full-size maps are reduced to half-scale for final right-of-way maps.	
	☐	4	All title blocks are completely filled out, including the Project No.	
	☐	5	Sheets have basis of bearings and scale factor used to convert grid coordinates to ground coordinates.	
	☐	6	Graphic files are included and files are compatible MicroStation DGN files.	
	☐	7	Graphic scale is shown on all map sheets.	
	☐	8	North arrow is shown on all map sheets.	
Title Sheet	☐	1	Title and description of project includes:	
		☐	a	Project designation
		☐	b	County
		☐	c	Project No
		☐	d	Limits (same as shown on Work Order)
	☐	2	Project layout (with north arrow) shows beginning and ending stations of project.	
	☐	3	Vicinity map (with north arrow) shows beginning and ending of project.	
	☐	4	Index of sheets is shown.	
	☐	5	Legend of symbols is shown.	

Table 3-7: Right of Way Maps Final Check List (continued)			
Sheet / Requirement	☐	**No.**	**Description**
	☐	6	Signature block:
	☐	a	Signed and dated recommending acquisition by:
	☐		(1) Right-of-Way Administrator.
	☐		(2) City Project Manager.
	☐	b	Signed and dated for final approval when acquisition is complete by:
	☐		(1) COSA Planning Commission Chairman and Secretary.
		7	Length of project is shown
		8	Scale of layout is shown.
Parcel Index Sheet (Optional: Example Shown in ROW Manual) (N)	☐	1	Intersections are shown and labeled.
	☐	2	Parcels are labeled.
	☐	3	Individual sheets are shown.
	☐	4	Beginning and ending stations of the project are labeled.
Control Sheet	☐	1	Beginning and ending stations of project are labeled.
	☐	2	All survey controls are shown.
	☐	3	All curve data are shown.
	☐	4	Intersection controls are shown.
Map Sheet Requirements	☐	1	Adjoining property owner names with recorded volume and page numbers are shown.
	☐	2	Existing intersecting roadways with recorded deed reference or information are shown.
	☐	3	Existing right-of-way lines with all bearings and distances are shown.
	☐	4	Proposed right-of-way lines with all bearings and distances are shown.
	☐	5	Whole property sketches or whole property inset must show acreage of parent tract as existing at time of right-of-way project and must show commencing point (POC).

Table 3-7: Right of Way Maps Final Check List (continued)			
Sheet / Requirement	☐	**No.**	**Description**
	☐	6	Matchline stationing is shown at the beginning and end of each map sheet.
	☐	7	Any survey, county, and/or city limit lines are shown and labeled.
	☐	8	½" iron rebar with company cap markers used for PC, PT, and break points (max. 1,500- foot intervals and iron rods or equivalent used for intersecting property corners)
	☐	9	Property lines are extended.
	☐	10	Property descriptions (i.e., lot, block, tract, subdivision, etc.) are labeled.
	☐	11	Stationing and bearings are shown on centerline.
	☐	12	Outside ties (POC) correspond with property descriptions for all parcels.
	☐	13	Point of beginning (POB) is established on proposed right-of-way line.
	☐	14	If sending in a revised sheet, show date of revision with a description of the revision on the sheet it occurs or on a “Revision Sheet” showing all revisions.
	☐	15	Math is checked on remainders.
	☐	16	Parcel numbering complies with COSA assigned numbers.
	☐	17	All access rights have been addressed and designated.
	☐	18	All data correspond exactly with parcel plats and property descriptions, as well as closure sheets.
	☐	19	All utilities within or crossing existing and proposed right-of-way are shown and labeled as to size, easement, or fee width, as well as recording data of instrument.
	☐	20	Locations of underground storage tanks and/or filler caps are shown and labeled.
	☐	21	All survey controls are shown.
	☐	22	All curve data are shown.
	☐	23	Buildings, improvements, creeks, rivers, and other controlling topography are shown.

Table 3-8: Parcels Final Check List (			
Sheet / Requirement	☐	**No.**	**Description**
Property Descriptions	☐	1	8½" x 11" sheets. (N)
	☐	2	Signature and seal of Registered Professional Land Surveyor (RPLS).
	☐	3	Roadway designation.
	☐	4	County.
	☐	5	Parcel number.
	☐	6	COSA Project No.
	☐	7	Revision date (if applicable).
	☐	8	Page number(s) (i.e., 1 of 2, etc.).
	☐	9	Give reference to and prepare parcel plat in conjunction with property description having the same survey date.
	☐	10	All data correspond exactly with right-of-way map and parcel plats, as well as closure sheets.
	☐	11	Control of access.
	☐	12	Has description been checked for compliance with Texas Board of Professional Land Surveying rules?
Parcel Plats	☐	1	8½"x 11" sheets. (N).
	☐	2	Signature and seal of Registered Professional Land Surveyor (RPLS).
	☐	3	Title block includes roadway designation, county, parcel number, and COSA Project No.
	☐	4	All data correspond exactly with right-of-way map and property descriptions, as well as closure sheets.
	☐	5	POB and POC are shown.
	☐	6	Give reference to and prepare parcel plat in conjunction with parcel plat having the same survey date.
	☐	7	Control of access is shown.
	☐	8	Has plat been checked for compliance with Texas Board of Professional Land Surveying rules?
	☐	9	Closure sheets have been included.

Table 3-9: Send Right-of-Way Map Checklist to Project Manager (		
Item Reviewed	☐	**Reviewer Signature**
Title Sheet	☐	Has been reviewed and approved by: Reviewer DATE
Map Sheets	☐	Has been reviewed and approved by: Reviewer DATE
Parcel Plats	☐	Has been reviewed and approved by: Reviewer DATE
Property Descriptions	☐	Has been reviewed and approved by: Reviewer DATE

3.9 Design Survey for Topography, Tree Survey, etc.

3.9.1 Survey Guidelines

Survey Guidelines utilize the following organizations and documents:

Texas Board of Professional Land Surveying (TBPLS):

- *The Professional Land Surveying Practices Act*
- *General Rules of Procedures & Practices*

Texas Society of Professional Surveyors:

- TSPS Manual of Practice Category 6
- TSPS Manual of Practice Category 7
- TSPS Manual of Practice Category 8
- Website link to purchase Manual of Practice

3.9.1.1 Units: U.S. Survey Feet

There is a unit of measure called the "U.S. Survey Foot." It is almost exactly equal to a standard foot, but its definition is slightly different:

- Standard (or "international") foot = .3048 meters
- U.S. Survey Foot = 1200/3937 meters

In other words, one is defined in relation to the meter by a decimal expression; the unit of measure for the other is defined by a fraction.

3.9.1.2 Horizontal Datum: NAD 83(93)

Texas State Plane Coordinate System, South Central Zone

3.9.1.3 Vertical Datum

NAVD 88

3.9.1.4 Surface Adjustment Factor

Reciprocal value of the Combined Scale Factor: The Surface Adjustment Factor for projects within Bexar County will be 1.00017.

3.9.2 Survey Safety — Required Items for Project Safety

- Proper traffic control devices in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD) shall be used when instruments/equipment are on or adjacent to the roadway.
- A set of warning signs will be used to warn that survey crews are working in or next to the roadway and should measure 48" x 48" when working on major highways (MUTCD). Survey personnel will wear safety vests at all times. Company vehicle(s) will have safety flasher (strobe) lights.
- If additional work is required outside of the right-of-way, prepare and send right-of-entry letters to all landowners affected by the survey.
- Before setting any subsurface monuments such as GPS points or benchmarks, all utilities in the area of proposed points must be located by calling 1-800-344-8377 (DIG-TESS).

3.9.3 Project Primary Control

A pair of project primary control points will be constructed at the beginning and end of the project, approximately 300 feet outside the project limits to avoid being disturbed or destroyed. Each of the primary control monuments will be a three-inch diameter aluminum disk on a ¾" rebar driven a minimum 24 inches into the ground (it can be shorter if in natural rock) or a three-inch disk set in concrete or rock with epoxy. The disk will be stamped “COSA CONTROL,” with a project number and point number provided by the COSA survey division. The primary control recovery sketches will be provided on 11" x 17" Mylar sheet. Each control sketch will provide the northing(y), easting(x), elevation (if applicable), and the Surface Adjustment Factor with a tie to the closest street intersection.

Three primary project monuments can be employed when the project length is less than 1,500 feet.

3.9.4 General Guidelines for a Digital Terrain Model (DTM) Survey

Information contained within this section is excerpted in its entirety and/or adapted for this manual from:

- Texas Board of Professional Land Surveying (TBPLS)
- Texas Department of Transportation (TxDOT) Survey Manual

  (http://onlinemanuals.txdot.gov/txdotmanuals/ess/index.htm)
- Texas Society of Professional Land Surveyors (TSPS) Manual of Practice.

3.9.4.1 Field Procedures

DTM or topographic surveys require a reliable horizontal and vertical control system based on acceptably closed and adjusted traverses and level loops. Attention should be given toward developing this control system before any detail work is begun.

Fieldwork shall be performed to achieve the specified or intended accuracy and results as stated in the TSPS Manual of Practice Categories 6, 7, and 8, and as directed by the manufacturer of the surveying instrument(s) or equipment used.

For GPS applications, the Federal Geodetic Control Subcommittee’s (FGCS) *Geometric Geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques* shall be followed.

Field personnel shall be well trained in the technical aspects of surveying as related to their respective duties.

Surveying instruments shall be checked and kept in close adjustment according to their manufacturer’s specifications or in compliance with textbook standards.

Field measurements of angles and distances shall be performed in such a manner as to attain the closures and tolerances as found in this manual and see the *TSPS Manual of Practice Chart* below for Tolerances for Conditions.

Where aerial photogrammetry is to be used to compile the topographic map, the surveyor shall consult with the photogrammetrist as to specific requirements for the photo control and for additional supplemental information required by conditions of a specific project or location.

For COSA purposes, methods that are more modern are normally used such as the DTM survey that incorporates methods described in the section below.

Surveying procedures with electronic total station or with GPS shall incorporate control points that are tied to a primary control system network of an appropriate level of precision and accuracy for the project.

Acquisition of field data may require running secondary control and benchmarks that begin and end at points on the primary control system.

The use of open-ended legs or “spur” lines should be avoided whenever possible. When such lines are necessary, appropriate checks shall be made on all field data before leaving the vicinity.

Any field notes written in a field book shall be kept in a neat and orderly manner on all control points, primary or secondary. Appropriate annotations shall be made on location, description of point, and reference to specific identifying features located during the DTM or topographic survey.

3.9.4.2 Topographic Features

The perimeter limits of any unique or special features, such as historical structures, cemeteries, burial grounds, or grave sites, known or found within the project limits or adjacent thereto and which may be affected (existing or proposed right-of-way) shall be shown by actual location.

Buildings and improvements, including distance from proposed right-of-way up to 25 feet. The project manager and/or city surveyor may extend this distance.

The following features shall be recorded:

- All trees with trunk diameter of four inches or greater.
- The engineer or owner will provide utility maps. Aboveground utilities and surface evidence of underground utilities will be located. The underground utility locater will conform to the *ASCE Utility Standards of Quality Level* provided in the survey work order.
- Centerlines of dry creeks, gullies, or other confined intermittent watercourses.
- Paths, car trails, pasture roads, etc.
- Curbs, sidewalks, driveways, mailboxes, crosswalks, signs, edge of pavement, etc.
- Borders, boundaries—city limits, county line, or state line.
- Additional data points shall be collected along such features, outside of street right-of-way, as required and directed by COSA. These additional features may include the following:
  - Creeks, streams, rivers, and water bodies, shown and identified by name. Water levels shall be determined and displayed by elevation, time, and date of observation.
  - Drainage areas—field information on drainage area(s) of a project shall be collected in the same manner as other information, to the extent directed by the project manager and/or city surveyor.

3.9.4.3 Electronic Data

In nearly all cases, collecting, reviewing, editing, and processing field data is automated by the use of computer software and hardware. A data collector may be connected to the instrument (total station, GPS receiver, digital level, etc.) to store the raw measurement data and perform coordinate geometry (COGO) functions while in the field. Original raw data must be saved as a file for retention, as a matter of record, before any data editing or processing is done.

3.9.4.4 Data Collection

Field data in electronic form should be collected in the Survey Data Management System (SDMS) software or Tripod Data Systems (TDS) collection form and processed in SDMS or TDS Processor. SDMS software was developed through the American Association of State Highway and Transportation Officials (AASHTO). Its purpose is to provide a more flexible and user-definable method of recording horizontal angle, vertical angle, and slope distance from most of the total stations and in a standard format recognized by the survey review or design software. There are other field data collection systems that can be used, pending approval by the city project manager.

There are numerous ways to provide connectivity. When performing radial topography surveys for a DTM, points in the same chain, such as edge of pavement, centerlines, and ditch lines, can be linked together. These survey chains can ultimately be ported to mapping files or to DTM files as DTM break lines. Standard feature codes are listed in Appendix 3B.

3.9.4.5 Office Analysis

Survey review and DTM — To view the results of a survey for troubleshooting and delivery of a .dgn file, pre-design software will be used. CAiCE Visual Transportation, GEOPAK Survey, and SDMS or TDS Processor software will serve as the tool(s). This software will accept the SDMS .cal file or TDS .raw files as input, with the feature table Exhibit “C,” and will graphically display the project for analysis. Corrections and additions can be made, and the DTM can then be created. Photogrammetry files, background maps, macros for visualization, and other enhancements may be used before 2D or 3D graphics are exported as a .dgn file for GEOPAK/MicroStation use by the designer.

3.9.4.6 COSA Deliverables — Computer Files, Maps, and Drawings

If required, printed maps or plan sets of topographic surveys or digital terrain model (DTM) files shall be represented by neat, reproducible drawing sheets. These drawing sheets are plotted for urban projects at a typical scale of 1" = 20' (full-size or scale) or 1" = 40'. Half-size, scale, or rural projects may use a typical scale of 1" = 100' and 1" = 200', unless otherwise approved or directed, and shall accurately depict the results and details of the fieldwork, research, and computations as compiled and checked.

For initial submission, plotted drawings may be on paper, in the same sizes listed above, or as requested by the city project manager. Information may also be submitted in electronic form according to city standards.

If required, full-size drawings shall be plotted on 22" x 34" media. Half (½) scale drawings shall be on 11" x 17" media. Bond paper may be used for initial submittal. Mylar shall be used for all final drawings.

No plat, map, or drawing shall be made on a sheet size smaller than 8½"x 11".

All information, existing topographic features, right-of-way or control monuments, or property corners, whether found or set, shall be represented on a map and in the computer file(s) in the properly dimensioned location. Some projects (i.e., right-of-way acquisition) may require that other features be labeled and dimensioned as to size, height, width, or depth and referenced to the nearest right-of-way or property line. Site maps for architectural design may require other symbology.

The Texas State Plane Coordinate System, South Central Zone, based upon NAD 83(93) or NAD 83(CORS), shall be used, and the proper adjustment factor, theta angle, and reference monument information shall be noted.

For purposes of all COSA projects, a statement containing the above information shall be placed on all drawings and/or included with all computer files that provide information or “metadata” on the control monumentation, NGS, or other reference used as a basis.

Table 3-10: Title Sheet - Deliverables for Topography Survey (	
A title/cover sheet shall be prepared for each project, if applicable, that includes the following items:	
☐	location of the route or project being mapped
☐	appropriate location sketch
☐	station numbers of the project’s beginning and end
☐	project numbers
☐	stated scale of the drawing with a graphic scale
☐	project description
☐	survey date
☐	for larger projects, a sheet index may be preferred
☐	statement of the basis for horizontal and vertical control, including information listed in sections below
☐	if prepared by a consultant, the company name, address, and phone number

Table 3-11: Horizontal Control - Deliverables for Topography Survey (	
Horizontal Control deliverables shall include the following:	
☐	For COSA purposes, the Texas State Plane Coordinate System, South Central Zone of NAD83(93) or NAD 83(CORS) shall be used.
☐	Map coordinates and distances shall be in surface measurements, and the SAF must be indicated to allow for return to SPC.
☐	A statement shall also be made specifying the proper zone, referenced traverse or triangulation station(s), and the published coordinates of the station(s) used, along with elevation.

Table 3-12: Vertical Control - Deliverables for Topography Survey (	
Typically, COSA elevation basis is one of the following: (1.) an existing project (datum specified by project) (2.) NAVD 88 A statement of the basis of elevations, similar to one of the following examples, shall be made in computer files and placed on all map prints:	
☐	Elevations refer to: ▪ a benchmark (BM) set near the NE corner of the intersection of First St. and Ave. B (Location) ▪ an “X” on top of a concrete inlet (description) ▪ Elevation is 200.00 feet ▪ referenced datum of Project No. 0000
☐	Elevations are based upon NGS benchmark A1422, NAVD 88, published elevation: 326.42 ft. (1988 Adjustment)

Table 3-13: Certification - Deliverables for Topography Survey (	
Horizontal Control deliverables shall include the following:	
☐	For COSA purposes, the Texas State Plane Coordinate System, South Central Zone of NAD83(93) or NAD 83(CORS) shall be used.
☐	Map coordinates and distances shall be in surface measurements, and the SAF must be indicated to allow for return to SPC.
☐	A statement shall also be made specifying the proper zone, referenced traverse or triangulation station(s), and the published coordinates of the station(s) used, along with elevation.

Table 3-14: Certification - Deliverables for Topography Survey (			
While COSA contract requirements call for supervision and monitoring by a Registered Professional Land Surveyor signing and sealing a topographic survey, a digital terrain model or preliminary design survey is not usually required. The following information is excerpted from the TSPS Manual of Practice:			
Condition	**I** **Urban Business, District Urban, Suburban, and Industrial**	**II** **Rural and Broad Area General Mapping**	**Remarks and Formulae**
Error in Traverse Closure	1:10,000	1:7500	System Control Loop
Unadjusted Level Loop Closure (ft.)	.04	.08	System Control Loop M=Miles
Secondary Traverse Closure	1:7500	1:5000	Between System Control Points
Secondary Level Loop Closure (ft.)	.05	0.2	Between System Control Points
Positional Error of Any Primary Monument (horizontal)			For monuments used for Triangulation or Radial Surveying in respect to another
Positional Error of Any Primary Monument (vertical)	1:15000	1:10000	
*Contour Interval			For permanent bench marks
Contour Accuracy	± .03 ft.	± 0.15 ft.	Or as needed by the COSA
Positional error of any Photo Control Point (horizontal and/or vertical)	2 ft.	10 ft.	
Location of Improvements, Structures, and Facilities during survey	± ½ Contour Interval	± ½ Contour Interval	Or as recommended by Photogrammetrist
Plotted location of Improvements, etc.			Vertical (inverts, flow lines) Horizontal
Scale of maps sufficient to show detail, but no less than	0.50 ft.	2 ft.	Symbols may be used for large scale maps indicating Center point

3.9.4.7 Scope of Service for DTM Survey

Phase 1 — Establish Primary Project Control

- Establish Texas State Plane Coordinate project control. Also, recover any NGS first order horizontal and first order vertical control stations in the vicinity of the project limits.
- Establish proposed location of a new monument pair, complete GPS obstruction field sketches, and communicate with and receive approval from the city project manager as to the proposed location of all new monuments.
    - GPS monuments, 1 pair (Station with Azimuth) set 300 feet outside the project limits at both ends of the project. Selected locations shall be free of overhead obstructions above a 15 degree elevation mask to allow for optimum satellite reception. Any deviation from this requirement must have prior approval from the city project manager.
- After approval of the proposed location of all new monuments, set all monuments and complete point sketches with descriptions and reference swing ties.
    - Monuments will consist of consultant's aluminum cap set in concrete.
    - The COSA assigned point number will serve as the station ID. The surveyor is responsible for purchasing materials for new monuments.
- Create a GPS survey plan and review with the city project manager, before proceeding.
- Perform a GPS static survey of all stations using dual frequency GPS survey equipment.
    - GPS methods may be used to establish elevations, if no vertical control is within the vicinity of the project. Otherwise, conventional three-wire leveling or digital leveling is required, holding existing COSA or NGS vertical control and following stated standards.
- Process, analyze, and adjust the data. Final coordinates should be provided in the Texas State Plane Coordinate System, South Central Zone, in U.S. Survey Feet. Provide coordinates in NAD83/93 or NAD 83(CORS). Vertical positions should be provided in NAVD88.
- Create approved COSA monument datasheets for all new monuments. A datasheet example will be provided upon request.

Phase 2 — Establish Secondary Control

- Set additional secondary control points along the project route, to be used for topographic features and cross sections. Additional secondary control points will be ½" iron pin with company caps and must be established by a closed traverse.
- Vertical established on control points must be tied to a minimum of two separate benchmarks and/or looped back to the starting benchmark.
- If a FEMA RM (Federal Emergency Management Agency Resource Management) is in the area, tie in for vertical comparison.

Phase 3 — Recover/Reestablish Apparent Right-of-Way

- Recover and/or reestablish apparent right-of-way within project limits. Apparent right-of-way is visible, evident, obvious, open to view, or appearing as real.

Phase 4 — Digital Terrain Modeling (DTM)

- Project Name: The COSA MicroStation® file project name will be assigned by the city project manager.
- Length of DTM: Collect data for a minimum of 200 feet from both ends of the project limits or as directed.
- On side streets, extend 100 feet past the right-of-way or as directed. Also, cross-section upstream and downstream creeks for a minimum of 500 feet at 50-foot increments and each side of the center of stream bed extending 10 feet beyond the top of bank.
- Contact utility companies for copies of their utility maps.
- Width of DTM: Collect right-of-way to right-of-way (fence line to fence line) and extend three feet beyond the right-of-way line.
    - If applicable, the DTM shall include a minimum of break lines, roadway striping, edge of pavement, or edge of gravel, top and bottom of bank, spot elevation, and high and low points. If applicable, locate the top edge of pavement, if a grade break exists between natural ground and the edge of pavement.
    - Only COSA feature codes (see Appendix 3B) will be allowed when collecting the DTM (if needed, contact COSA for current feature code list).
    - Tie in visible right-of-way monuments.
    - Topographic shots will not exceed 450 feet from the instrument and distance between ground shots and spot elevations will not exceed 50 feet.

- Tie in all drainage structures, defining break lines around each end of the culvert or bridge.
- Provide a field drawing of each headwall to all culverts, including pipe culverts.
  NOTE: Digital photographs may be used in addition to sketches.
- Locate all visible utilities within project limits and provide ownership information and utility pole tag numbers as a PD tag, if applicable. Contact 1-800-344-8377 (DIG-TESS) to mark underground utilities. Utility alignments shall be included in CAD PD files.
- Locate all driveways when collecting DTM and provide PD of type (i.e., gravel, concrete, etc.).
- Locate trees, within and three feet beyond the existing right-of-way, which have a trunk diameter of four inches or greater at chest height and provide species and drip-line diameter as a PD tag. Right of entry will be required from property owner(s).
- When locating road signs, provide a description of sign type(s) and any labeling on signs (use PD tag).
- Provide a description of each instrument setup and back sight with the height of instrument and staff height noted. The last shot of each setup shall be to a control point.
  NOTE: Digital photographs may be used in addition to sketches.

Deliverables

▪ Horizontal control layout on 11" x 17" Mylar, with one-inch left border. (See Appendix 3C.)

▪ Submit the following digital data on CD:

- Complete backup of all the project data including the project report and digital photos.
- Raw GPS files in RINEX (Receiver Independent Exchange) format.
- An ASCII (American Standard Code for Information Interchange) file of the final position information for inclusion into COSA GIS database.
- MicroStation V8 2D and 3D Annotated (.dgn) files with an ASCII file. MicroStation files must comply with COSA V8 level structure.
- The CD shall be labeled with a minimum of project name, limits, and units.

3.10 Construction Surveying

3.10.1 Overview

It is not the intent of the city to develop a strict guideline of policy and procedures for project engineers, project managers, and construction inspectors to follow in the area of construction surveying.

3.10.2 Surveying Suggestions

The following surveying suggestions may aid a project manager or inspector:

- The project surveyor for an individual project should establish the horizontal and vertical control. Project surveyors working for any subsequent construction contractors should be required to use the initially established control when establishing baselines/secondary control.
- Conduct periodic spot-checks of the contractor’s completed surveying. This should be accomplished by city surveyors or by an independent existing consulting surveyor under contract with the city for that project. Spot-checks can alleviate undue pressure on the project manager or inspector.

The following checklist may be used by the project manager to review a contractor’s work:

Table 3-15: Survey Checklist; Contractor Work Review (		
Item	**Min. Frequency**	**Remarks**
Benchmarks	ALL	Includes all BMs and TBMs set by contractor
☐ Culverts & Storm Sewers		
☐ Flow Lines	50%	Both U.S. and D.S. [upstream and downstream] flow lines should be checked. This check should include two of the first three lines the contractor places. There should also be intermediate checks on long structures.
☐ Alignment	25%	This includes station location and placement angle.
Inlets and Manholes		
☐ Grade	25%	This includes checking calculations at each end of curb inlet to assure proper alignment with curb. Top

Table 3-15: Survey Checklist; Contractor Work Review (continued)			
Item		**Min. Frequency**	**Remarks**
			grades and flow lines of manholes and drop inlets should be checked.
☐	Location	25%	Includes station and offset.
Bridges			
☐	Alignment	100%	Check Contractor's control points.
☐	Deck Grades	50%	At least ½ of the bridge overhangs should be checked at 50 ft. intervals.
☐	Drilled Shafts and Piling	100%	Check distance between shafts or piling.
☐	Columns	100%	Check plumb before placing concrete.
☐	Caps (Bearing Seats)	50%	Check for location and elevation prior to placing concrete.
☐	Caps (Dowel Bars)	100%	Visually check location and projection.
Roadway			
☐	Grade	10%	
☐	Width	1 per 2000'	
Retaining Walls			
☐	Height	1 per section	The first footing and wall the contractor forms should be checked.
☐	Footing Elevations	1 per wall	

NOTE:

- In all cases, records should be made of the survey checks and any corrections made. A daily report form may be used.
- If the contractor demonstrates a propensity for erroneous surveying, the frequency of checks should be inversely proportionate to the quality of the contractor's work product so far.
- Checks by city personnel are not intended to relieve the contractor of responsibility for accuracy. All survey checks should be random and independent.

3.10.3 Construction Survey Specifications

For construction survey specifications, see Category 5 section in the TSPS *Manual of Practice for Land Surveying in the State of Texas*, available for purchase.

3.11 Aerial Photogrammetric Control

3.11.1 Survey Guidelines

Survey Guidelines utilize the following organizations and documents:

Texas Board of Professional Land Surveying (TBPLS):

- *The Professional Land Surveying Practices Act*
- *General Rules of Procedures & Practices*

Texas Society of Professional Surveyors:

- TSPS Manual of Practice Category 6
- TSPS Manual of Practice Category 7
- TSPS Manual of Practice Category 8
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3.11.1.1 Units: U.S. Survey Feet

There is a unit of measure called the "U.S. Survey Foot." It is almost exactly equal to a standard foot, but its definition is slightly different:

- Standard (or "international") foot = .3048 meters
- U.S. Survey Foot = 1200/3937 meters

In other words, one is defined in relation to the meter by a decimal expression; the unit of measure defining the other is a fraction.

3.11.1.2 Horizontal Datum: NAD 83(93) or NAD 83(CORS)

Texas State Plane Coordinate System, South Central Zone

3.11.1.3 Vertical Datum:

NAVD 88

3.11.1.4 Surface Adjustment Factor

Reciprocal value of the Combined Adjustment Factor: The Surface Adjustment Factor for projects within Bexar County will be 1.00017.

3.11.2 Survey Safety — Required Items for Project Safety

- Proper traffic control devices in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD) shall be used when instruments/equipment are on or adjacent to the roadway.
- A set of warning signs will be used to warn that survey crews are working in or next to the roadway and should measure 48" x 48" when working on major highways (Texas MUTCD). Survey personnel will wear safety vests at all times. Company vehicle(s) will have safety flasher (strobe) lights.
- If additional work is required outside of the right-of-way, prepare and send right-of-entry letters to all landowners affected by the survey.
- Before setting any subsurface monuments, such as GPS points or benchmarks, all utilities in the area of proposed points must be located by calling 1-800-344-8377 (DIG-TESS).

3.11.3 Photogrammetry

3.11.3.1 Control Target Documentation

All control points will be documented with a:

- graphical representation of the location of markers
- textual documentation in the form of a spreadsheet

The above information shall be provided to the city project manager. However, the city project manager may require additional documentation, depending on the requirements of the project.

3.11.3.2 Graphical Information

Graphical documentation presented as a sketch or CAD drawing shall include the following information:

- Spatial location of control point with sufficient detail to allow recovery of the point in the field
- Map scale and north arrow
- Stationing annotated project centerline or roadway alignment (if available) as supplied by the city

3.11.3.3 Textual Information

- Date of installation
- Highway name and project limits
- General description of the location of point referenced to highway intersections, city limits, etc.
- COSA work order number
- Identification of reference coordinate system and elevation datum
- Combined surface adjustment factor (CAF) or COSA SAF
- Point coordinates identified as being either grid or surface

Textual documentation shall be submitted using a Microsoft® Excel spreadsheet.

The standard deviations computed from the network adjustment shall be included on this form.

3.11.4 Control Targets: General

The secondary control network described in the previous section is marked with cross-shaped targets during the aerial photography flight. The targets are visible on the developed aerial film and are used to relate the aerial photography to the ground. Targeting is an essential part of photogrammetric mapping. Studies conducted by the Federal Highway Administration (FHWA) determined that pre-marked targets improve the efficiency of photogrammetric processing and increase overall accuracy of point measurements.

A right-of-entry agreement with a landowner must be obtained prior to entering private property to set photogrammetric control. The agreement shall include detail on the length of time that the control target will be on the ground and those responsible for removal of the material. The agreement may include additional detail, such as specific times for access to the property or conditions on notification before entering the property.

Targets may be placed on hard surfaces, such as pavement or concrete, or on soft surfaces, such as soil, gravel, or grass. In general, hard surfaces are preferred because point measurements, both for the surveyor and for the photogrammetrist, are more accurate on a hard surface. In addition, a hard surface allows targets to be painted, which increases the durability and longevity of the mark.

The cross-shaped target is centered on the PK (Parker-Kalon) nail, iron rod, or other surveying marker that defines the control point. On hard surfaces the targets shall be painted using flat finish paint. The target color shall be either white (on darker background surfaces) or black (on lighter background surfaces). Contrast between the target and the background material is important for point measurement in the photogrammetric process. It is permissible to use both paint colors, one as a background color and the other as the target color, to enhance the contrast further. However, in general, white targets are preferred.

On soft surfaces the target is constructed of cardboard, sheetrock, plastic film, Tyvek, or other similar materials durable enough to remain in place until the flight mission is complete and the film has been inspected. Once the flight mission has been approved, the target materials shall be collected.

Placement of control targets shall meet the following criteria:

- The target should be clear of any obstruction that may obscure the target on the aerial photography. When standing on the target, there should be a clear view of the sky from 45º above the horizon to zenith in every direction.
- The target shall be placed as flush to the ground as possible. Any vegetation that may grow beneath the target should be cleared prior to placing the target material. Vegetation growth can cause a target to bow, affecting the accuracy of the photogrammetric measurement.
- Targets should not be placed in a shadow or in a shady area. It is advisable to visit target locations at the approximate time of the planned flight mission to determine the location of shadows.
- Placement of targets beneath overhead wires should be avoided. Overhead wires make measurement of the targets in the photogrammetric process problematic.
- Targets should be placed on as level an area as possible. If a target must be placed on a slope, the target should be oriented so that two of the legs that form a straight line traverse the slope at approximately the same elevation.
- The horizontal coordinate provided for the target shall be at the center of the target at the location of the control monument. The vertical elevation of the target shall be at the center of the target at the level of the target material. This is important because the photogrammetric measurement of the point is made at the elevation of the target material, which may or may not be the elevation of the survey marker.

3.11.5 Control Targets: Design

Figure 3-4: Target Design and Dimensions Example, found on page 89, shows the design of a typical control target. Note that the size of the target is dependent on the scale of the aerial photography for which it will be used.

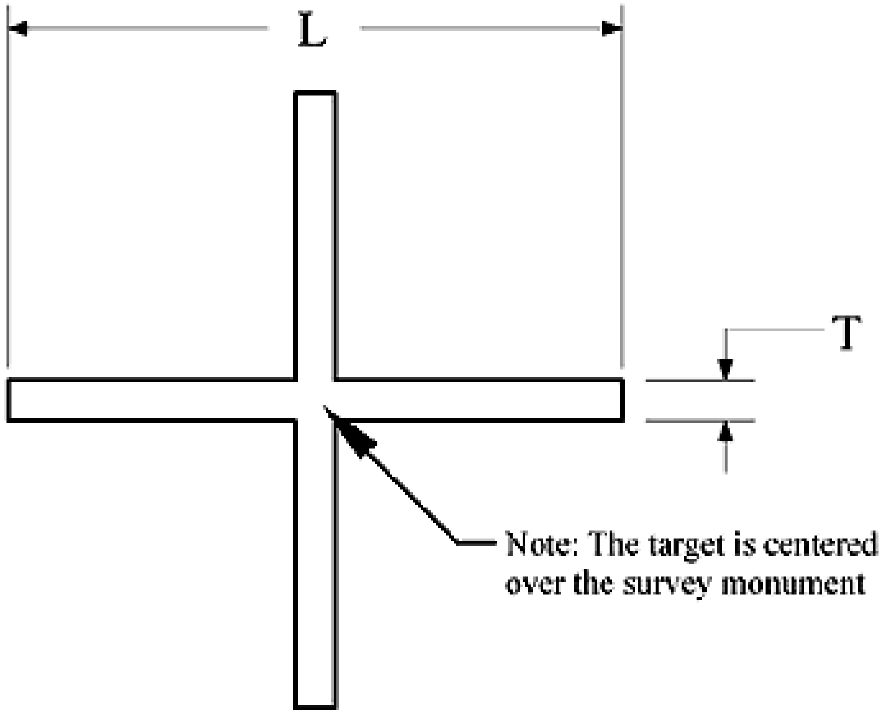

Figure 3-4: Target Design and Dimensions Example

For a typical 1" = 250' photo scale, the dimensions of the target are:

Thickness (T) = 6" and Length (L) = 84".

Figure 3-5: Box Target Design Example, on page 90, shows the design of a box-type target used to designate new flight tangents.

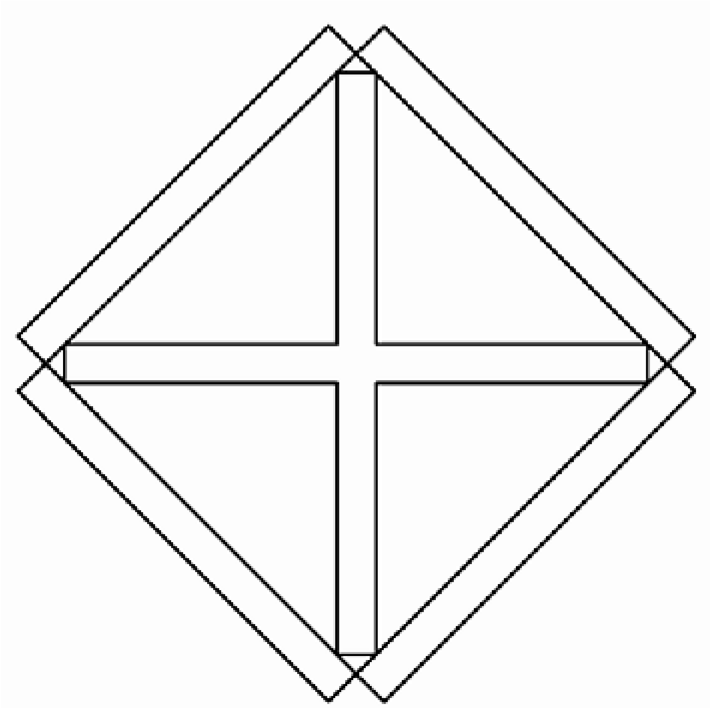

Figure 3-5: Box Target Design Example

A flight tangent is a single, straight flight line maintained by the aircraft. Anytime the aircraft has to make a turn to maintain photo coverage over a roadway, that turn and new flight direction constitute a new flight tangent. Generally, a point of intersection (PI) in a roadway of 15 degrees or more will require a new flight tangent.

3.11.6 Control Targets — Placement

Placement of the secondary control network survey markers and targets shall adhere to the following requirements:

- A band of control is placed 300 to 500 feet before the beginning and ending control bands for the project. A band of control is defined as being the centerline survey marker and its associated wing markers.
- Control bands are placed at 1,500 feet maximum and 1,000 feet minimum intervals along the flight line. The maximum distance between bands can be increased to 1,800 feet, but not for two or more consecutive bands.
- Wing markers are set at the width of the mapping area, with a maximum distance of 600 feet from the centerline. The minimum distance is typically 200 feet from the centerline marker. However, in situations where access to private property is denied or physical features prevent placement at the minimal 200 feet, the target can be placed at the edge of the right-of-way.

- The first and last centerline survey point of each separate flight line shall be constructed as a “box” marker. Note that if the roadway being covered by the aerial photo mission has a point of intersection greater than 15 degrees, a new separate flight line will be required to maintain photo coverage. In this case the new flight line will require box panels at the beginning and ending of the flight line.
- All flight lines require a minimum three (3) horizontal markers.

Figure 3-3 below illustrates the control marker and target layout for a typical aerial mapping project. Note the PI that occurs towards the center of the figure and the corresponding control point locations.

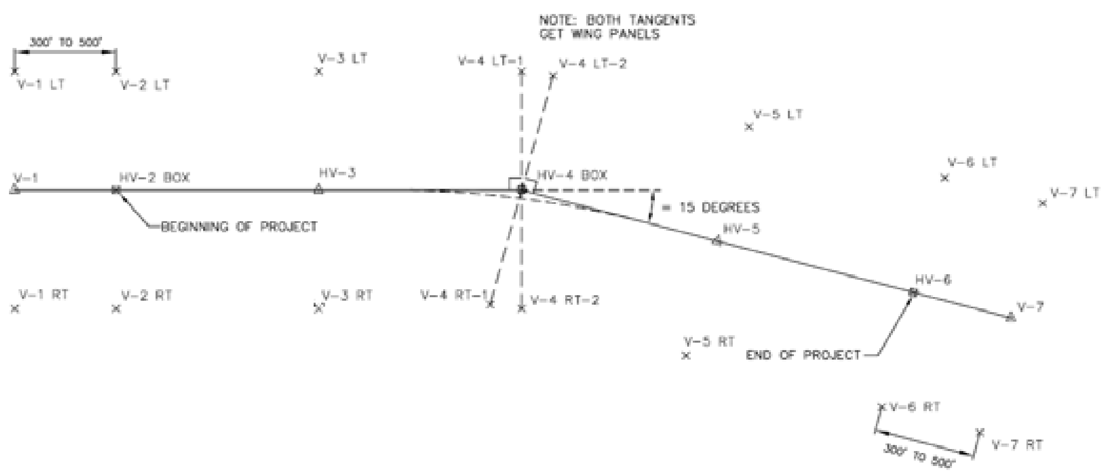

Figure 3-6: Control Target Layout and Naming Example

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Section 4 Drainage

4.1 Introduction

This section provides criteria for performing drainage design and guidance on what standards the drainage design shall conform to. It is not the intent of this manual to instruct the design engineer in the usage or applicability of these criteria. Engineering training, experience, and judgment must be used in the performance of drainage design tasks. The means and methods used in completing the design are under the direction of the design engineer, who will be required to submit supporting design calculation summaries and software models as part of the plan submittals during the various phases of the design. The drainage calculation results will be required in the plan of record. Drainage calculation summary formats are included in this section of the manual.

The Unified Development Code (UDC) is the basic reference for drainage design, although it does not address some drainage design items in sufficient detail. The TxDOT Hydraulic Design Manual has been referenced to cover some of these areas. Note that the city requires designs to conform to different storm frequencies than TxDOT does. A performance check using City of San Antonio design storm criteria may be necessary for project designs governed by TxDOT design storm criteria.

The drainage design criteria reference the documents listed below. These reference documents are not duplicated to avoid discrepancies that may develop as these references are updated.

- City of San Antonio Unified Development Code

  https://library.municode.com/tx/san_antonio/codes/unified_development_code

  - Appendix H – Storm Water Design Criteria Manual
    https://library.municode.com/tx/san_antonio/codes/unified_development_code?nodeId=APTOWADECRMA

  - Appendix F – Floodplains – Areas of Special Flood
    https://library.municode.com/tx/san_antonio/codes/unified_development_code?nodeId=APXFFLRESPFL

- *TxDOT (Texas Department of Transportation) Hydraulic Design Manual*

  http://onlinemanuals.txdot.gov/txdotmanuals/hyd/index.htm

- San Antonio River Authority

  - San Antonio River Basin Regional Modeling Standards

    - Reports and Studies

https://www.sara-tx.org/public-services/reports-and-studies/

- *San Antonio River Basin Regional Modeling Standards for Hydrology and Hydraulic Modeling*

  https://www.sara-tx.org/wp-content/uploads/2015/04/San-Antonio-River-Basin-Regional-Modeling-Standards.pdf

- San Antonio River Basin Low Impact Development Technical Guidance Manual
  - Developer Resources

    https://www.sara-tx.org/public-services/development-resources/

  - *San Antonio River Basin Low Impact Development Technical Guidance Manual*

    https://www.sara-tx.org/wp-content/uploads/2015/11/SARA-Full-LID-Manual.pdf

- U.S. DOT FHWA (Department of Transportation, Federal Highway Administration)
  - Hydraulic Design Series, No. 5
    - Hydraulic Design and Analysis, Principal Documents

      https://www.fhwa.dot.gov/engineering/hydraulics/culverthyd/culvert.cfm

    - *Hydraulic Design Series No. 5, Hydraulic Design of Highway Culverts*

      https://www.fhwa.dot.gov/engineering/hydraulics/pubs/12026/hif12026.pdf

  - Hydraulic Engineering Circular No. 14
    - U.S. DOT FHWA Hydraulic Design and Analysis, Principal Documents

      https://www.fhwa.dot.gov/engineering/hydraulics

    - *Hydraulic Engineering Circular No. 14, Hydraulic Design of Energy Dissipators for Culverts and Channels*

      http://www.fhwa.dot.gov/engineering/hydraulics/pubs/hec/hec14SI.pdf

- *Open Channel Hydraulics* by Ven Te Chow, McGraw-Hill, 1959, ISBN: 978-0070107762.

Table 4-1: Drainage Plans & Calculations Submittal Requirements on page 99 depicts the sections of drainage design and the appropriate document and section to reference for specific design criteria and guidance.

4.2 Design Criteria

The City of San Antonio, Bexar County, and the San Antonio River Authority (SARA) have an agreement of understanding to address common flooding and drainage issues. These three agencies, along with 19 suburban communities, have formed the Bexar Regional Watershed Management (BRWM) partnership. A BRWM technical committee agreed on and adopted regional modeling standards, which are to be used when modeling floodplains and watercourses.

The BRWM has produced a number of hydrologic and hydraulic models of major watercourses in Bexar County. These studies are based on regional modeling standards and can be used for detailed planning and design purposes. Study data and documentation can be found at, and downloaded from, SARA's D2MR website: http://gis.sara-tx.org/D2MR/

Coordination is required to determine applicability to a specific project prior to using these models. The BRWM models will be discussed with city staff during scoping meetings, and their applicability and degree of usage will be specified in the design summary report.

4.2.1 Hydrology

Chapter 5 of the Storm Water Design Criteria Manual (SWDCM) found in Appendix H of the UDC lays out the methods to use in establishing project hydrologic values.

Areas that are smaller than those portions of the watershed shown in BRWM studies should be analyzed individually by the design engineer using the methods outlined in Chapter 5 of Appendix H.

4.2.2 Floodplain Analysis

BRWM hydraulic models may be used if applicable for the project or study area.

The TxDOT Hydraulic Design Manual, Chapter 7, Section 2, *Stream Channel Planning Consideration*, and Section 4, *Stream Stability Issues* may be referenced for additional information.

Projects may require one or more of the following:

- Conditional Letter of Map Revision (CLOMR)
- Letter of Map Revision (LOMR)
- Floodplain Development Permit (FPDP)
- other permits

These requirements will be discussed in the DSR and at the initial scoping meeting. The permits and plans shall be developed in accordance with applicable state and local requirements.

Appendix F of the UDC references the Floodplain Ordinance that is applicable within City of San Antonio jurisdiction. Sections of Appendix F may apply to projects which are located, either entirely or partially, within a FEMA Special Flood Hazard Area.

4.2.3 Hydraulics

The hydraulic design for each project can be divided into five areas of concern: channels and improved watercourses, bridges, culverts, streets, and storm sewer systems.

4.2.3.1 Channels and Improved Watercourses

Channels and improved watercourses will be designed using the criteria outlined in Chapter 9 of UDC Appendix H.

4.2.3.2 Bridges

Bridges will be analyzed in conjunction with floodplain analyses or channels and improved watercourses. Refer to Chapters 5 and 11 in Appendix H of the UDC for hydrology and bridge hydraulic design criteria, respectively, and to Chapter 9 (Bridges) of the TxDOT *Hydraulic Design Manual*. Scour calculations will be required on all new and existing structures. Scour must be calculated for the Ultimate one (1) percent annual chance design storm (100-year Ultimate).

4.2.3.3 Culverts

Culverts may be designed by means of hand calculations or using available software. The design will follow the approach in:

- City of San Antonio Storm Water Design Criteria Manual (Chapter 10)
- TxDOT Hydraulic Design Manual, Chapter 8
- U.S. DOT FHWA Hydraulic Design Series No. 5, Hydraulic Design of Highway Culverts

Minimum culvert velocities shall be as specified in the TxDOT *Hydraulic Design Manual*.

The decision between constructing a culvert or a bridge requires an evaluation of initial cost, maintenance, and environmental and operational considerations. Generally, culverts that span a distance of 30 to 50 feet could be replaced with a span bridge.

4.2.3.4 Streets

Streets are often used for drainage conveyance in San Antonio. The limitations for pavement/street drainage are outlined in Chapter 6 of UDC Appendix H. UDC Section 35-506(d) provides some additional guidance regarding cross-section design for streets. The design engineer will provide calculation data showing that velocities are acceptable and ponding widths are within limits. The pavement design shall consider the effects of water inundation at sags and low areas.

4.2.3.5 Storm Sewer Systems

Refer to Chapters 7 and 8 of Appendix H in the UDC for criteria on storm sewer design. The preference of the city is to use curb inlets, combination curb and grate inlets, or a 4-way inlet. Grate inlets should be used only under isolated situations and only with the specific approval of Storm Water Engineering staff. The use of grate inlets requires special considerations such as nuisance noise, fastening/securing of the grates, increased maintenance activities, and ADA, pedestrian, and bicyclist mobility.

Junction losses can have a significant effect in the design of storm sewers and should be considered in the design. Historically, the city has used *Pressure Changes at Storm Drain Junctions, Engineering Bulletin No. 41*, University of Missouri (Sangster, Wood, Smerdon, and Bossy, 1958), commonly called the “Missouri Charts.” Appendix B of the *Storm Water Design Criteria Manual* includes Missouri Chart instructions, equations, and figures. This publication may be used, although other options are available for the designer to use, including several storm sewer design computer programs that contain options to calculate junction losses.

Junction boxes or manholes, as appropriate, shall be constructed at spacing not to exceed 500-ft and used to join multiple lines and at locations of change in storm sewer grade or alignment. The riser portion of a junction may be placed on the top of a box culvert for this purpose, with the inclusion of sufficient details and standard drawings. Providing proper maintenance access for particularly deep storm sewer trunklines shall be a consideration during design. Cast-in-place steps might be required in manhole risers with depths exceeding the 10 to 12 foot range. The use of pre-cast bend, tee, or wye storm sewer products should generally be avoided, but may be considered on a case-by-case basis after proper coordination with city engineering and maintenance staff.

Junction box size selection shall take into consideration the skew angle of the connecting storm line(s) as well as storm pipe (RCP) or box (RCB) wall thickness so that junction box modifications that might impact the structural integrity of the junction box can be avoided. Concrete collar detail(s) for providing an adequate connection of the storm sewer line to the junction box will be included in the design plans. Concrete collars connecting individual storm sewer lines in series (e.g., existing pipe to proposed pipe) will be permitted only on a case-by-case basis for isolated situations after proper coordination with city staff.

Curb inlet extensions are permitted only on the upstream side of on-grade inlet configurations. Only one extension per full depth inlet box is permitted unless the design engineer provides documentation or calculations showing that the use of more than one extension will not introduce a storm runoff capture restriction in the storm sewer system. Curb inlet extensions are typically not permitted at inlets in a sag (sump) configuration. Generally, only full depth inlet boxes will be permitted in sag configurations due to maintenance concerns.

When connecting proposed storm sewers with existing storm sewers, the beginning water-surface elevation needs to be identified or calculated. Use existing plan information when available. The starting water-surface elevation shall be documented in the design summary report (DSR) and determined by the design engineer with concurrence from Storm Water Division staff.

4.2.3.6 Conduit Strength and Durability

Concrete pipe class can be determined using Table 1 and 2 from item 401 of the City of San Antonio Standard Specifications for Public Works Construction.

- Standard Specifications and Details

  http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Standard-Specifications-and-Details

- *City of San Antonio Standard Specifications for Construction*

  https://www.sanantonio.gov/Portals/0/Files/CIMS/StandardSpecifications/CIMSConstructionSpecifications062008.pdf

  (ITEM 401 Reinforced Concrete Pipe, page 226 of June 2008 edition)

Reinforced concrete pipe is the required drainage conveyance in pipe systems. Corrugated metal pipe and HDPE (high-density polyethylene) pipe shall be considered on a case-by-case basis in non-roadway areas.

4.2.4 Erosion and Stabilization

Chapter 9 of UDC Appendix H addresses acceptable channel surfaces and linings for various velocity conditions. The design must minimize channel erosion along both the channel bottom and side-slopes. The designer should consider grass, concrete retards/drops, or concrete riprap lining as the standard surfaces for channels.

The design engineer should utilize appropriate erosion control measures, velocity control measures, or a combination of the two at storm sewer systems outfalls, where the channel lining type transitions from concrete to vegetated, or where velocities warrant. The design engineer should also rely on project geotechnical reports for site-specific guidance related to erosion and stabilization. The goal when specifying these measures should be to control velocity and discourage erosion to reduce long-term maintenance and repair activities by city crews.

The design engineer may consider erosion control mats in conjunction with vegetative control to line channels. The design must consider operation and maintenance practices and the durability of the specified mat and vegetative control. Some of these special circumstances could be the protection of outlets and outfalls and the lining of improved channels. These concepts should be discussed during the scoping and preliminary meetings to determine project requirements and appropriateness.

Rock-filled wire baskets/mattresses (Gabion baskets, Gabion mattresses, Reno mattresses) and rock riprap may also be used in special circumstances, and with approval for a single project application. The design must follow applicable HEC (Hydrologic Engineering Center) guidelines. Transitions from concrete rip-rap to vegetative channel linings, storm sewer outfall locations, abutments, slopes, and other bridge features may be appropriate areas. Use of these protection methods should be discussed during the scoping and design meetings to determine project requirements and appropriateness.

The Storm Water Pollution Prevention Plan (SW3P) will address erosion control and stabilization methods to be used during construction of the project. Best management practices will address those design concepts that can best manage erosion control and stabilization when the project is completed.

4.2.5 Plan Submittal Requirements

Table 4-1: Drainage Plans & Calculations Submittal Requirements lists the plan requirements for various project phases.

Table 4-1: Drainage Plans & Calculations Submittal Requirements

Design Criteria		PER	40%	70%	95%	Bid Docs
Hydrology (Plans)						
	Drainage area map(s)	x	x	x	x	x
	Interior drainage area map(s)		x	x	x	x
Hydraulics (Plans)						
Channels and Improved Watercourses	Plan of watercourse	x	x	x	x	x
	Typical sections	x	x	x	x	x
	Proposed cross-sections		x	x	x	x
	Plan and Profile sheet(s)		x	x	x	x
	Details: Concept	x				
	Details: Final			x	x	x
	Hydraulic Computation sheet(s)		x	x	x	x
	HGL/EGL		x	x	x	x
Bridges	Location	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*
	Layout	*(1)*	*(1)*	*(1)*	*(1)*	*(1)*

Table 4-1: Drainage Plans & Calculations Submittal Requirements (continued)						
Design Criteria		**PER**	**40%**	**70%**	**95%**	**Bid Docs**
	Hydraulic data sheet(s)		x	x	x	x
Culverts	Layout	x	x	x	x	x
	Plan and Profile sheet(s)		x	x	x	x
	Details: Concept	x				
	Details: Final			x	x	x
	Hydraulic Data sheet(s)		x	x	x	x
Streets	Hydraulic Computation sheet(s)		x	x	x	x
Storm Sewers	System layout	x	x	x	x	x
	Plan and Profile sheet(s)		*(2)*	x	x	x
	Inlet sections			x	x	x
	Details: Concept	x				
	Details: Final			x	x	x
	Hydraulic Computation sheet(s)		*(2)*	x	x	x
	HGL/EGL		*(2)*	x	x	x
Low Impact Development (LID)	Conceptual layout / conceptual details	x				
	LID layout sheets		x	x	x	x
	LID details			x	x	x
Floodplain Analysis (Plans)						
	Plan of watercourse	x	x	x	x	x
	Profile of:					
	Existing ground		x	x	x	x
	Proposed invert/grading		x	x	x	x
	Water surface elevations		x	x	x	x
	Cross-sections		x	x	x	x
	HEC-RAS detailed calculations		x	x	x	x
	HEC-RAS summary	x	x	x	x	x

Table 4-1: Drainage Plans & Calculations Submittal Requirements (continued)						
Design Criteria		**PER**	**40%**	**70%**	**95%**	**Bid Docs**
Erosion & Stabilization (Plans)						
	SW3P narrative			x	x	x
	SW3P details			x	x	x
	SW3P summary / quantities			x	x	x
	SW3P BMP layout plan / phasing			x	x	x
	SW3P BMP (conceptual)	x				
	Outlet / outfall stabilization			x	x	x
Hydrology (Calculations)						
	Discharge calculations	x	x	x	x	x
	Time of concentration calculations	x	x	x	x	x
	SCS Curve Number & C-value calculations	x	x	x	x	x
	Percent impervious cover	x	x	x	x	x
	Frequency of coincident occurrence	x	x	x	x	x
Hydraulics (Calculations)						
Channels and Improved Watercourses	HEC-RAS analysis	x	x	x	x	x
	Manning's Equation	x	x	x	x	x
Bridges	HEC-RAS analysis	x	x	x	x	x
	Scour analysis & calculations	x	*(2)*	x	x	x
Culverts	Tailwater calculations		x	x	x	x
	Culvert sizing	x	x	x	x	x
	Energy dissipation / velocity control	x	x	x	x	x
	Soil stabilization (if required)			x	x	x
Storm Sewers	Conceptual layout / system feasibility	x				
	Conveyance calculations		*(2)*	x	x	x
	Inlet sizing		*(2)*	x	x	x
	Discharge summary	x	x	x	x	x

Table 4-1: Drainage Plans & Calculations Submittal Requirements (continued)						
Design Criteria		**PER**	**40%**	**70%**	**95%**	**Bid Docs**
	Tailwater calculations		x	x	x	x
	Energy dissipation / velocity control		x	x	x	x
	Soil stabilization (if required)			x	x	x
	Street velocities and capacities		*(2)*	x	x	x
Low Impact Development (LID)	LID concept feasibility calculations	x				
	Detailed design calculations		x	x	x	x
Floodplain Analysis (Calculations)						
	HEC-RAS analysis:	x	x	x	x	x
	Existing	x	x	x	x	x
	Proposed	x	x	x	x	x
	Ultimate	x	x	x	x	x
	Erosion and Stabilization			x	x	x
	SW3P Sizing Calculations			x	x	x

(1) Include in roadway plans
(2) These deliverables typically required at 40% but exceptions may be made by project manager for unique situations.

4.2.6 Calculations, Models & Digital Data Requirements

Table 4-2: Facility Design Frequencies, found on page 104, lists the calculation requirements for the various project phases. Chapter 17 of UDC Appendix H discusses some of the common hydrologic and hydraulic software used locally. Chapter 18 of UDC Appendix H discusses some of the local data sources available to design engineers.

Include a CD with applicable calculations, electronic copies of all hydrologic and hydraulic models, and pertinent GIS shapefiles that support the design and modeling for the project with each submittal. Hydrologic and hydraulic models should be updated to be consistent with any project improvement changes since the last submittal. These models should be submitted with each design submittal package whether or not there have been changes to the models, unless the design engineer has otherwise coordinated with Storm Water Division review staff prior to the submittal.

Where HEC-HMS, HEC-RAS, and xpswmm/storm are to be used in accordance with the San Antonio River Basin Regional Modeling Standards, results from these software models must be summarized (tables, graphs, figures, etc.) appropriately in the plans and/or drainage report. Similarly, results from software used to analyze storm sewer systems and detention ponds (regional or local) should be summarized in accordance with these guidelines and staff guidance. Low Impact Development features incorporated into projects must be supported with appropriate design calculations. Paper calculations shall also be submitted in PDF (Portable Document Format).

Composite or weighed calculations shall be supported with a detailed breakdown of the calculation, or otherwise be explained with a note or description in project documentation. Common examples of these calculations include: times of concentration, SCS Curve Numbers, Runoff Coefficient C-values, and Manning's n-values. The detailed calculation breakdown may be included on the design plans (space permitted), drainage report, or a separate technical memorandum or letter if a drainage report is not required for a particular project.

4.2.7 Design by Frequency Selection

Table 4-2: Facility Design Frequencies shows the frequencies to which various drainage elements shall be designed.

Table 4-2: Facility Design Frequencies (1		
Facility Type		**Design Frequency Reference (2)**
Bridges	Design	Appendix H, Section 11.3
	Freeboard	Appendix H, Section 11.3.2
Channels / Watercourses	Design	Appendix H, Section 9.3
	Freeboard	Appendix H, Section 9.3.14 & 9.3.15
Culverts	Design	Appendix H, Section 10.3
Easements	Natural channels	Appendix H, Section 14.3.2
	Other (3)	Appendix H, Chapter 14, various sections
	Storage facilities	Appendix H, Section 14.5
Letters of Map Revision (LOMR) (4)		10-, 50-, 100-, 100F-, and 500-year storm events
Low Impact Development (LID) (5)		Refer to SARA LID Technical Guidance Manual
Pump Stations		Appendix H, Section 12.3.1
Storage Facilities	Dams	Appendix H, Section 13.6 & TCEQ guidance
	Detention	Appendix H, Sections 13.3.2.2 & 13.3.2.5
	Retention	Appendix H, Sections 13.4.1.1 & 13.4.1.3
Storm Sewers	Inlets	Appendix H, Section 8.3
	Laterals & mains	Appendix H, Section 7.3
Streets (6)		Appendix H, Sections 6.1 & 6.2

(1) Table references COSA design frequencies only where COSA design criteria govern; refer to TxDOT guidance where TxDOT design criteria governs.
(2) Appendix H of COSA UDC, also referred to as Storm Water Design Criteria Manual
(3) Based on geometry or dimensions rather than design frequency
(4) Storm events vary by C/LOMR deliverable (e.g., FIS profiles, mapping, etc.); 100F refers to 100-yr Future storm event
(5) Varies by LID BMP; based on volume and/or flow criteria
(6) Varies by roadway classification

4.2.8 Plan Sheet Formats

The design and data shall be presented on various plan sheets. Example sheets with a minimum level of content are included in this manual to show how the design and calculations shall be presented. The design engineer should use judgment as to whether additional information is needed for proper design of the proposed system. The information presented on these plan sheets shall be updated to be consistent with the project design at each successive design submittal. Notes may be added to any of these sheets for purposes of clarification or to provide additional information relevant to the analysis to assist City staff with technical reviews.

4.2.8.1 Drainage Area Maps

The information presented on the drainage area map should include: watershed identification code (from regional modeling standards, if applicable), overall watershed boundary, sub-drainage area boundaries, project drainage area identification symbology, flow arrows, outfall(s), time of concentration flow paths, street labels and topographic contours from COSA GIS mapping or survey data. A background aerial imagery can be included if it is helpful to demonstrate watershed characteristics such as land use or level of development. The design engineer should use good judgment to balance the amount of detail and information presented relative to the scale of the drainage area maps.

Topographic contours used for drainage area maps are generally shown at 1-foot or 2-foot intervals, depending on the type of project, scope of project improvements, and scale of the drainage area maps. Topographic contours shown at other intervals should be discussed with the project management team and Storm Water Engineering staff prior to the submittal.

The drainage area maps should also show design discharge calculations and detailed time of concentration calculations used to determine the discharge(s). At a minimum, the hydrology table on this sheet should include drainage area or concentration/collection point identification names, areas, resulting discharge values, and time of concentration data. Full calculations may be shown on a second sheet if additional space is needed. Discharge calculations for all applicable design storm events (e.g., 5-year, 25-year, 100-year, etc.) shall be included in the hydrology summary table. See Figure 4-1: Drainage Area Map with Accompanying Hydrology Table on page 111 for an example of a drainage area map with accompanying hydrology table.

4.2.8.2 Interior Drainage Area Map(s)

Some projects may benefit from interior drainage area maps which show smaller areas that drain to specific inlets, collection points, or computation points. Similar calculations and information as described in the Drainage Area Map section above should be provided. See Figure 4-2: Interior Drainage Area Map, found on page 112, for an example of an interior drainage area map.

4.2.8.3 Plan of Watercourse

These sheets are often used with floodplain analyses or for watercourse (channel, creek) improvement projects where a FEMA floodplain is not mapped. The purpose of these sheets is to convey pertinent information that supports the hydraulic analysis of a watercourse. These particular sheets may be omitted from the design plans if an associated project drainage report contains work maps with similar information.

These sheets typically include the following information at a minimum: plan view of the watercourse in the study reach, stream centerline, location of cross-sections used in the hydraulic analysis, existing and proposed topographic features that affect the study, appropriate labels, and FEMA Effective, Proposed and Ultimate 100-year floodplain delineations, or as agreed to in project meetings. The Proposed 100-year floodplain does not need to be shown if the contributing watershed is fully developed or nearly fully developed, but a note should be added on the sheet conveying this information. Additional information that is often helpful during technical reviews and can be included on these sheets include: parcel or property boundaries, aerial imagery, and Manning's n-value areas (if available).

4.2.8.4 Hydraulic Data Sheets

These sheets can be used to show summary calculations for bridges, culverts, and natural and improved watercourses for all required design storm events. In addition to the summary data, include the method and program used for the analysis and the storm frequency(s) used in the calculations. See Figure 4-3: Hydraulic Data Sheets (1) on page 113 and Figure 4-4: Hydraulic Data Sheets (2) on page 114 for examples of a Hydraulic Data Sheets.

4.2.8.5 Hydraulic Computation Sheets

Storm sewer calculations are shown on these sheets, divided into discharge calculations, conveyance calculations, and inlet hydraulic calculations. This information may fit on one sheet or may need multiple sheets for larger projects. See Figure 4-5: Hydraulic Computation Sheet on page 115 for an example of a Hydraulic Computation Sheet.

4.2.8.6 Plan and Profile Sheets

Various components of the drainage design will need to be shown on plan and profile sheets. The Hydraulic Grade Line and Energy Grade Line (HGL/EGL) for the Ultimate design storm must be shown and identified on the sheets during the design phases of the project. For clarity, the EGL/HGL will be shown in color or highlighted in color with labels, or they can be shown in black and white with corresponding line types and labels. Turn off the HGL/EGL on the final construction documents (Bid plans) to avoid confusion during construction. See Figure 4-7 and Figure 4-8, on pages 117 and 118 to view example plan and profile sheets for a channel, culvert, and storm sewer system, respectively.

Storm sewer Plan and Profile sheets should label storm sewer to junction boxes or manholes connection angles in the plan view. Storm sewer elements (inlets, storm lines, manholes) must be labeled in some manner to facilitate cross-referencing the drainage design on the Plan and Profile sheets to the Hydraulic Computation Sheet. On occasion, the storm sewer system design might have a complex layout and alignment and presenting pertinent design information on a traditional Plan and Profile sheet would be difficult. In these cases, the engineer might need to separate the plan view and the profile view for the storm sewer design and present this information on different sheets. The design engineer may also choose to include a storm sewer overall layout sheet with storm sewer element labels for clarification purposes and to facilitate technical review by city staff.

4.2.8.7 Standard Details

COSA has a number of standard details that may be used. These details are available for download in electronic format on the TCI department website. TxDOT has standard details for culverts, headwalls, curb inlets and extensions, and other drainage items that may also be used. Any modifications to standard details must be called out on the standard sheets and be sealed by a professional engineer licensed to practice in the state of Texas.

4.2.8.8 Drainage Details

Details designed for the project, but not included in standard details, shall be shown on drainage detail sheets. These details are typically drawn to scale and show plan, section(s), and perspective views as needed. These details should provide additional information for the design of a particular improvement and provide additional guidance for construction.

4.2.8.9 Drainage Cross Sections

Cross sections will be needed for channel and watercourse projects. Show existing ground, proposed improvements, and design basis water surface elevations with labels. For proposed channels, cross sections will be provided at 50-foot intervals and as needed. For natural watercourses, sections will be shown at the intervals used in the HEC-RAS model, unless the design engineer deems a more frequent interval is necessary. Storm sewer improvements will be shown on the roadway cross sections along with known utility information. Show flow arrows at or near the ROW areas where it may not be clear whether adjacent areas are draining into or away from the project. Figure 4-9: Drainage Cross-Section Sheet for a Channel Project, on page 118, depicts an example drainage cross-section sheet for a channel project.

4.2.8.10 Inlet Sections

Storm sewer laterals shall be shown on section views similar to cross sections. Include HGL/EGL lines on these sections. See instructions in the plan and profile sheet section of this manual and Figure 4-10: Included HGL/EGL lines for Storm Sewer Laterals on Section Views Similar to Cross Section, found on page 120. Examples of how HGL and EGL data are to be presented are shown in Figure 4-7, Figure 4-8, and Figure 4-10.

4.2.8.11 Storm Water Pollution Prevention Plan

This plan will be of sufficient scale to show project features that need protection during construction. Project complexity will dictate how many sheets will be needed to convey the prevention plan to the contractor and the inspection representatives. Some projects will need the SW3P to follow the construction phasing plan. The plan shall include contours, flow arrows, existing topographic features, proposed improvements as appropriate, proposed devises, notes, and instructions. In addition, this plan must be developed in accordance with applicable state and local requirements.

4.2.8.12 Storm Water Pollution Prevention Narrative

A standard narrative sheet has been prepared by the city and shall be filled out with the appropriate project information.

4.2.8.13 Storm Water Pollution Prevention Details

Some projects will need additional engineering details that are not shown in the standard SW3P details provided by COSA and TxDOT. The engineer shall present these details with the SW3P or on separate detail sheets if needed.

4.2.9 Special Review Coordination

There are four special areas of consideration related to the drainage design and review process for which the design engineer should determine applicability for scoping, design, and coordination purposes. These areas are Low Impact Development (LID), Administrative Exceptions and Variances (AE/V), Floodplain Development Permits (FPDP), and FEMA Map Changes.

4.2.9.1 Low Impact Development (LID)

Projects that will include Low Impact Development (LID) features in the overall improvements should be identified as early as possible in the scoping and design process to facilitate proper review and minimize impacts to the overall project design. LID features will require review coordination with both Storm Water Engineering and Storm Water Operations & Maintenance staff during the design process. Engineering staff will generally focus on the design (calculations, feature details) of the proposed LID feature(s) while maintenance staff will focus on the short-term and long-term impacts of the LID feature(s) on maintenance activities by city crews.

4.2.9.2 Administrative Exceptions and Variances (AE/V)

Occasionally, some projects require an Administrative Exception or Variance to one or more sections of the Unified Development Code (UDC). The design team should identify potential storm water related code exceptions and notify project management and Storm Water Engineering review staff early in the design process. The design team should continue with the project design and determine at later design milestones if the Administrative Exception or Variance was able to be avoided or will need to be requested. If it is determined that a code exception will be required, the design engineer should coordinate with Storm Water Engineering review staff for additional guidance on processing code exceptions prior to the completion of design.

4.2.9.3 Floodplain Development Permits (FPDP)

Projects with some or all of the proposed improvements located within a FEMA 100-year Special Flood Hazard Area (floodplain) will require a City of San Antonio Floodplain Development Permit. Floodplain Development Permits are processed based on guidance set forth in Appendix F of the UDC. The design engineer shall identify the need for a FPDP early in the design process and submit a FPDP application prior to the completion of design. Storm Water Engineering staff will process Floodplain Development Permits closer to the commencement of project construction.

4.2.9.4 FEMA Map Changes

The design team shall assemble a Letter of Map Revision (LOMR) after construction is complete for those projects that result in a change to a mapped FEMA Special Flood Hazard Area (floodplain). The need for LOMR additional services should ideally be identified during the scoping phase. The design team should coordinate with the project management team and Storm Water Engineering staff as the project construction nears completion to initiate the LOMR task. The LOMR submittal shall be submitted through the project management team for Storm Water Engineering review coordination. Storm Water Engineering staff will in turn coordinate with the City of San Antonio Floodplain Administrator (FPA) to acquire proper LOMR form signatures once the LOMR review process is complete.

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				Discharge for Individual				Time of Concentration							Overland Flow			
	Comp			Existing		Ultimate		Reach 1		Reach 2		Reach 3		Tc	Overland			Total
No.	Area acres	Comp C	Tc Used	I_{25} in/hr	Q_{25} cfs	I_{25} in/hr	Q_{25} cfs	L Ft	Vel. fps	L Ft	Vel. fps	L Ft	Vel. fps		L Ft	Slope %	Tc	Tc minutes
A26	1.03	0.67	15	4.48	3.09	6.71	4.64											

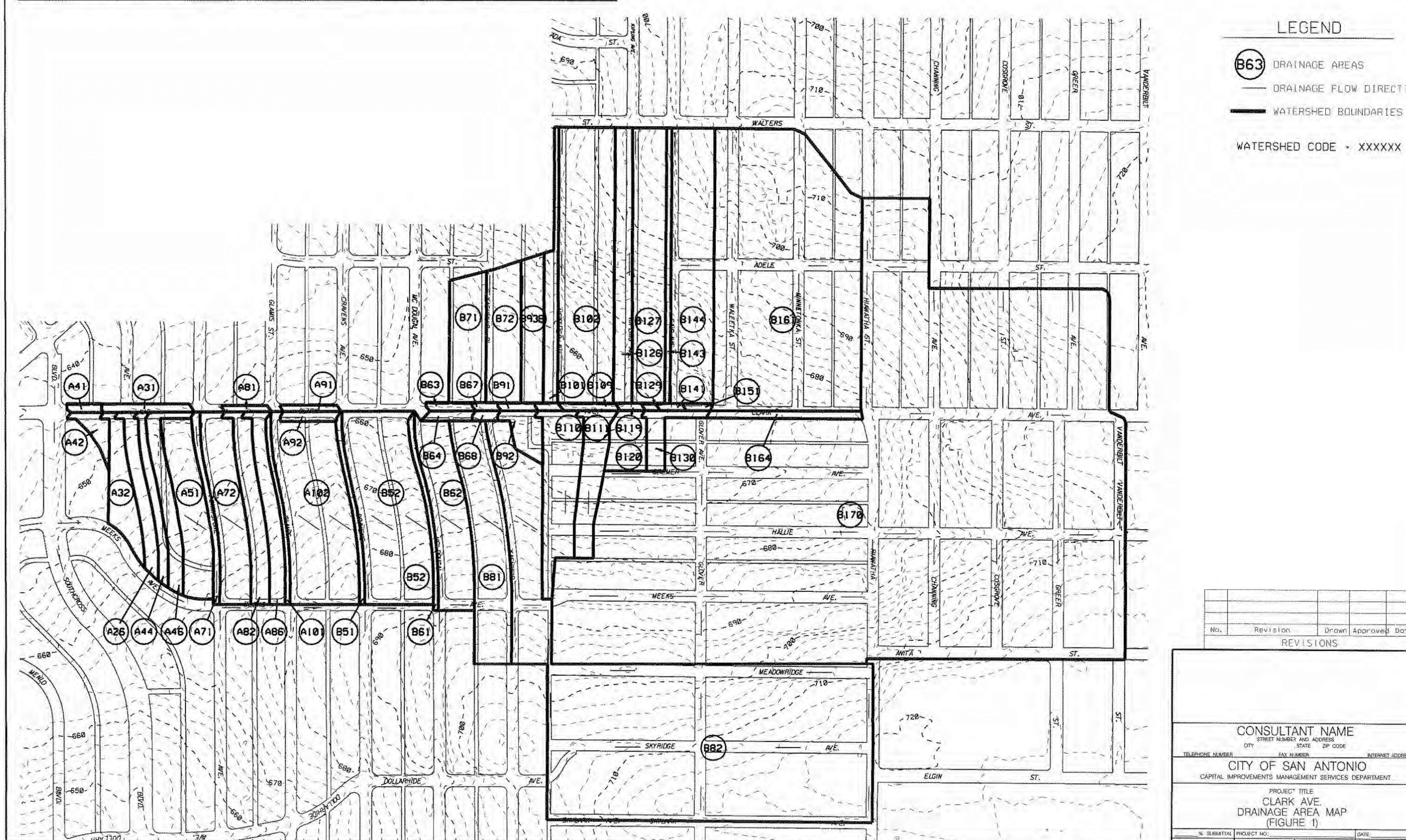


Figure 4-1: Drainage Area Map with Accompanying Hydrology Table

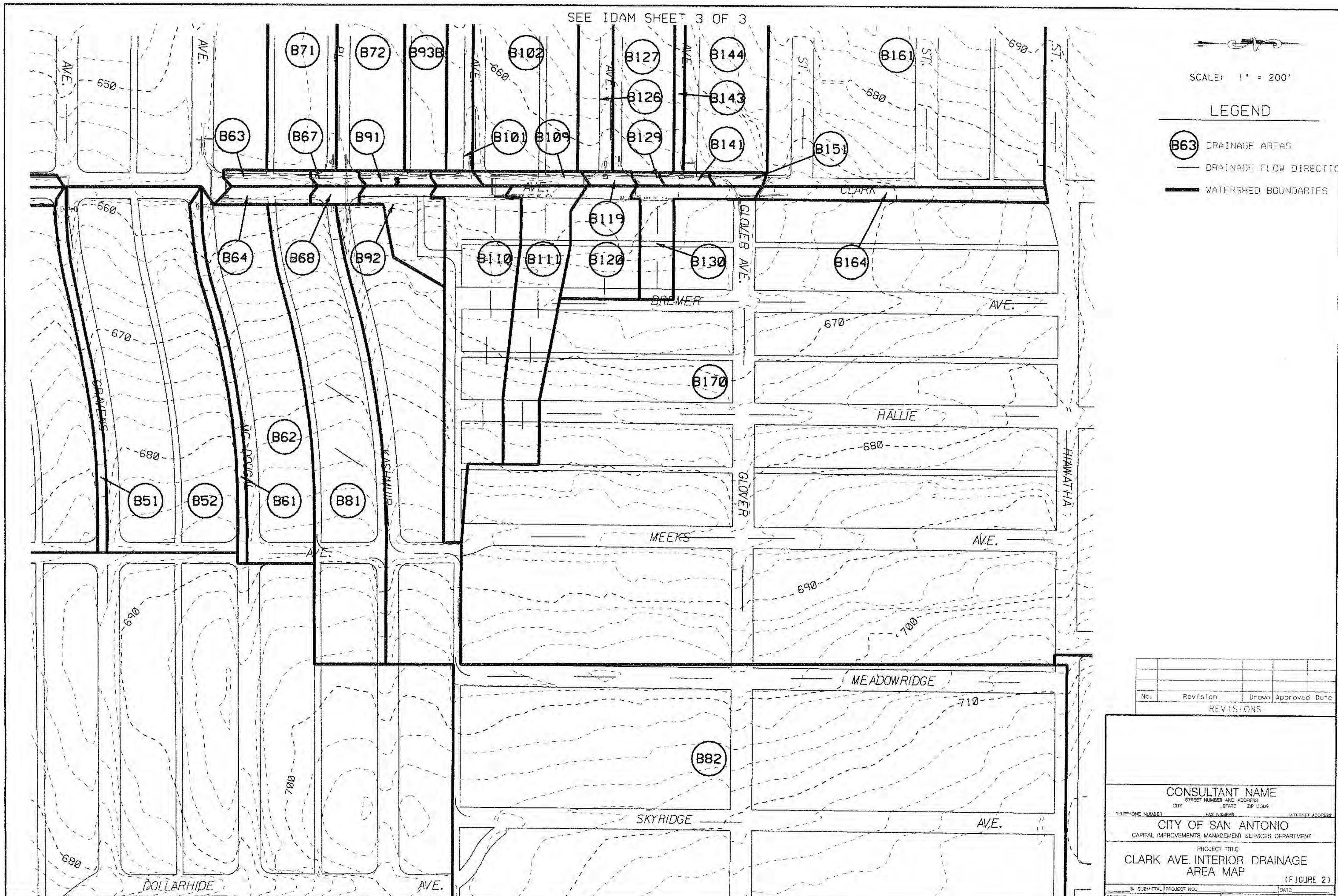
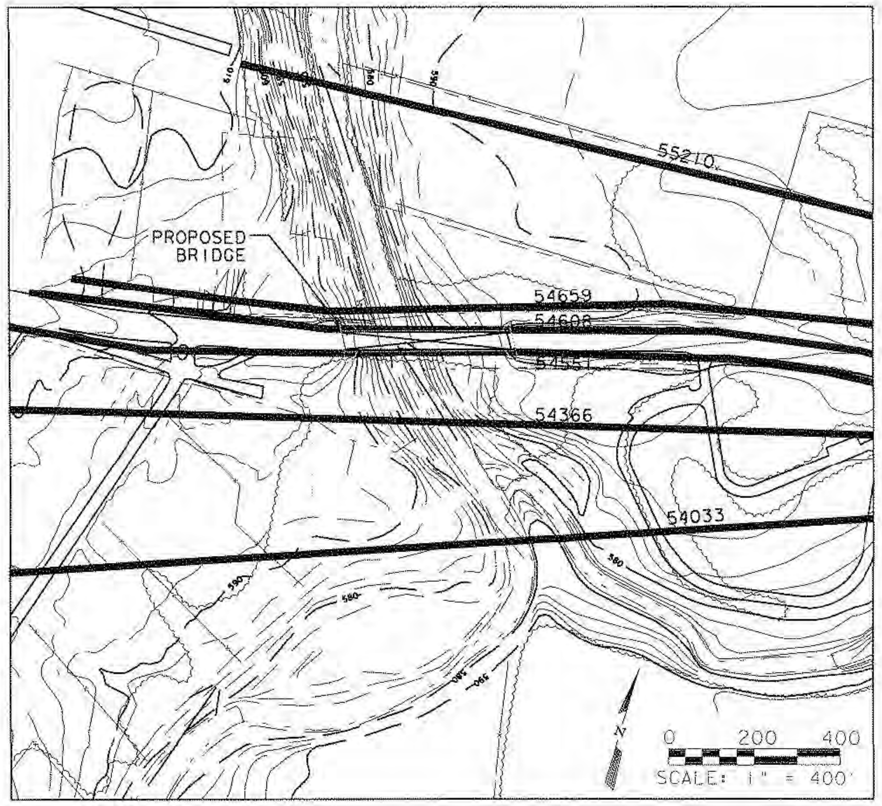


Figure 4-2: Interior Drainage Area Map

HEC-RAS CROSS SECTION LAYOUT (SALADO CREEK)



HEC-RAS OUTPUT

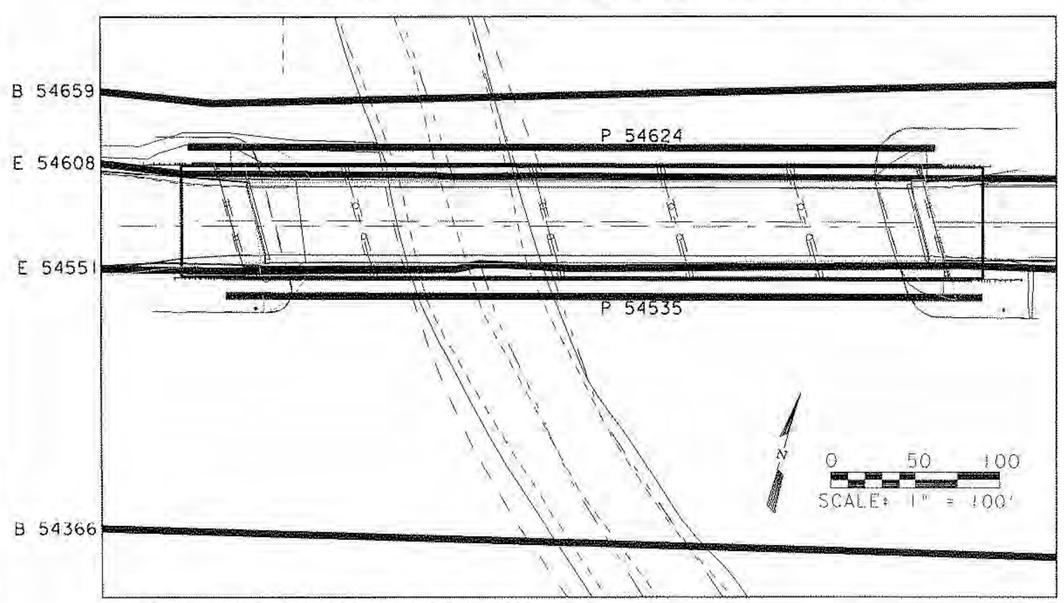
EXISTING

River Sta	Prof	Q (cfs)	Min EL	W.S. EL	Crit W.S.	E.G. Elev	E.G. Slope	Vel	Flow A	Top W	F no.
55210	Q100	27600	572.00	593.11	584.10	593.68	0.002455	6.22	5709.74	1411.15	0.29
55210	Q25	20297	572.00	591.11	582.31	591.59	0.002229	5.62	3875.08	572.80	0.28
54659	Q100	27600	571.90	591.29	585.32	591.96	0.004262	6.68	4845.24	1214.62	0.37
54659	Q25	20297	571.90	589.33	583.51	589.95	0.004162	6.32	3290.78	506.32	0.38
54608	Q100	27600	571.85	590.89	584.58	591.63	0.009970	6.95	3971.66	1218.96	0.38
54608	Q25	20297	571.85	589.04	582.95	589.63	0.009491	6.17	3288.67	362.14	0.36
54579.5		Bridge									
54551	Q100	27600	571.80	590.77	584.38	591.52	0.004148	6.97	3957.85	1285.73	0.37
54551	Q25	20297	571.80	588.96	582.79	589.54	0.003467	6.13	3313.37	679.72	0.35
54366	Q100	27600	571.80	590.58	583.42	590.79	0.001642	4.18	9132.40	1867.22	0.23
54366	Q25	20297	571.80	588.56	581.69	588.88	0.002392	4.80	5593.37	1681.27	0.28
54033	Q100	27600	571.70	590.64	583.95	590.67	0.000076	0.76	21846.68	2303.71	0.04
54033	Q25	20297	571.70	588.70	582.81	588.72	0.000074	0.70	17662.49	2072.55	0.04

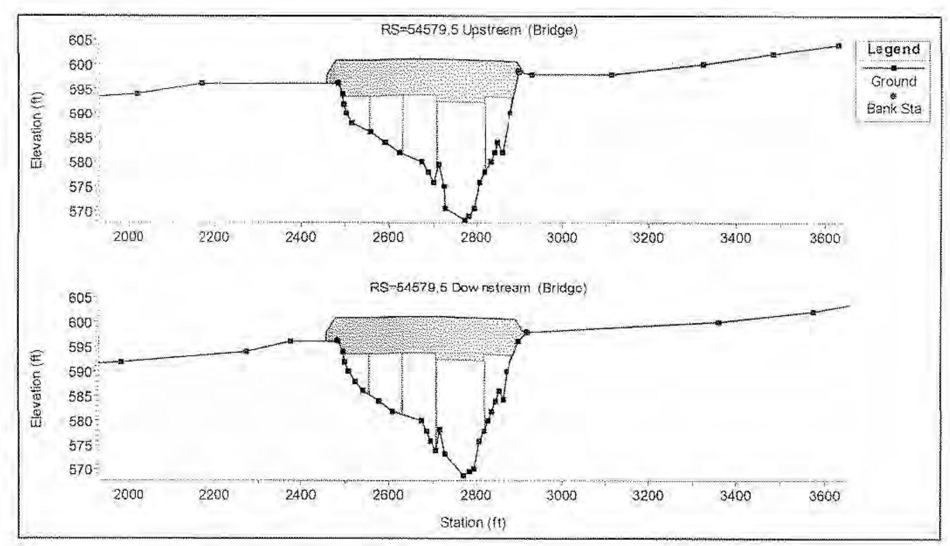
PROPOSED ULTIMATE

River Sta	Prof	Q (cfs)	Min EL	W.S. EL	Crit W.S.	E.G. Elev	E.G. Slope	Vel	Flow A	Top W	F no
55210	Q100U	27600	568.70	593.93	582.69	594.28	0.003029	5.10	7282.40	1830.53	0.23
55210	Q25U	20297	568.70	592.15	580.70	592.48	0.002990	4.75	4831.42	913.17	0.22
54659	Q100U	27600	566.00	591.22	584.38	591.80	0.008016	6.27	5004.23	1182.95	0.34
54659	Q25U	20297	566.00	589.35	582.01	589.88	0.008571	5.85	3545.12	508.69	0.34
54624	Q100U	27600	568.20	590.92	584.07	591.53	0.007912	6.34	4598.01	1251.50	0.34
54624	Q25U	20297	568.20	589.06	582.31	589.59	0.008160	5.85	3467.00	364.38	0.33
54579.5		Bridge									
54535	Q100U	27600	568.80	590.90		591.32	0.005842	5.57	5527.42	1325.13	0.29
54535	Q25U	20297	568.80	589.02		589.54	0.007551	5.84	3602.29	706.29	0.33
54366	Q100U	27600	567.60	590.57	582.99	590.79	0.001422	4.30	9126.92	1841.28	0.23
54366	Q25U	20297	567.60	588.56	581.24	588.88	0.001891	4.79	5650.69	1663.32	0.27
54033	Q100U	27600	570.30	590.64	584.03	590.67	0.000075	0.78	21944.29	2303.71	0.04
54033	Q25U	20297	570.30	588.70	582.96	588.72	0.000073	0.72	17760.10	2072.55	0.04

BRIDGE DETAIL PROPOSED & EXISTING SECTIONS



B: CROSS SECTION EXISTING & PROPOSED
E: CROSS SECTION EXISTING
P: CROSS SECTION PROPOSED



No.	Revision	Drawn	Approved	Date

REVISIONS

CONSULTANT NAME
STREET NUMBER AND ADDRESS
CITY STATE ZIP CODE
TELEPHONE NUMBER FAX NUMBER INTERNET ADDRESS

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

PROJECT TITLE

HYDRAULIC DATA SHEET
(FIGURE 3)

% SUBMITTAL PROJECT NO. DATE
DRAWN BY: DSGN BY: CHKD BY: SHEET NO. OF

Figure 4-3: Hydraulic Data Sheets (1)

CULVERT 5

HYDRAULIC DATA FOR STRUCTURES UNDER 1500 CFS

(PIPES, PIPE ARCHES & BOX CULVERTS)

					OUTLET CHANNEL										
	STATION	FREQ. YEAR	Q (cfs)	ALLOW HW (Elev)	W	SS	n	SLOPE (ft/ft)	TW (Elev)	SIZE, LENGTH AND DESCRIPTION	SLOPE (ft/ft)	Ke	HW (Elev)	VEL OUT (fps)	REMARKS
EXISTING	158+00.00	10 (DES)	48	1284.03	24.5	100:	0.035	0.0667	1280.17	2 - 5' x 3' x 70' MBC	0.0103	0.50	1282.19	7.33	
		100	71						1280.23				1282.65	8.24	
PROPOSED		10 (DES)	48		24.5	100:	0.035		1280.10	2 - 5' x 3' x 77.87' MBC		0.20	1282.09	7.33	
		100	71						1280.16				1282.52	8.24	

CULVERT ANALYSIS USING
(SHOW PROGRAM USED)

EXISTING CULVERT ANALYSIS

Culvert Summary - (Existing Design Storm)			
Computed Headwater	1282.19ft	Discharge	48 cfs
Inlet Control HW Elev.	1282.12ft	Tailwater Elevation	1280.17ft
Outlet Control HW Elev.	1282.19ft	Control Type	Entrance Control
Headwater Depth/Height	0.52		
Grades			
Length	70 ft	Constructed Slope	0.010286ft/ft
Hydraulic Profile			
Slope Type	Steep	Normal Depth	0.65ft
Flow Regime	Supercritical	Critical Depth	0.89ft
Velocity Downstream	7.33ft/s	Critical Slope	0.003843ft/ft
Section			
Section Material	Concrete	Span	5 ft
Section Size	5 x 3 ft	Rise	3 ft
Number Sections	2		
Outlet Control			
Ke	0.5	Entrance Loss	0.22ft
Inlet Control			
Inlet Type	90 and 15$^{3}/_{64}$ wingwall flares	Area Full	30 ft$^{2}/_{64}$
K	0.061	HDS 5 Chart	8
M	0.75	HDS 5 Scale	2
C	0.04	Equation Form	1
Y	0.8		

Culvert Summary - (Existing Design Storm)			
Computed Headwater	1282.65ft	Discharge	71 cfs
Inlet Control HW Elev.	1282.58ft	Tailwater Elevation	1280.23ft
Outlet Control HW Elev.	1282.65ft	Control Type	Entrance Control
Headwater Depth/Height	0.68		
Grades			
Length	70 ft	Constructed Slope	0.010286ft/ft
Hydraulic Profile			
Slope Type	Steep	Normal Depth	0.84ft
Flow Regime	Supercritical	Critical Depth	1.16ft
Velocity Downstream	8.24ft/s	Critical Slope	0.003897ft/ft
Section			
Section Material	Concrete	Span	5 ft
Section Size	5 x 3 ft	Rise	3 ft
Number Sections	2		
Outlet Control			
Ke	0.5	Entrance Loss	0.29ft
Inlet Control			
Inlet Type	90 and 15$^{3}/_{64}$ wingwall flares	Area Full	30 ft$^{3}/_{64}$
K	0.061	HDS 5 Chart	8
M	0.75	HDS 5 Scale	2
C	0.04	Equation Form	1
Y	0.8		

PROPOSED ULTIMATE CULVERT ANALYSIS

Culvert Summary - (Proposed Design Storm)			
Computed Headwater	1282.09ft	Discharge	48 cfs
Inlet Control HW Elev.	1282.09ft	Tailwater Elevation	1280.1ft
Outlet Control HW Elev.	1282.05ft	Control Type	Inlet Control
Headwater Depth/Height	0.49		
Grades			
Length	76.1ft	Constructed Slope	0.010118ft/ft
Hydraulic Profile			
Slope Type	Steep	Normal Depth	0.65ft
Flow Regime	Supercritical	Critical Depth	0.89ft
Velocity Downstream	7.33ft/s	Critical Slope	0.003843ft/ft
Section			
Section Material	Concrete	Span	5 ft
Section Size	5 x 3 ft	Rise	3 ft
Number Sections	2		
Outlet Control			
Ke	0.2	Entrance Loss	0.09ft
Inlet Contro			
Inlet Type	90$^{3}/_{64}$ headwall w 3/4 inch chamfers	Area Full	30 ft$^{3}/_{64}$
K	0.515	HDS 5 Chart	10
M	0.667	HDS 5 Scale	1
C	0.0375	Equation Form	2
Y	0.79		

Culvert Summary - (Proposed Design Storm)			
Computed Headwater	1282.52ft	Discharge	71 cfs
Inlet Control HW Elev.	1282.52ft	Tailwater Elevation	1280.16ft
Outlet Control HW Elev.	1282.48ft	Control Type	Inlet Control
Headwater Depth/Height	0.63		
Grades			
Length	76.1ft	Constructed Slope	0.010118ft/ft
Hydraulic Profile			
Slope Type	Steep	Normal Depth	0.84ft
Flow Regime	Supercritical	Critical Depth	1.16ft
Velocity Downstream	8.24ft/s	Critical Slope	0.003897ft/ft
Section			
Section Material	Concrete	Span	5 ft
Section Size	5 x 3 ft	Rise	3 ft
Number Sections	2		
Outlet Control			
Ke	0.2	Entrance Loss	0.12ft
Inlet Control			
Inlet Type	90$^{3}/_{64}$ headwall w 3/4 inch chamfers	Area Full	30 ft$^{3}/_{64}$
K	0.515	HDS 5 Chart	10
M	0.667	HDS 5 Scale	1
C	0.0375	Equation Form	2
Y	0.79		

No.	Revision	Drawn	Approved	Date

REVISIONS

CONSULTANT NAME
STREET NUMBER AND ADDRESS
CITY STATE ZIP CODE
TELEPHONE NUMBER FAX NUMBER INTERNET ADDRESS

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

PROJECT TITLE
CULVERT NO. 5
HYDRAULIC DATA SHEET
(FIGURE 4)

____% SUBMITTAL PROJECT NO.:____ DATE:____
DRWN. BY:____ DSGN. BY:____ CHKD. BY:____ SHEET NO.:____OF____

Figure 4-4: Hydraulic Data Sheets (2)

CONVEYANCE

U.S. Node	D.S. Node	Actual Length	Hyd. Length	N Value	Slope	No. Bls	Span	Rise	Fs	Sof U.S.	Sof D.S.	Inv U.S.	Inv D.S.	Unif. Dep	Unif. Vel.	Act. Vel. D.S.	Act. Dep U.S.	Act. Dep D.S.	HGL U.S.	HGL D.S.	EGL U.S.	EGL D.S.	Sum Tc	Sum Q	Sum Area	Avg C Value	Rain I	Junction Loss
Line A																												
A15	A10	22.22	24.72	0.013	0.23	1	n/a	3.5	0.011	624.35	624.30	620.85	620.80	3.50	11.97	11.67	3.50	3.50	627.01	626.70	629.12	628.81	17.15	112.23	26.25	0.68	6.39	0.78
Line B																												
B51	B50	11.39	11.39	0.013	15.28	1	n/a	2	0.153	648.74	647.00	646.74	645.00	0.23	12.20	10.14	1.00	0.26	647.74	645.26	647.74	646.87	15.01	2.39	6.33	0.67	6.71	0.52

INLET HYDRAULICS

ID	Station	Type	Profile Type	Q	Cap	By Pass Flow	By Pass Flow Into	By Pass Node ID	Inlet Curb Length	Inlet Length Rqrd	Computed Ponded Width	Computed Ponded Depth	St slope	gutter Depth
A26	34+30.00	Curb	On Grade	3.98	3.98		0.88	A32	20	17.85	12.37	0.25	1.30	0.21
A31	35+00.94	Curb	On Grade	1.71	1.68	0.03			10	9.95	9.08	0.18	1.30	0.21
A32	35+00.94	Curb	On Grade	4.08	3.15	0.92			10	18.38	12.57	0.25	1.30	0.21
A44	33+53.50	Curb	On Grade	2.17	1.29	0.88		A26	5	11.83	9.93	0.20	1.30	0.21
A46	32+95.00	Curb	On Grade	3.91	3.91		0.11	A44	20	18.75	12.22	0.24	1.49	0.21
A51	32+36.00	Grate	Sag	8.79	3.48				n/a	n/a		0.58	n/a	n/a
A71	10+51.43	Curb	Sag	2.08	4.15				10	13.09	9.78	0.20	n/a	0.21
A72	10+52.14	Curb	Sag	8.06	20.32				10	13.09	24.20	0.48	n/a	0.21
A81	29+73.00	Curb	On Grade	0.68	0.68				10	5.04	6.25	0.13	1.49	0.21
A82	29+66.58	Curb	On Grade	5.84	5.73	0.11	0.99	A46	20	24.15	14.05	0.28	1.49	0.21
A86	28+70.00	Curb	On Grade	4.06	3.08	0.99		A82	10	18.78	12.23	0.25	1.49	0.21
A91	27+10.37	Curb	On Grade	0.85	0.85				10	5.99	6.79	0.14	1.49	0.21
A92	27+09.92	Curb	On Grade	1.30	1.30				10	8.29	7.97	0.16	1.49	0.21
A101	10+51.66	Curb	Sag	1.44	4.15				10	13.09	7.66	0.15	n/a	0.21
A102	10+52.29	Curb	Sag	16.84	20.32				10	13.09	30.90	0.62	n/a	0.21
B51	10+51.63	Curb	Sag	1.60	4.15				10	13.09	8.22	0.16	n/a	0.21
B52	10+52.05	Curb	Sag	17.68	11.06				10	13.09	34.05	0.68	n/a	0.21

DISCHARGE

No	Comp Area acres	Comp C	Tc Used	Discharge for Individual Areas			
				Existing		Ultimate	
				I25 in/hr	Q25 cfs	I25 in/hr	Q25 cfs
A26	1.03	0.67	15	4.48	3.09	6.71	4.64
A31	0.33	0.96	10	5.41	1.71	8.07	2.55
A32	1.36	0.67	15	4.48	4.08	6.71	6.11
A41	0.13	0.96	10	5.41	0.70	8.07	1.04
A42	0.41	0.96	10	5.41	2.12	8.07	3.16
A44	0.72	0.67	15	4.48	2.17	6.71	3.25
A46	1.27	0.67	15	4.48	3.81	6.71	5.70
A51	2.43	0.67	10	5.41	8.79	8.07	13.11
A71	0.57	0.67	10	5.41	2.08	8.07	3.10
A72	2.69	0.67	15	4.48	8.06	6.71	12.08
A81	0.13	0.96	10	5.41	0.68	8.07	1.01
A82	1.62	0.67	15	4.48	4.85	6.71	7.27
A86	1.35	0.67	15	4.48	4.06	6.71	6.09
A91	0.16	0.96	10	5.41	0.85	8.07	1.26
A92	0.25	0.96	10	5.41	1.30	8.07	1.94
A101	0.40	0.67	10	5.41	1.44	8.07	2.15
A102	5.89	0.67	15	4.48	17.68	6.71	26.48
B51	0.44	0.67	10	5.41	1.60	8.07	2.39
B52	5.89	0.67	15	4.48	17.68	6.71	26.49

INLETS DESIGNED FOR Q_2
TRUNK DESIGNED FOR Q_{10}
STORM SEWER CALCULATION PERFORMED
IN " ____________ " (SHOW PROGRAM USED).

No.	Revision	Drawn	Approved	Date

REVISIONS

CONSULTANT NAME
STREET NUMBER AND ADDRESS
CITY , STATE ZIP CODE
TELEPHONE NUMBER FAX NUMBER INTERNET ADDRESS

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

PROJECT TITLE
CLARK AVE. HYDRAULIC COMPUTATION
SYTEM A
(FIGURE 5)

____ % SUBMITTAL | PROJECT NO.: ____ | DATE: ____
DRWN. BY: ____ | DSGN. BY: ____ | CHKD. BY: ____ | SHEET NO.: ____ OF ____

Figure 4-5: Hydraulic Computation Sheet

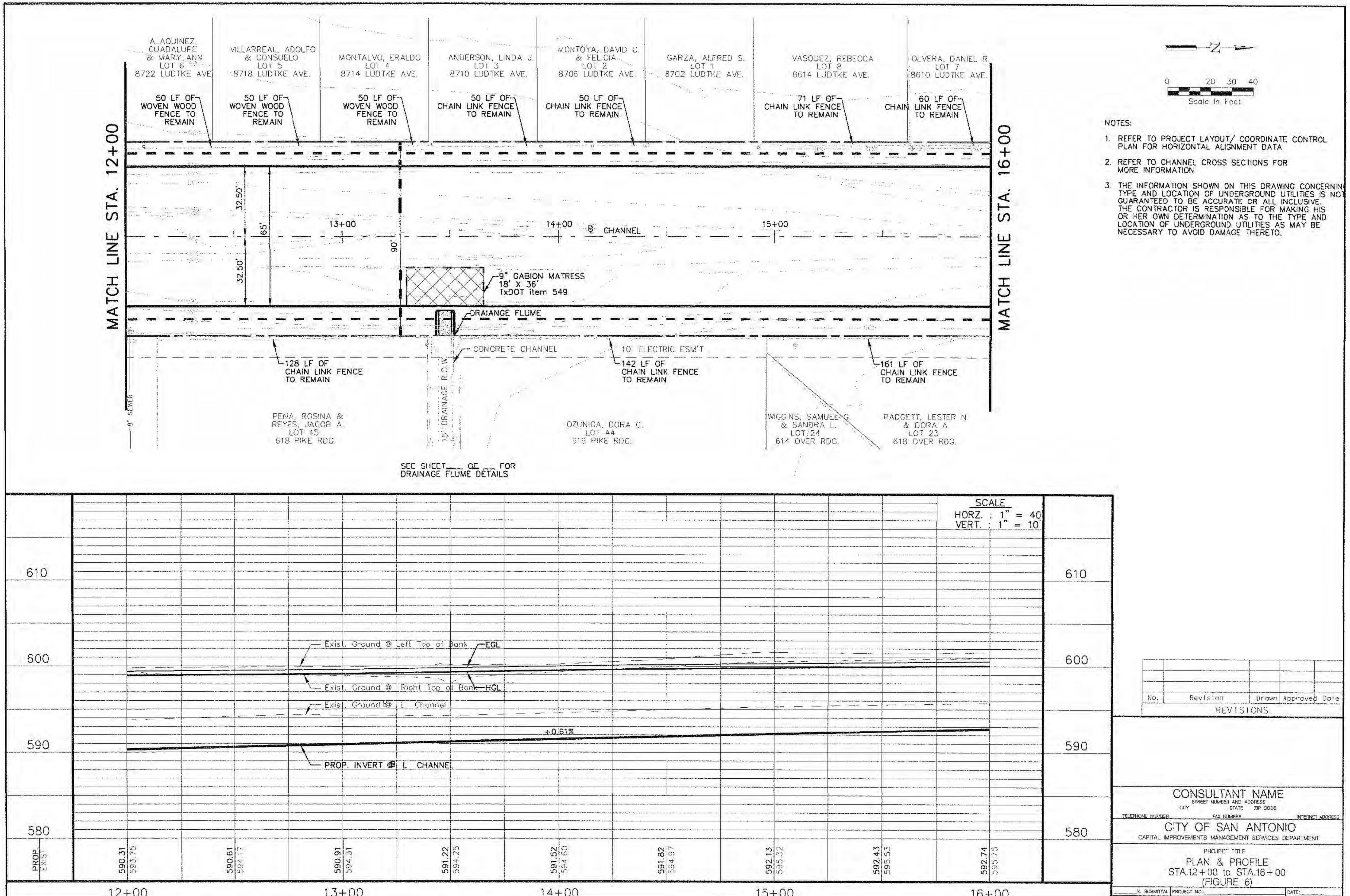


Figure 4-6: Example Plan and Profile Sheets for a Channel

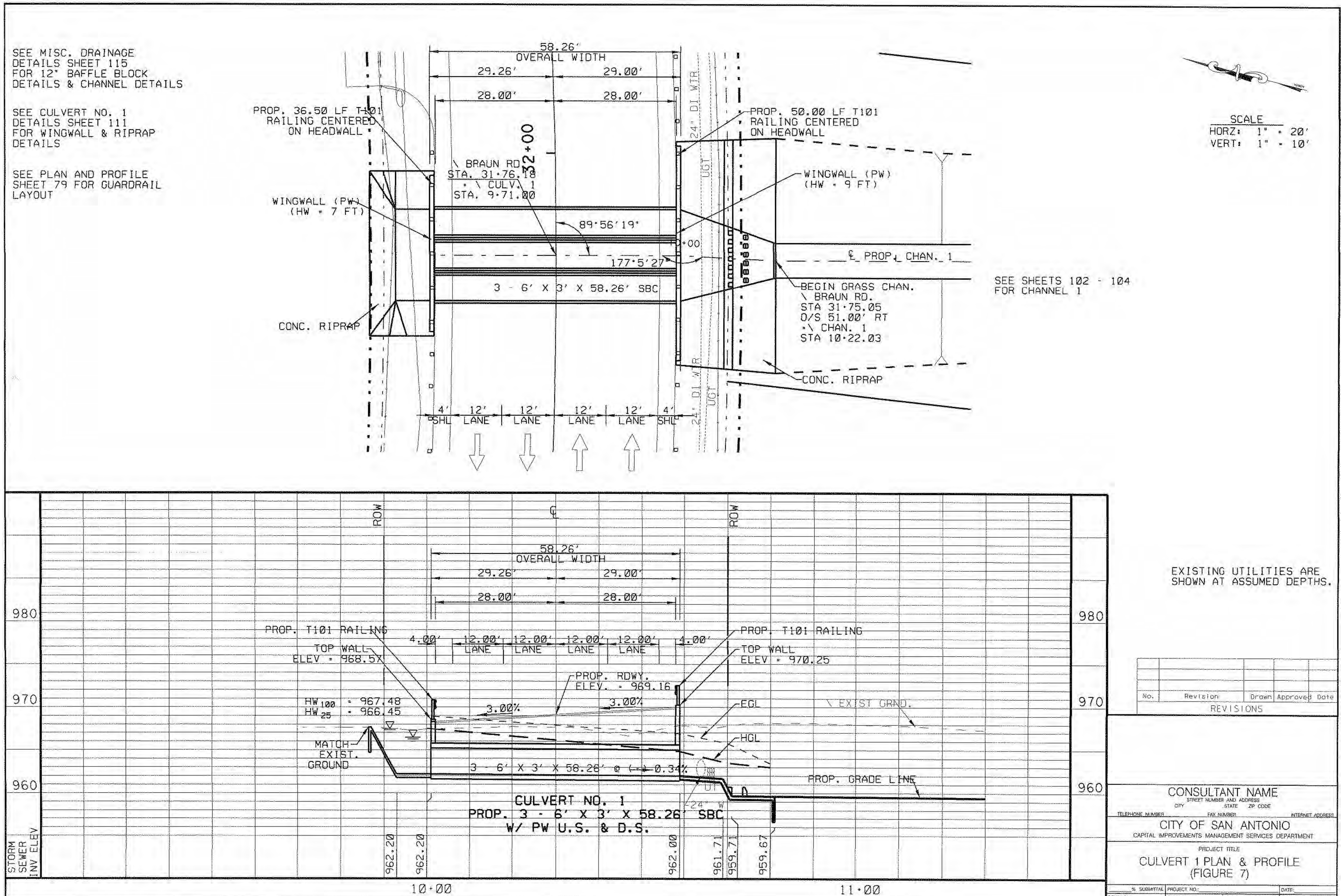


Figure 4-7: Example Plan and Profile Sheets for a Culvert

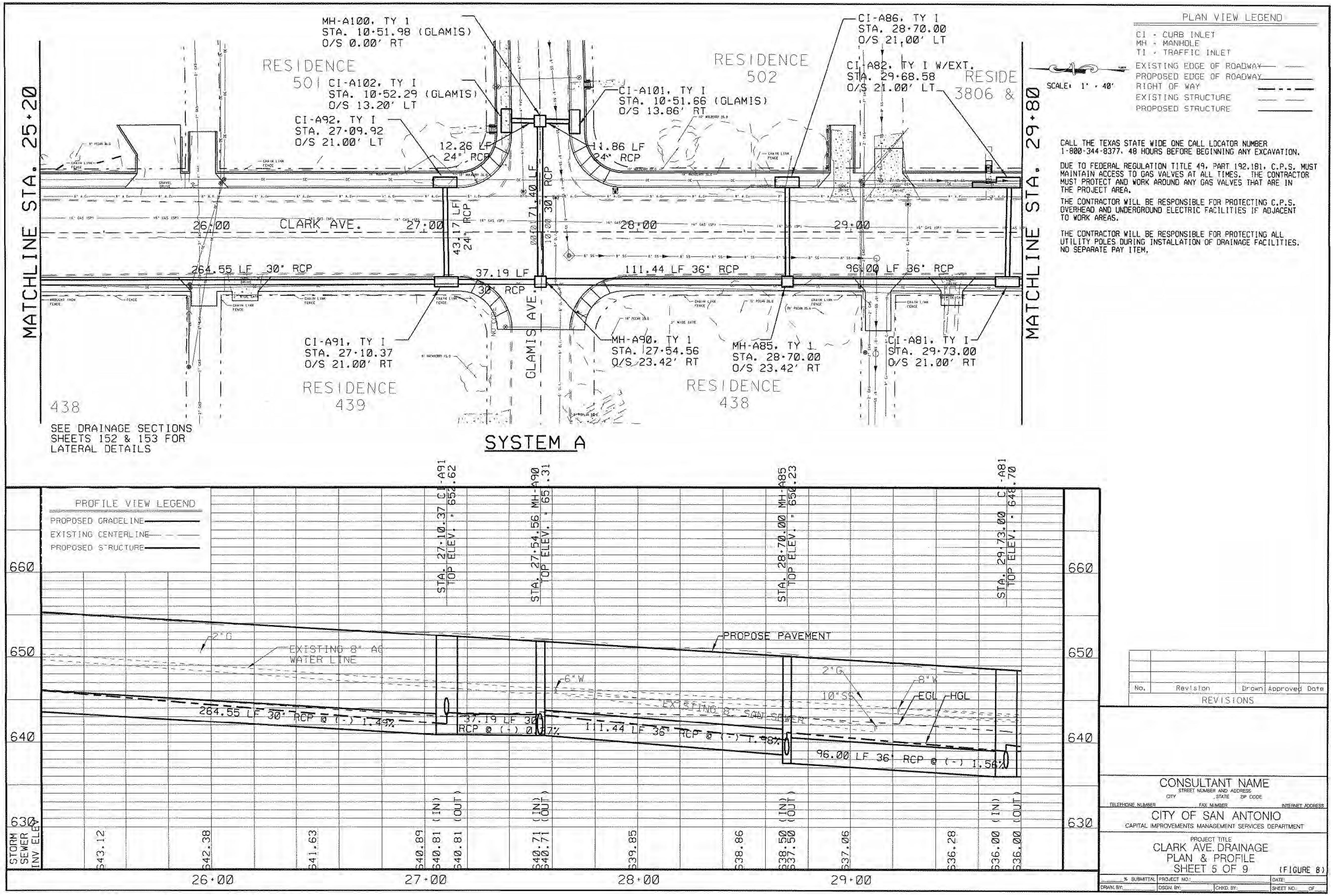


Figure 4-8: Example Plan and Profile Sheets for a Storm Sewer System

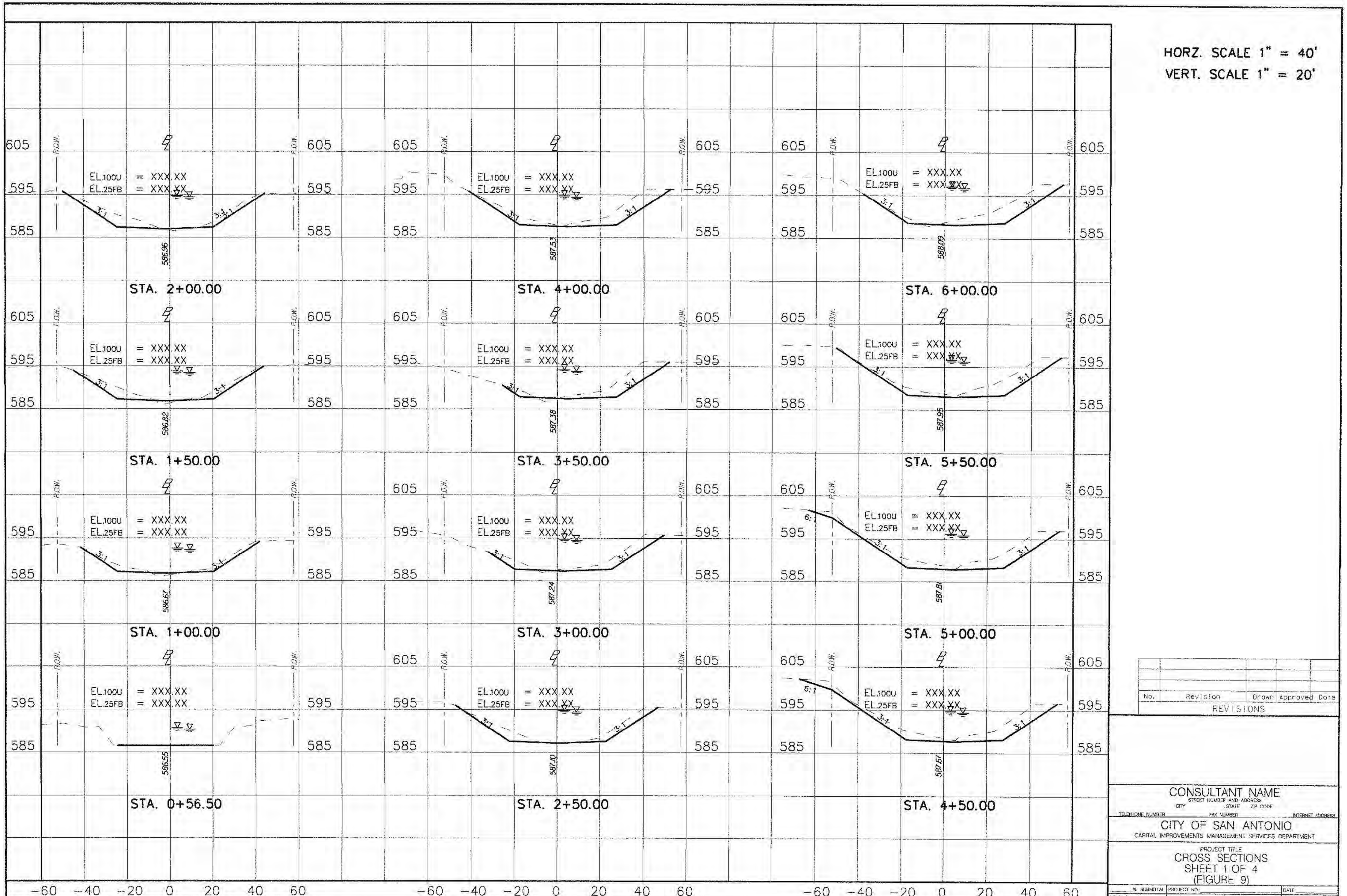


Figure 4-9: Drainage Cross-Section Sheet for a Channel Project

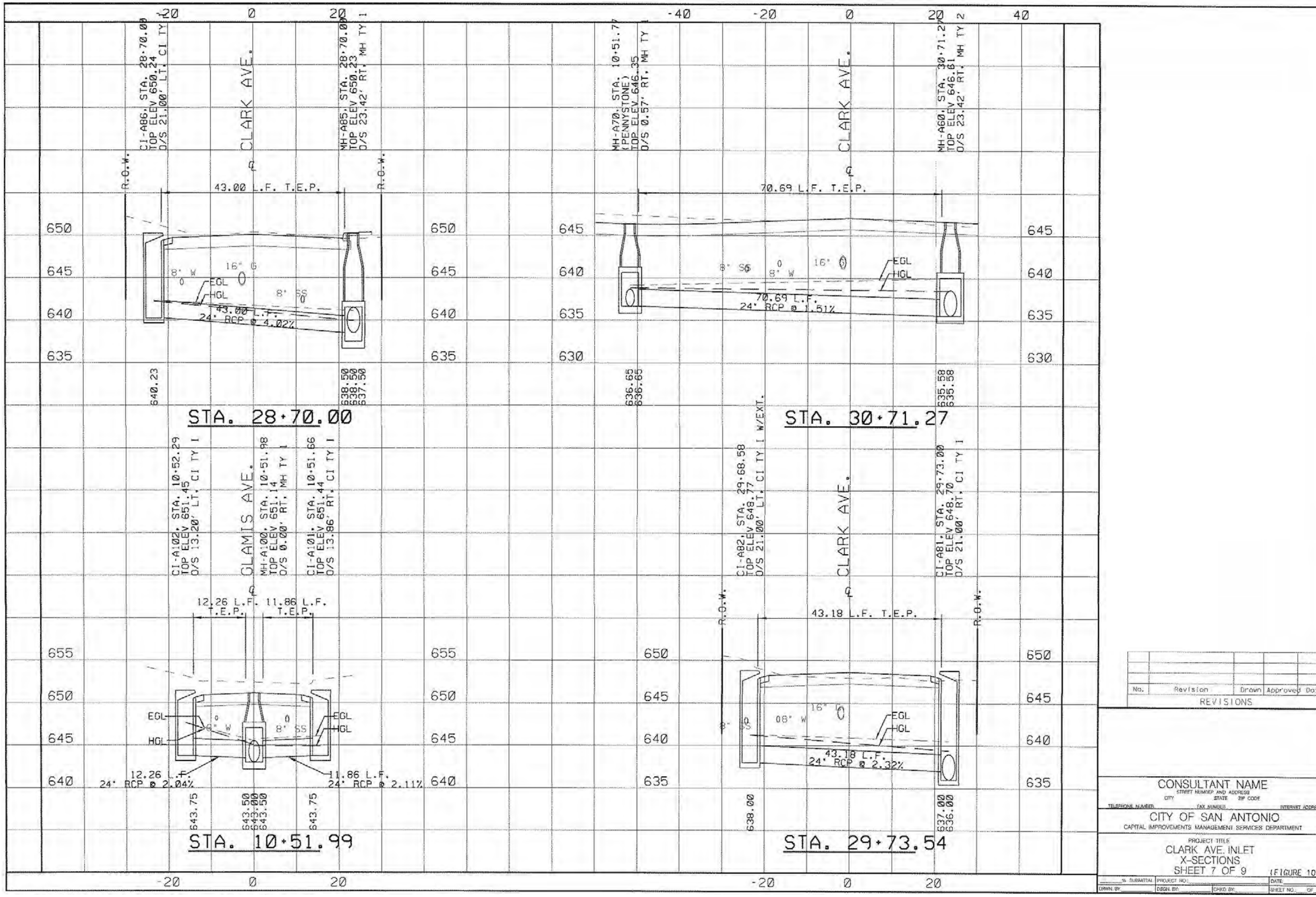


Figure 4-10: Included HGL/EGL lines for Storm Sewer Laterals on Section Views Similar to Cross Section

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Section 5 Utility Coordination

5.1 Introduction

One of the most commonly cited sources of change orders, delays, and additional costs is “utility coordination.” This term is used to describe a wide range of activities that relate generally to utilities, including mapping of existing utilities, assessment and identification of conflicts between proposed infrastructure and existing and/or proposed utilities, resolution of those conflicts, and scheduling of utility relocations and adjustments.

Understanding the importance of utility coordination can help in effective planning to mitigate and even avoid change orders, delays, and additional costs due to utility conflicts.

- Many utilities are underground, which presents several problems. Because there is no direct access, their locations or depths cannot be determined conclusively at all locations. Moreover, the methods required to enhance and improve the quality of information for the location and depth of existing utilities can be expensive to obtain and disruptive to the general public.
- The utilities are owned, operated, and maintained by entities other than the City. Some are wholly owned subsidiaries of the City, and some are private-sector, commercial enterprises. Since the City has no direct control over these entities, it must manage its relationship with them through franchise agreements, interlocal agreements, and other policy-level vehicles.

Nevertheless, the facts are that these utilities serve essentially the same customers, and those customers harbor an expectation that the City and the utility companies will cooperate within reason to minimize the overall cost and disruption of implementing capital improvement projects.

One potential implication is that design engineers should look beyond the costs of the basic infrastructure being designed and be sensitive to the overall costs associated with utility coordination, relocation, and adjustment, including the intangibles such as community relations. While the design engineer must optimize the design within the constraints of the project, a thoughtful, common-sense approach to these issues can benefit all entities involved, as well as the people they serve.

5.2 General Approach

In general, the design engineer's approach to utility coordination will involve four broad categories of effort:

- surveying the horizontal and vertical locations of the existing utility facilities
- evaluating the impact or potential impact of the proposed infrastructure on the utilities
- collaborating and coordinating with the affected participants and refining the infrastructure design to minimize overall project costs
- preparing plans for utility work or providing information to third parties to prepare these plans

Utility work can be organized into three categories: Functional Replacement, Relocation, and Adjustment (RRA).

- *Functional Replacement:* involves replacing a utility line that is not otherwise in conflict with proposed infrastructure construction due to the line's condition, obsolescence, or inadequate capacity. The line can be put back in the same place or in another location that is not in conflict with a proposed improvement. An example of this would be to replace a sewer line that is in poor condition to avoid the need to replace it three years after other improvements are complete.
- *Relocation:* involves installing a new line or lines in a different location due to the existing line's conflict with proposed infrastructure construction. An example is to install a water line in a new location to facilitate construction of a large storm drainage trunk line in a street.
- *Adjustment:* involves minor changes to accommodate proposed infrastructure construction. An example is the installation of a relatively short section of water line to facilitate the construction of a drainage lateral or a storm drainage inlet.

5.3 Participating Utility Companies

The utility companies that are involved in the delivery of City of San Antonio capital improvement projects include:

- *San Antonio Water System:* sanitary sewer, potable water, and recycled water
- *CPS Energy:* natural gas and electricity
- *AT&T:* telephone, cable television and internet service
- *Spectrum* (a merger of Time Warner Cable, Charter, and Bright House Networks companies)*:* cable television, telephone, and Internet service

- *Grande Communications:* cable television, telephone, and Internet service
- *Other utilities*: "cross country" pipelines, local water supply companies, and competitive local exchange carriers (CLECs), among others

A brief look at each of these entities provides better understanding of how they are typically involved with COSA capital improvement projects.

- *San Antonio Water System (SAWS)*: SAWS is a public utility owned by the City of San Antonio. It operates water supply and distribution facilities, sewage collection and treatment facilities, and treated wastewater transmission and distribution facilities. SAWS may agree to allow the evaluation and design of any replacement, relocation, or adjustment (RRA) of its facilities to be performed by the design consultant pursuant to its professional services contract with the city and to have any RRA work be done by the construction contractor pursuant to its construction contract with the city.

  Accordingly, the design team should include engineers who are familiar with SAWS design standards. SAWS design standards are available at the governmental relocations section of the SAWS website, with the following Internet link: http://www.saws.org/business_center/specs/govtrelocation/

- *CPS Energy*: CPS Energy (CPS), the largest municipally owned energy company in the nation, provides both natural gas and electric service. CPS facilities include natural gas transmission and distribution facilities and both underground and overhead high-voltage electrical transmission. CPS may agree to allow evaluation and design of any RRA of its gas and underground electric facilities to be performed by the design consultant, pursuant to its professional services contract with the city, and may have any RRA work be done by the construction contractor pursuant to its construction contract with the city. Implied in this is that CPS staff may conduct its own design and construction for any RRA work related to its gas, overhead, and underground electrical facilities.

  See Appendix 5C for a list of things to consider when designing or constructing a project around CPS Energy.

- *AT&T*: AT&T, Inc. (AT&T) is a holding company whose subsidiaries and affiliates provide both wireline and wireless telecommunications services and equipment. The services and products offered by AT&T that are most vulnerable to being affected by capital improvement projects include local-exchange services, long-distance services, and data/broadband and Internet services, using underground, overhead, and wireless technology infrastructure. The design consultant should ensure that both the long-distance coordinator and local coordinator are contacted.

  AT&T operates many of its facilities within the rights-of-way and easements owned by the city, pursuant to a franchise agreement, some sections of which govern how AT&T's facilities are to be adjusted and relocated to accommodate capital improvement projects.

- *Spectrum* (a merger of Time Warner Cable, Charter, and Bright House Networks companies) is the second largest cable operator in the nation. It provides cable television, Internet, and digital telephone service, through a network of underground, overhead, and wireless technology infrastructure, operating within rights-of-way and easements, pursuant to a franchise agreement with the city. The company typically manages design and construction of RRA work in advance of or concurrent with construction of capital improvement projects.
- *Grande Communications*: Grande Communications is a Texas-based communications system providing high-speed Internet, local and long-distance telephone service, and digital cable services through a fiber optic network. Grande operates it facilities within rights-of-way and easements, pursuant to a franchise agreement with the city, and typically manages design and construction of any RRA work in advance of or concurrent with capital improvement project construction.
- *Other utilities:* Other utilities that may be encountered include the following:
  - fiber optic and copper wire lines owned by entities other than AT&T, such as Sprint, Verizon, and a host of competitive local exchange carriers (CLECs)
  - underground pipelines owned and operated by a variety of entities, such as Valero and Coastal States, typically conveying petroleum products
  - private lines and tunnels operating in City of San Antonio ROW, both with and without benefit of a formal approval

  Design Engineers should contact 1-800-344-8377 (DIG-TESS) / 1-800-ONE-CALL to locate other utilities that may be in the right-of-way.

Points-of-contact for these companies can be found in Appendix 5A.

5.4 Standards

Prior to the year 2000, no standards existed for locating utilities that were shown on infrastructure plans. As a result, there were almost as many ways to locate utilities and show them on the plans as there were projects. One of the problems was (and continues to be) that it is generally difficult to distinguish the utilities that are depicted as a result of a conscientious and thorough investigative effort from those that are depicted based on less thorough methods.

In an attempt to create order in this somewhat chaotic environment, the Federal Highway Administration commissioned Purdue University to conduct a study of the costs and benefits of utility coordination efforts. That study, published in 2000, was significant for several reasons, including:

- It established a definition for subsurface utility engineering (SUE):

  SUE is an engineering process for accurately identifying the ***quality*** of subsurface utility information needed for [infrastructure projects], and for acquiring and managing that level of information during the development of [an infrastructure] project.

  http://www.fhwa.dot.gov/programadmin/sueindex.cfm

- It established a framework for identifying different levels of quality for utility information (Quality Levels A, B, C, and D).
- It provided a rational economic justification for the use of SUE. In particular:
  - for every $1.00 spent on SUE, savings of $4.62 in overall project costs were realized
  - the cost of obtaining Quality Level A and B data on the 71 projects studied was less than 0.5 percent of the total construction costs
  - using Quality Level A and B data resulted in a construction cost savings of 1.9 percent over using the traditional Quality Level C and D data

Within a few years, The American Society of Civil Engineers (ASCE)/Construction Institute (CI), along with a host of other participants and supporters, including the Associated General Contractors, collaborated to develop and promulgate an industry standard, *CI/ASCE 38-02, Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data (ISBN 0784406456, 2002)*. This is the standard that will be used for COSA capital improvement projects.

In general, the standard establishes four quality levels with Quality Level A (QLA) being the highest level and Quality Level D (QLD) being the lowest quality. These quality levels are described briefly in Table 5-1: ASCE Quality Level Descriptions below.

Table 5-1: ASCE Quality Level Descriptions (	
Level Designation	**Description**
Level A (QLA)	Horizontal and vertical location of utility with utility size and dimensions are known to a relative certainty and accuracy of about ½ inch. With some exceptions, Level A locations are limited to individual points along a buried utility where the utility has been exposed and surveyed and/or correlated with a high degree of certainty to other QLA data points (e.g., a gravity sewer main or storm drain that is on a straight alignment and consistent slope.)
Level B (QLB)	Utility locations and depths are based on locates established using geophysical techniques. This is done in conjunction with tasks associated with QLC and QLD. Vertical information is not based on direct measurements, but geophysical methods such as use of subsurface radar, ultrasonic, or a tracing method. Locations for QLB are reproducible. Locates exceeding QLB specifications that cannot meet QLA are classified as QLB.
Level C (QLC)	Utility locations are based on a correlation of surveyed field locations of surface evidence with information derived from utility maps and/or record drawings from the utility. QLC involves horizontal correlation and inferred vertical location based on surveyed and observable surface features along the utility route, such as valve locations, trench cuts, or manholes.
Level D (QLD)	Utility locations are based solely on utility maps, record drawings, or other similar mapping information. Composite drawings depicting this level have most apparent conflicts with topographic features resolved and include utility type, owner, date of map, beginning and ending of the utility, activity status, apparent size and number of conduits, and encasement, where applicable, and where indicated, available mapping information. This level is indicated when utility information cannot meet Level C criteria due to discrepancy or other problem. This level may sometimes involve field survey or reconnaissance.

5.5 Communicating Quality Levels

An important aspect of this effort is the communication of the quality levels of the various utilities shown on the plans. There are two important things to consider in this regard: first, the quality level of the utility information shown on the plans will change and evolve during the course of the design effort and, second, the quality level at any particular phase of the design may vary from utility to utility.

More specifically, utility information relied on in preparing a preliminary engineering report will most likely be Quality Level D. At the completion of the 40 percent plans, the utility information should be a minimum of Quality Level C and in some cases may be Quality Level B. As the plans become more complete, there may be instances in which some utility information will be Quality Level C, some will be Quality Level B, and perhaps some will be Quality Level A.

The design engineer must indicate the quality level typical of the majority of the utility information for a particular utility and then indicate by note specific locations where utility information falls short of or exceeds that typical quality level. For example, show location and depth of existing utility based on pothole (QLA) information. This information must be shown on the Utility Basemap with a note that reads as follows:

> *"The typical quality level of the utility information shown on these plans is shown in the table below. Specific notes on the plans indicate locations where the utility information shown is known to fall short of or exceed the stated typical quality level."*

Storm Drainage Mains	*QL B*
Sanitary Sewer Mains	*QL B*
Water Distribution Mains	*QL C*
Recycle Mains	*QL C*
Natural Gas Mains	*QL B*
Overhead Electric Lines	*QL C*
Underground Electric Lines	*QL C*
Underground CATV (Company) Lines	*QL C*
Underground Telecommunication Lines	*QL C*
All Underground Utility Service Lines	*QL C*

Continuing with this same example, the bid documents for this same project might contain the note shown below. The exact location (x, y and z) for Quality Level A locates must be shown on the Utility Basemap.

"The typical quality level of the utility information shown on these plans is shown in the table below. Specific notes on the plans indicate locations where the utility information shown is known to fall short of or exceed the stated typical quality level."

Storm Drainage Mains	*QL A*
Sanitary Sewer Mains	*QL A*
Water Distribution Mains	*QL B*
Recycle Mains	*QL B*
Natural Gas Mains	*QL B*
Overhead Electric Lines	*QL C*
Underground Electric Lines	*QL C*
Underground CATV (Company) Lines	*QL C*
Underground Telecommunication Lines	*QL B*
All Underground Utility Service Lines	*QL C*

5.5.1 Common Mistakes to Avoid

The following are common mistakes to avoid:

1. Existing utilities are frequently depicted by single lines. While this may be acceptable for a 2" gas line, it may not be appropriate for a 20" water line and is clearly not appropriate for a 24" sewer line. Design consultants should show the utility line as much as possible to scale in both plan and profile views, using the outside diameter of the utility.
2. Sometimes the alignments of utilities entering and leaving the project area are not correctly shown because the features are located only within the project area and the lines are extrapolated to the project boundaries. Design consultants should locate features beyond the project boundaries in order interpolate the line locations at the project boundaries. Consultant should locate these utilities by surveying or potholing if required.
3. Not everything is shown on the plans of record. In particular, in evaluation of potential conflicts, design consultants should give due consideration to the possibility that concrete saddles, cradles, and thrust blocking were "overpoured." When designing facilities close to concrete-steel cylinder lines, consider the approximate "diaper band" dimensions.

4. Sometimes design engineers calculate the cover on an existing utility as the distance between finished grade and the existing utility. In fact, the cover needs to be calculated as the distance between the ***subgrade*** and the existing utility. Design consultants should be particularly alert for utilities being installed at a shallower depth than the plans of record indicate in rocky locations.
5. In designing the profile of large-dimension box culverts and storm sewers running longitudinally in streets, design consultants sometimes fail to consider the routing of sanitary sewer service laterals to homes and businesses on the “other side” of the box or pipe. Design consultants should make sure that homes and businesses on both sides of the drainage facility can be served. In addition, where relevant, design consultants should compare the costs of running a new sanitary sewer on both sides of a shallower drainage facility with costs of a single sanitary sewer on one side of a deeper drainage facility.
6. In designing the plans for Joint-Bid utility work, Design Consultants should consider how the utility’s scope of work may affect the City’s traffic control plan in regard to street closures and the length of time closures are required to stay in place to complete the utility’s scope of work. Ignoring these details could affect the construction schedule if the City is unable to accommodate either the street closure or the length of time the street closure is needed to remain in place.
7. In the process of creating, updating and closing out items within the Utility Conflict Matrix (UCM), Design Consultants should be diligent in providing recommendations to resolve the conflict and the follow-up of resolving each conflict throughout the design process. The UCM is a key component for partnering utility companies tracking utility conflicts with the proposed improvements.
8. In designing for Join-Bid utility work for Functional Replacement, Design Consultants should be mindful that other utility may request payment for relocations due to proposed improvements if the relocation is not caused by City improvements.
9. Design Consultants should be mindful that utilities may require payment for any relocation within existing utility easements on City right-of-way or within proposed City easements to be acquired for City Improvements.
10. Design Consultants should be mindful that CPS overhead electric requires a 15-ft buffer from all overhead obstructions. This requirement could trigger the relocation of large signs that remain outside the exiting right of way but encroaches upon eth e15-foot buffer CPS requires if poles are relocated to 1-ft from the existing right-of-way.

11. It is important that the design Engineer show proposed utility alignments and depths for SAWS and CPS improvements in the 40% design phase plan submittal. This Information is critical for Environmental to assess and conduct their environmental studies. In the event this information is not provided, the project schedule will be delayed. Therefore, the design Engineer should ensure utility alignments and depths for both SAWS and CPS improvements are provided at the design phase submittal.

5.5.2 Overhead (OH) Utilities

Design Consultants are required to employ the same level of care in locating and evaluating overhead utilities as they use in locating and evaluating underground utilities. Particular attention should be paid to the impact of excavation close to poles and/or guys as well as the alignment of proposed pedestrian facilities and driveways relative to existing poles. Engineers should include a review of bracing procedures should excavation occur within five feet of a pole or guy and be at least three feet deep.

Upon the conclusion of the Utility Kickoff Meeting, the Design Consultant should conduct a cursory review of the existing overhead utilities, identify all the poles within the project limits, label the poles by number and provide a narrative for each overhead utility by describing the scope of work necessary to complete the transfer of facilities to new poles within the utility coordination report.

From the Utility Coordination Matrix (UCM), CPS Energy will generate a design for the relocation of their overhead electric facilities frequently called the “OH sketch”. The OH Sketch will map the scope of work for CPS overhead electric. Upon release of the OH sketch, the Design Consultant should coordinate with CPS regarding the staking of proposed locations to ensure the proposed locations are not in conflict with any proposed improvements.

Design Consultants should also conduct a cursory review of the project schedule to complete the utility transfers required to remove existing poles in conflict with proposed improvements on the utility conflict matrix. Ignoring this very simple detail could delay the completion of a utility transfer which may have a small amount of work but ultimately delay the transfer of another utility that involves a large amount of work impacting the start of construction.

5.6 Utility Coordination Roles & Responsibilities

- *Design Consultant*: The Design Consultant's role is to identify existing underground/overhead utilities as well as any and all potential conflicts of the existing underground/overhead utilities with the proposed improvements. The Design Consultant's role also includes providing recommendations to resolve conflicts and track the status of those recommendations to completion.
- *PM Team*: The Project Team's role is to take the lead in coordinating with utility companies the proposed recommendations identified by the Design Consultant and work through any issues/concerns the utility companies may have with the proposed recommendations provided by the Design Consultant.
- *Utility Coordinators*: Once a recommendation has been accepted by all parties, the Utility Coordinator's role is to follow-up on the progress of these recommendations, report the status and report any issues that could adversely impact the timely completion of these recommendations to the PM Team, Consultant and/or utility company.

5.7 Process

The utility coordination process that will be used for city capital improvement projects will be based on effective communication, followed by documentation that provides a basis for the approved design. The process itself can be split up in three phases consisting of:

- Phase 1 – Utility Data Collection
- Phase 2 – Utility Plan Development
- Phase 3 – Utility Plan Tracking

5.7.1 Phase 1 – Utility Data Collection

Before utility coordination can begin, the design consultant must first be able to define the project so that utility companies can understand its impact. This means that the following must be known:

- Project schedule
- Project limits
- General horizontal alignment
- General vertical alignment

- Project configuration (traffic signals, sidewalk width, roadway width and number of lanes)
- Approximate pavement design (total pavement depth to include pavement thickness, base depth, and prepared subgrade depth)

With this information, the Design Consultant is prepared to conduct a preliminary assessment of the project's utility condition.

The preliminary assessment begins by contacting all utility companies that may have facilities within the project limits as stated on Stop 1 of the 40% Design Phase of Table 5-1: ASCE Quality Level Descriptions, found on page 128. It's important that communications with the utility companies be documented; therefore, the Design Consultant will send notice of the project along with any preliminary mapping of the project to the utility companies through certified mail. At a minimum, the initial notification to the utility companies shall include the following information:

- Request of available utility block/system maps, and record drawings
- A description of the design engineer's requested procedure for delineating existing facilities, providing disposition of utilities and resolving conflict
- A statement that attendance at meetings and cooperation of the affected utilities is encouraged and expected
- A statement that the private utility is ultimately responsible for any conflicts in design by its own organization which result in uncovered or unresolved conflicts
- A statement that any utility that has no facilities within the limits of the project, or determines that its facilities are not affected by the proposed work, will furnish a letter of "NO CONFLICT/NON-INVOLVEMENT" to the project manager

As stated on Step 2 of the 40% Design Phase (Table 5-2), a Utility Kickoff Meeting is then scheduled by the City with all utility companies to inform them of the City's Scope of Work and begin to obtain any available data such as system maps and/or as-builts as stated on Step 2 of the 40% Design Phase (Table 5-2). After the Utility Kickoff Meeting, the Design Consultant must identify apparent utilities in the project vicinity, create a Utility Basemap of Quality Level C and send two copies to all utility companies for their review and comments as stated on Steps 43 & 4 of the 40% Design Phase (Table 5-2). One copy is for their records and one is to be returned to the Design Consultant with comments. In addition, the Design Consultant should conduct a cursory review of the existing overhead utilities, identify all the poles within the project limits, label the poles by number and provide a narrative for each overhead utility describing the scope of work necessary to complete the transfer of facilities to new poles within the utility coordination report.

5.7.2 Phase 2 – Utility Plan Development

As stated on Steps 5 and 7 of the 40% Design Phase (Table 5-2), Design Consultant will continue their preliminary assessment by comparing the utility locations to the proposed improvements and begin to identify and assess possible conflicts. The Design Consultant will also develop preliminary roadway cross-sections/storm drain profiles & show vertical locations of existing utilities as well as conduct an initial analysis for SAWS water/sewer, CPS gas, and/or other utilities affected by the project & identify those conflicts in the Utility Conflict Matrix. This includes, at a minimum, an initial list of SUE needs. As stated on Step 8 of the 40% Design Phase (Table 5-2), The Design Consultant must coordinate closely with the City and utility owner to identify locations and number of "pot-holes" required to properly identify the horizontal and vertical location of the utility in question.

As stated on Step 9 of the 40% Design Phase Table 5-2), a 2nd utility coordination meeting, labeled the "20% Utility Coordination Meeting", is then scheduled to discuss the accuracy of the Utility Basemap, project scope, project schedule, and either how the project can be designed to reduce impact or how the utility can be modified to suit project conditions. At this time, the need for additional data is discussed and agreed upon.

At this meeting, the design consultant shall, at a minimum, perform the following:

- Confirm that preliminary plans (roadway and drainage) have been furnished to each utility so they may begin their reviews and designs;
- Describe the project to the utility companies so they better understand the scope of the project;
- Identify obvious conflicts and possible major relocations; and
- Describe and discuss with all parties the possible locations and alignments of new facilities and the types of installations involved.

After the 20% Utility Coordination meeting, the Design Consultant is ready to further define existing utility alignments. This process requires close coordination among the parties. The Design Consultant will maintain complete records of this process, so that decisions regarding proposed utility disposition and project configuration are memorialized.

If the proposed roadway and drainage improvements have been optimized to the extent possible and water, sewer and gas utilities must be adjusted, the Design Consultant will investigate and determine how these facilities can be configured to mitigate conflict with proposed facilities and still provide service. Close coordination with the SAWS and CPS Energy is needed to ensure the design of these systems is consistent with their goals and standards as stated on Step 10 of the 40% Design Phase (Table 5-2).

As stated on Step 11 of the 40% Design Phase (Table 5-2), the Design Consultant will recommend and assign utility alignments for all affected facilities with close coordination with the TCI Project Management Team and utility representatives. The assigned alignments must be included in the Utility Coordination Report as an exhibit showing the typical street section. The utility coordination report will also document all changes and revisions to the assigned alignments as the plans move from preliminary to final design. The 40 percent submittal to the city shall include this report, the phone log, letters, responses, emails, other correspondence and the Utility Conflict Matrix related to the Utility Coordination task as stated on Step 12 of the 40% Design Phase (Table 5-2).

The Design Consultant will then determine the need for further effort to establish utility locations. It may be necessary to conduct “pot-holing” activities to increase certainty regarding the horizontal and vertical locations of subsurface utilities.

The Design Consultant will then move to finalize the 40 percent design of COSA improvements and prepare construction drawings with associated specifications. Also, if required, move to finalize the water, sewer, and gas relocation work. Consultant must ensure copies of these drawings and MicroStation files are sent to SAWS, CPS Energy and utility companies for final review and comment. Any comments must be addressed by the design consultant. The design consultant will continue to coordinate the design of all other required utility adjustments so these designs are consistent with COSA plans and specifications and to ensure they are ready for implementation prior to advertising the project.

All results and coordination efforts will be documented in a utility coordination report that accompanies the 40 percent design submittal and updated in all subsequent submittals. The report should include maps, evidence of communication regarding utility locations within the project area, and a completed Utility Conflict Matrix as shown in Appendix 5B.

5.7.3 Phase 3 – Utility Plan Tracking

As stated on Steps 1 and 2 of the 70% Design Phase (Table 5-2), the Design Consultant will act upon the 40% submittal recommendations that have been evaluated by the City PM Team and utility participants. They will also incorporate any findings obtained from the results of the completed SUE work. The Design Consultant will coordinate with non-joint bid utilities, update the Utility Conflict Matrix by assessing the remaining utility conflicts; updating the recommendations and making recommendations for utility locates that will be deferred to construction as stated on Steps 3, 7 and 8 of the 70% Design Phase (Table 5-2). Upon release of the overhead sketch by CPS, the Design Consultant should conduct a cursory review of the overhead facilities by reviewing the utility transfers necessary to remove any existing poles in conflict with the proposed improvements and update the Utility Conflict Matrix by identifying any conflicts preventing the completion of these transfers.

As stated on Steps 4, 5 and 6 of the 70% Design Phase (Table 5-2), the Design Consultant will complete the utility base map, the 70% cross sections to verify existing utility locations and the proposed utility design components and incorporate them into the overall plans. All results and coordination efforts will be documented in a utility coordination report that accompanies the 70 percent design submittal and updated in all subsequent submittals. The report should include maps, evidence of communication regarding utility locations within the project area, and a completed Utility Conflict Matrix as shown in Appendix 5B as stated on Steps 9 and 10 of the 70% Design (Table 5-2).

As stated on Steps 1 thru Steps 1 thru 5 of Design Phase (95%) on Table 5-2, the Design Consultant will address any comments from reviewers from the prior phase; resolve any remaining utility conflicts; finalize plans, sections and details related to utility coordination; provide an assessment for Utility Coordination needed during construction; and include a narrative of the major design changes from the previous submittal of the Utility Coordination Report.

As stated on Steps 1 thru 3 of Bid Phase (Table 5-2), the Design Consultant will address comments from reviews, resolve any outstanding utility coordination issues and provide plan notes as necessary and finalize any outstanding utility issues in the plans and specifications.

The design consultant’s scope of work is further defined below in Table 5-2: Designer's Utility Coordination Scope and Check List.

Table 5-2: Designer's Utility Coordination Scope and Check List (			
☐	**No.**	**Description**	**Completion Date**
40% Design Phase			
☐	1	Send notice to all utilities requesting block/system maps, including the project scope, and a project location map.	
☐	2	Conduct utility kickoff coordination meeting.	
☐	3	Identify apparent utilities in the project vicinity and surrounding area by topographic survey, field investigation, by requested marking on the ground, and by available record search.	
☐	4	Prepare initial Utility Basemap (Quality Level C) sufficient to identify all utilities in the project vicinity and distribute to all utility companies.	
☐	5	Compare utility locations to proposed project and assess conflicts.	
☐	6	Develop preliminary roadway cross-sections and storm drain profiles and show vertical locations of existing utilities.	
☐	7	Conduct initial utility conflict analysis for SAWS water and sewer, CPS gas, and all utilities affected by the project. Identify potential conflicts in the utility conflict matrix.	

Table 5-2: Designer's Utility Coordination Scope and Check List (continued)			
☐	No.	Description	Completion Date
☐	8	Prepare initial list of SUE needs for the project required to fully characterize utilities with potential high impact on the project.	
☐	9	Initiate coordination for design of all utilities that may require relocation and conduct 2nd utility coordination meeting.	
☐	10	Optimize street and drainage design to minimize/avoid conflicts with utilities.	
☐	11	Recommend/Assign utility alignments for all affected utilities.	
☐	12	Prepare and provide Utility Coordination Report for the Project, attaching utility conflict matrix, phone log, letters, responses, emails and other correspondence related to the Utility Coordination task.	
☐	13	Provide utility alignments and depths for SAWS and CPS improvements.	
70% Design Phase			
☐	1	Act upon 40% submittal recommendations	
☐	2	Complete SUE related work, obtain results, and incorporate findings	
☐	3	Track the coordination of design by PM team with non-joint bid utilities.	
☐	4	Complete utility basemap, resolve all known utility conflicts, and update utility conflict matrix	
☐	5	Complete 70% cross sections to verify existing utility locations	
☐	6	Complete utility proposed design components and incorporate into overall plans	
☐	7	Assess remaining utility conflicts and make recommendations in the final design submittal	
☐	8	Make recommendations for utility locates that will be deferred to the construction phase	
☐	9	Provide Utility Coordination Report supplement to address changes since the initial submittal, including attached letters and other correspondence.	
☐	10	In the Utility Coordination Report, include a narrative with list of major design changes from previous submittal	
95% Design Phase			
☐	1	Address comments from prior phase	
☐	2	Resolve remaining utility conflict resolution	
☐	3	Finalize plans, sections, and details related to utility coordination	

Table 5-2: Designer's Utility Coordination Scope and Check List (continued)			
☐	No.	Description	Completion Date
☐	4	Provide Construction Phase Utility Coordination Needs Assessment	
☐	5	In the Utility Coordination Report, include a narrative with list of major design changes from previous submittal	
Bid Phase			
☐	1	Address comments from reviewers	
☐	2	Resolve outstanding utility coordination issues and provide plan notes	
☐	3	Finalize outstanding utility issues in the plans and specifications	
Construction Phase			
☐	1	Update project drawings to reflect location of placed utilities, using marked up plans signed and provided by the Contractor with concurrence by the Inspector.	

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Section 6 Traffic Engineering

6.1 Introduction

Traffic engineering is a branch of civil engineering that uses engineering techniques to achieve the safe and efficient movement of people and goods. It focuses mainly on accommodating traffic demands within the constraints of available infrastructure through traffic-flow management techniques, including the application of traffic control devices (signs, signals, and pavement markings).

For capital improvement programs, traffic engineering involves analysis of existing and projected multimodal traffic and roadway conditions on project roadways to assess traffic safety, traffic demands, roadway capacity, and the traffic engineering measures necessary to provide safe streets and acceptable levels of service. To the level determined by the COSA project manager, the traffic engineer is expected to review current and future traffic conditions and determine the general configuration of the project, so it provides a desired design-level of service and adheres to the City's Complete Streets Policy and furthers San Antonio's Vision Zero goal. This includes, among other considerations, the identification of:

- multimodal transportation accommodations
- safety enhancements
- lane width
- number of lanes
- intersection configuration
- traffic control
- access management
- speed

6.2 Traffic Engineering Design Process

The traffic engineering design process is required for every COSA roadway project. The result establishes design parameters and specific traffic engineering features for the design team to incorporate in preparing the project. The specific requirements of the traffic engineering study will be determined for each project by the COSA project manager. Section 6.2.1: Traffic Studies, found on page 142, is a description of the design process required for traffic engineering.

6.2.1 Traffic Studies

In the early stages of a project, various studies may be required to establish critical criteria for street or roadway design, including design level of service, sight distance, and access management limitations, which are needed to establish the configuration of the primary elements of the work. Access management is particularly important in that it determines driveway locations, where medians and median openings are needed, and the types of access and turn restrictions that should be imposed to facilitate the movement of traffic and preserve the integrity of the roadway function within the infrastructure network. Access management must also take into consideration conflict points between modes such as vehicles, pedestrians, and bicycles, and design to reduce potential conflict. In some instances, it may be appropriate to employ computer simulation modeling to project the relative effectiveness of various alternatives.

The recommendations of the traffic engineering study will address such issues as the required number of through lanes, auxiliary lanes, signals and other traffic control improvements, access management, and multimodal improvements (i.e., bicycles, pedestrians, and buses). The recommendations will guide the design of the proposed roadway and intersections, as well as the specific design of traffic engineering features.

The traffic engineering study will comply with requirements of the most recent versions of:

- Texas Manual on Uniform Traffic Control Devices (TMUTCD)
- Transportation Research Board Highway Capacity Manual (HCM)
- AASHTO A Policy on Geometric Design of Highways and Streets (“Green Book”)
- National Association of City Transportation Officials (NACTO) design guides
- other standards of traffic engineering practice, as appropriate

Computer simulation modeling software used in development of the traffic engineering study must be approved by the city for use. The study findings will be summarized and documented in the traffic engineering report (TER).

6.2.2 Deliverables

6.2.2.1 Traffic Engineering Study

The Traffic Engineering Study deliverables shall include:

- Executive Summary: A two-page (maximum) summary of key features of the report, suitable for distribution as an informational handout on the project at public open houses or meetings with citizens.
- Introduction: A general project description, location map, and aerial photo of the project, identifying significant landmarks in the vicinity.
- Existing Conditions:
  - Roadway:
    An inventory of existing conditions for all roadways, intersecting roadways, and intersections to be improved, including a scaled drawing of existing conditions. At a minimum the inventory will include, but not be limited to, the following.
    - roadway geometry and typical roadway cross sections, including median treatments and channelization
    - auxiliary lanes

      (left- and right-turn lanes)
    - inventory of traffic-control devices

      (signs, signals, pavement markings, school zones)
    - posted speed limits
    - identification of existing schools, high pedestrian traffic generators (such as parks and hike & bike trails), and other major traffic generators, including those in development
    - multimodal accommodation

      (bus routes and existing and proposed pedestrian and bicycle facilities)
  - Traffic data:
    The traffic data collection schedule shall be coordinated and approved by the city. Traffic counts should be recorded only on typical weekdays (not subject to special events or incidents that could affect typical traffic patterns or volumes) during a continuous 48-hour period between 12:00 noon on a Monday and 12:00 noon of the following Friday. Data collected should include the following.
    - Turning movement traffic counts for critical intersections (a.m. and p.m. peak hours).

      Critical intersections will be determined during the project scoping process. New data will be collected if existing data are more than two years old or, for projects located in high-growth areas, if existing data are more than one year old, as directed by the COSA project manager. The design consultant will check with the Traffic Engineering Division for existing data.

- Hourly approach traffic volume counts for one full 24-hour period at critical intersections may be needed, as determined by the city project manager.

  New data will be collected if existing data are more than two years old. The consultant will check with the Traffic Engineering Division for existing data.

- Directional average daily traffic (ADT) and hourly volumes on the improvement roadway between existing signalized intersections and other intersecting major streets and side streets deemed critical.

  New data will be collected if existing data are more than two years old. The consultant will check with the Traffic Engineering Division for existing data.

- Up to three years of roadway and critical intersections collision data (city data) and associated collision rates, based on the most recent data available for all modes of travel from statewide crash reports.

  Prepare a collision data summary spreadsheet and collision diagram.

- Capacity and level-of-service analyses for existing conditions along the segments and at critical intersections (a.m. and p.m. peak-hour periods)
- K (proportion of the ADT occurring in the peak hour) and D (proportion of the peak-hour traffic in the peak direction) factors
- Peak-hour factor by approach and by movement at critical intersections as determined by the COSA project manager
- Heavy vehicle (truck and bus) percentage during the peak a.m. and p.m. peak periods
- Bicycle and pedestrian counts, where applicable
- Intersection and roadway lighting
- Intelligent Transportation Systems (ITS) based on Traffic Management Division data

- Projected Conditions
  - Determine the a.m. and p.m. peak-hour volumes for all roadways, intersecting roadways, intersections, and major driveways within the limits of the project or as determined by the COSA Project Manager.
    These volumes shall be determined for the opening year and the design year (typically 20 years into the future). The volumes will be based on existing traffic volumes and on traffic projections prepared by the Metropolitan Planning Organization (MPO) or by the designer guided by city staff.

    - Determine capacity and level of service (LOS) for opening year and design year on the roadway and at critical intersections (a.m. and p.m. peak-hour periods).
    - Address traffic impacts on adjacent neighborhoods (both during and after construction), including traffic calming and access management issues.

- Prepare traffic signal warrant analyses for the project opening year at critical intersections as determined by the COSA project manager and identified in the project scoping process. Traffic signal warrant analyses will be conducted in accordance with the latest version of the Texas MUTCD.

- Complete Streets

  The Traffic Engineering Study and subsequent Design Summary Report shall describe how the assessment of all modes of travel (automobile, pedestrian, bicycle, and transit) leads to the proposed design of the right-of-way to best accommodate all users within the land use context. When necessary to assess to alternative design cross-sections, a multi-modal level of service (MMLOS) analysis* shall be conducted and the results provided.

- Recommendations to be provided
  - Summary of improvements necessary to achieve the design level of service determined by the COSA project manager (typically LOS "D") and address identified safety issues
    - Speed zones, including school speed zones
    - All transportation modes

      (vehicular, transit, pedestrian, and bicycles)
    - Design parameters

      (design speeds, design vehicle, sight distances, shoulders, access control, and clear zones)
    - Access management features
    - Proposed roadway typical cross sections and intersection typical cross sections
    - Auxiliary lanes

      (left- and right-turn lanes, acceleration and deceleration lanes), including recommended lengths per city approved methodology to achieve design LOS
    - Critical intersection traffic control
    - ITS based on Traffic Management Division program requirements
  - School zone flashing beacons
    (roadside or overhead)
  - Conceptual improvement diagram illustrating recommended improvements

6.2.2.2 Preliminary Engineering Report and Design Summary Report

The resulting data from these studies should be documented in a Preliminary Report, if required. At a minimum, it should include the following:

- documentation of data as specified above
- modeling outputs and electronic simulation files
- tables of existing and projected measures of effectiveness (MOE) appropriate to the project, as defined by the consultant (see Table 6-1, on page 146 and Table 6-2, on page 147).
    - delays (control)
    - approach
    - intersection
    - network
    - levels of service (Highway Capacity Manual criteria)

Table 6-1: Existing Delay and Levels of Service Summary A.M. (or P.M.) Peak Period for Current Year 20xx (

Intersection	Intersection Approaches									
	Northbound		Southbound		Eastbound		Westbound		Average	
	Control Delay (sec)	LOS	Control Delay (sec)	LOS	Control Delay (sec)	LOS	Control Delay (sec)	LOS	Control Delay (sec)	LOS
Major at Minor 1										
Major at Minor 2										
Major at Minor 3										
Major at Minor 4										

Table 6-2: Projected Delay and Levels of Service Summary A.M. (or P.M.) Peak Period for Design Year 20xx (										
Intersection	Intersection Approaches									
	Northbound		Southbound		Eastbound		Westbound		Average	
	Control Delay (sec)	LOS	Control Delay (sec)	LOS	Control Delay (sec)	LOS	Control Delay (sec)	LOS	Control Delay (sec)	LOS
Major at Minor 1										
Major at Minor 2										
Major at Minor 3										
Major at Minor 4										

In addition, the results of this report should also address the following:

- design-year traffic volumes with truck and bus traffic projections
- identification of the design vehicle
- identification of the design speed
- projected level of service for the design year, utilize multimodal level of service, where applicable
- identification of any traffic-signal improvements
  - reconstruction of existing traffic signals
  - modification of existing traffic signals or signal systems
  - new traffic signal installations
  - signal system optimization and coordination
  - use of flashing beacons
- intersection improvements
  - approach widening
  - corner radius design
  - turn lanes, auxiliary lanes, lane adjustments
- pedestrian facilities (buffered sidewalks, pedestrian crossings in high pedestrian crash areas)

- bicycle facilities (buffered or protected bike lanes preferred)
- access management
- schools
  - limits of school zones,
  - type of treatment,
  - signs and pavement markings,
  - roadside flashing beacons, and
  - overhead flashing beacons;
- railroad coordination
- traffic handling during construction
- traffic control plan (TCP)
- signs
- pavement markings
- traffic signals including communications
- special requirements

In the event this work is to be done by a design engineering consultant, the issues identified above can be included in the design summary report and can be included in the consultant’s scope of work.

6.2.2.3 40 Percent Design

If a preliminary engineering report is completed, it should be provided to the design consultant. The design consultant can now proceed with the street or roadway design. The first milestone in the consultant’s work scope is the 40 percent design deliverable. In this deliverable, the consultant should provide layouts that conform to the traffic engineer’s criteria in the following areas:

- preliminary construction phasing: includes an exhibit showing preliminary construction phasing/sequencing and a sequence of work narrative.

  Exhibit and narrative must include all proposed improvements including all joint-bid utilities.
- intersection layout, including channelization
  - right-of-way (existing and proposed)
  - turn lanes
  - auxiliary lanes
  - lane assignments
  - wheelchair ramps
- bicycle and pedestrian facilities layout

- school-zone layout
- access management
  - driveways
  - medians and median openings
  - access and turn restrictions

In this deliverable, the design consultant should identify sight distance issues caused by the roadway widening, existing features, and proposed features. The design consultant should also provide a narrative description of the conceptual sequence of work and construction phasing plan, which addresses constructability of the project.

6.2.2.4 70 Percent Design

Upon approval of the 40 percent design submittal, the design consultant will be authorized to move forward to the 70 percent design submittal. At this point, the major design decisions have been made, and the configuration of the project is known. The design team is engaged in the development of construction plans to include standard details and specifications.

Although the primary effort is directed towards construction-plan development, some design decisions remain for the traffic engineer, including traffic control during construction, signal design, signage, and intelligent transportation system implementation. Following is a list of issues to be addressed in the 70 percent design submittal:

- traffic control plan
  - detours for vehicular, transit, bicycle, and pedestrian travel, as applicable
  - signage
  - pavement markings
  - traffic-signal plan:
    include for each phase of traffic control plan, including detection and communication to be maintained at all times
  - roadway widening
  - typical construction sections
  - portable dynamic message signs (DMS)
  - transit
  - bid items
  - review

- traffic-signal layouts
- signals
  - equipment
    - support system (poles and mast arms, etc.)
    - signal heads (vehicle, transit, bicycle, and pedestrian)
    - vehicle, bicyclist, and pedestrian detectors
    - Priority/preemption for vehicles, transit, bicycle, and pedestrian
    - controller
    - system communications, including maintenance agency interfacing
    - railroad pre-emption
  - layouts
    - existing to remain utilities and proposed utility relocations required by signal layout
    - pole and controller locations
    - signal-head locations
    - conduit and cable runs
    - identification of electrical service source with written confirmation from CPS Energy
  - conduit and conductor schedule
  - working with Traffic Management Division, develop signal timing and phasing plan and system coordination timing plan, as required
- signs (layouts including sign types and locations)
- pavement markings (layouts, including pavement marking types: line type, line width, color, and locations)
- flashing beacons
  - equipment
    - support system (poles and mast arms, etc.)
    - beacon heads and colors (red/yellow)
    - controller
  - layouts
    - existing utilities
    - pole and controller locations
    - signal head locations
    - conduit and cable runs
    - electrical service source
  - conduit and conductor schedule

- sidewalks and pedestrian facilities layouts
- bicycle facilities layouts
- access management
  - driveways
  - medians and median openings
  - access and turn restrictions
- intelligent transportation systems
  - traffic volume counting and speed recording stations
  - advanced traffic management system (ATMS)
  - dynamic message signs
  - maintenance agency interfacing
- bid items
- preliminary cost estimates

6.2.2.5 95 Percent Design

Upon completion of the 70 percent design, the resulting plans and specifications will be submitted to the city for review and comment. The design is nearly complete at this point, and the design consultant is principally engaged in addressing comments from the various permitting agencies and city departments. Satisfactory resolution of comments and suggestions from these reviewers moves the project to 95 percent completion.

6.2.2.6 100 Percent Design

Work within this phase consists of addressing any final comments and conducting a final review of the documents to assure that they are complete. Any city comments received during this period are to be addressed.

6.2.3 Standard Details

Standard details covering a variety of facilities are available from the City and other agencies and can be used in city projects. These details can be found on the City's website. The City's website will include web-links to TxDOT standard details as appropriate. All standard details applicable to a project will be included in the plan set. Standard details may include:

- signs
  - warning
  - regulatory
  - guide

  - structures
- barricade and construction traffic control
- school zone
- bicycle facilities
- pavement markings/channelization
- signals
  - intersection
  - equipment
  - layouts
  - pole and controller foundations
  - flashing beacon,
  - school-zone treatments
- system communications
- railroad pre-emption
- intelligent transportation systems

6.2.4 Standard Specifications

In addition to standard details, standard specifications covering a variety of traffic-engineering topics are available through the city's website. The city's website will include web-links to TxDOT standard specifications as appropriate. Standard specifications include:

- signs
- pavement markings
- signals
  - intersection
    - equipment
    - layouts
    - pole and controller foundations
    - flashing beacon
    - school zone
- system communications
- railroad pre-empts
- vehicle priority/preemption
- intelligent transportation systems

6.2.5 Plan Sheet Standard Layouts

Four traffic-related plan sheet templates are included:

1. Traffic Signal Layout (Figure 6-1, on page 155)

   Includes the intersection layout, locations of signal supports, controller foundation, electrical service and source, signal support- mounted signage, detectors, conduit runs, cable and conductor schedule, equipment details and identification key, and supplemental data. This sheet will include the city's stamp for signature of approval of the traffic plans.

2. Traffic Signal Elevation Details (Figure 6-2, on page 156)

   Includes elevation details for each signal support structure, depicting positioning and all dimensions relevant to the installation of all support components and support-mounted equipment.

3. Traffic Signal Notes (Figure 6-3, on page 157)

   Includes materials and quantity estimates, foundation layout, foundation station and offset data table, traffic signal construction notes, and detailed signal component information. The latter must include descriptions of the electrical service, controller, controller cabinet, cabinet foundation, and, for each support structure individually, descriptions of the pole, mast arm, pole foundation, signal heads, pedestrian heads, detectors, signage, and other signal support-mounted equipment.

4. Pavement Markings — Signing (Figure 6-4, on page 158)

   Includes the intersection layout, pavement markings layout specifying types of pavement markings for each application, materials and quantity estimates, and signs and markings details, as needed for clarity of the design

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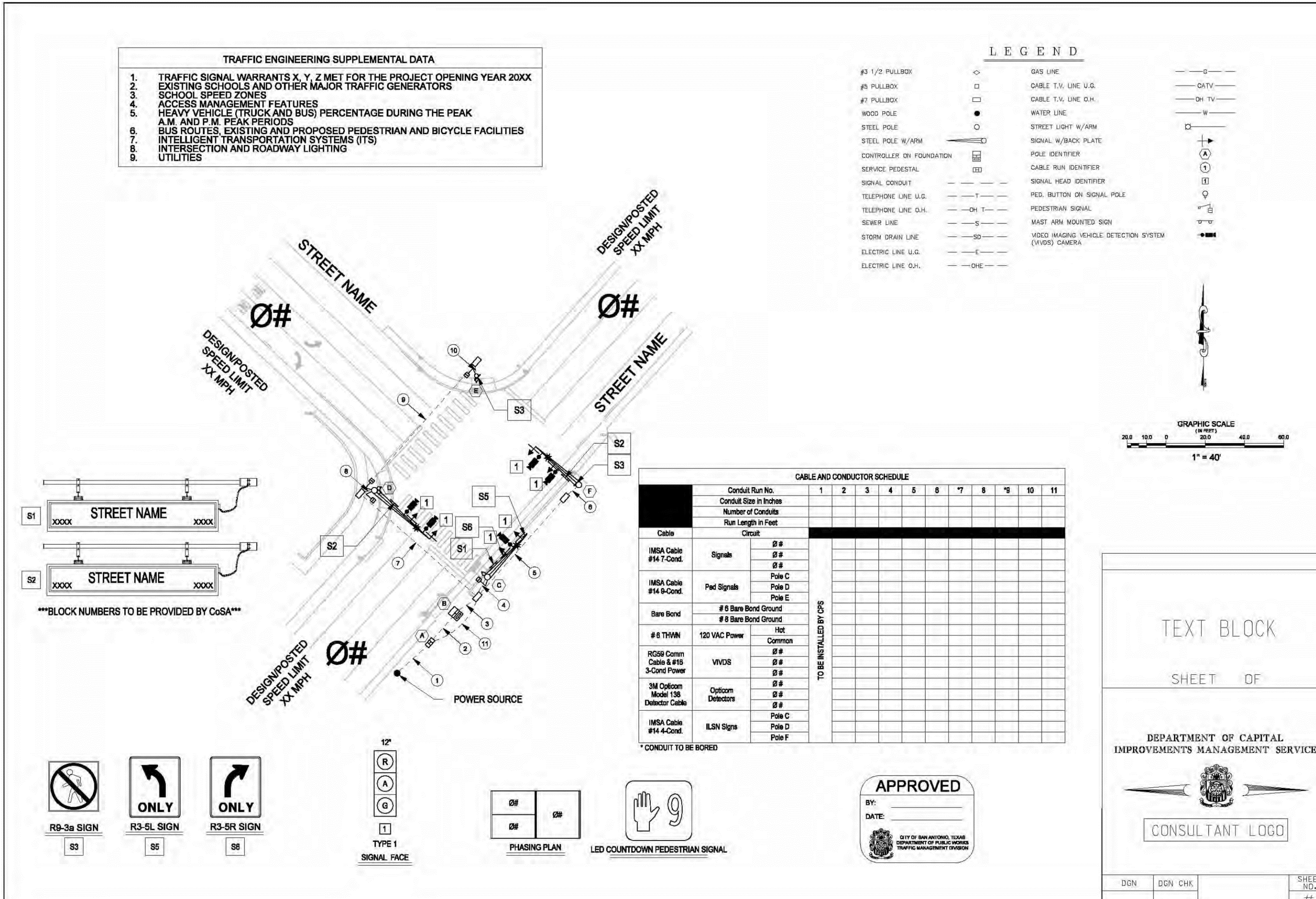


Figure 6-1: Traffic Signal Layout

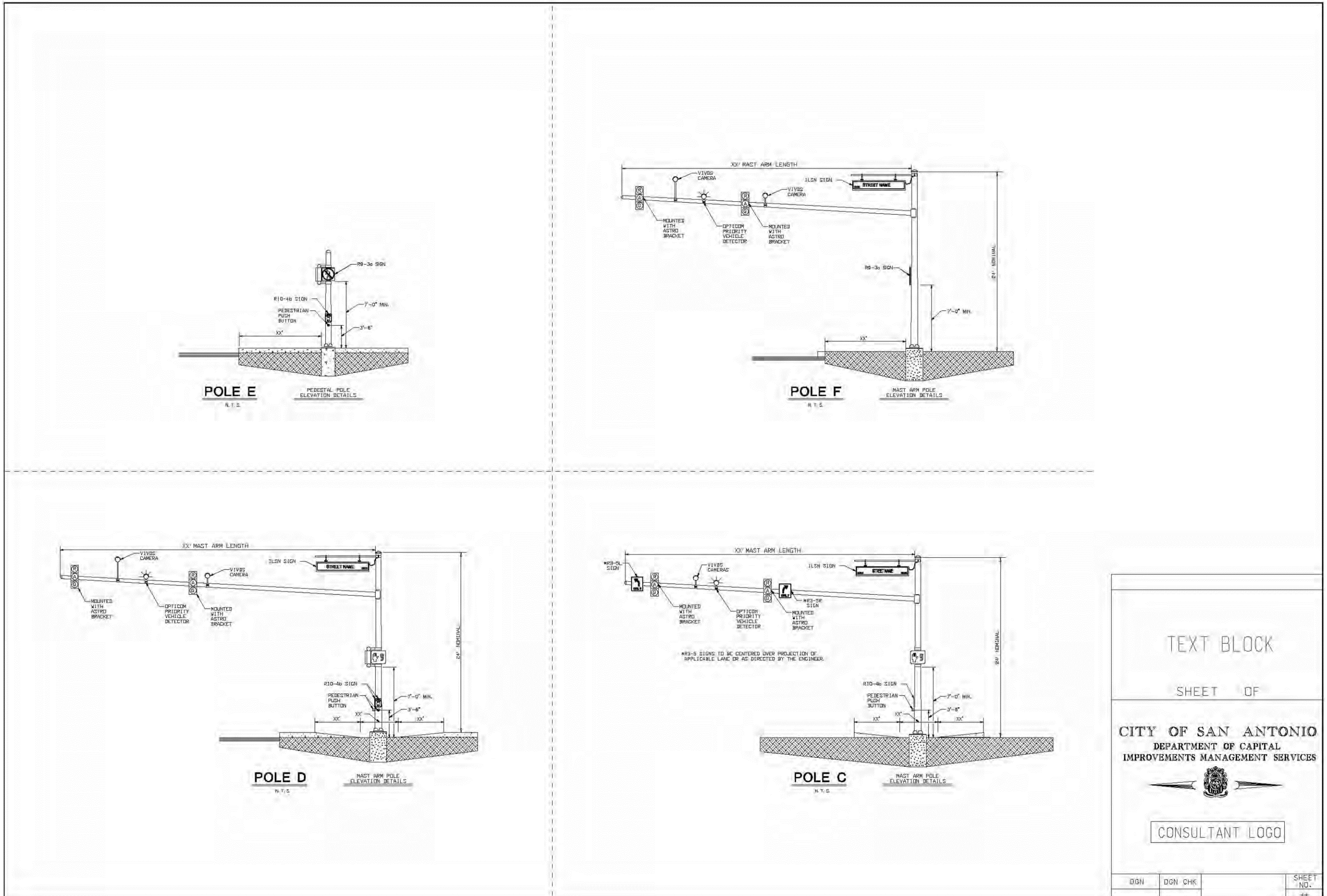


Figure 6-2: Traffic Signal Elevation Details

TRAFFIC SIGNAL MATERIALS TO BE FURNISHED & INSTALLED BY CONTRACTOR			
ITEM	DESCRIPTION	UNIT	QUANTITY
531.11	R3-5 Left Only	EA	X
531.11	R3-6 Right Only	EA	X
531.14	R3-8 LR (Galv Sq Sign Post)	EA	X
531.24	R9-3a Pedestrian Crossing Prohibited	EA	X
600.01	Traffic Signal Conditions	PI	X
601.01	CPS Insurance	PI	X
603.03	#7 Pull Box	EA	X
605.01	Pedestrian Signal, Count Down	EA	X
607.01	Traffic Signal Head Type 1	EA	X
613.01	Pedestrian Pushbutton and Sign	EA	X
615.01	Type 2070 Controller and 332 Cabinet	EA	X
619.01	Type 332 Controller Foundation	EA	X
624.07	Mast Arm Pole 28 feet [8.5 m] w/ 24' Pole	EA	X
624.09	Mast Arm Pole 36 feet [11 m] w/ 24' Pole	EA	X
624.35	Type I Signal Pole; 10 feet [3 m]	EA	X
626.01	Pole Foundation Type 30-A	EA	X
626.03	Pole Foundation Type 36-A	EA	X
626.04	Pole Foundation Type I Pole	EA	X
628.03	Conduit Trenched 2 inches [50 mm] PVC	LF	X
628.04	Conduit Trenched 3 inches [76 mm] PVC	LF	X
628.21	Conduit Bored 3 inches [76 mm] PVC	LF	X
630.02	Traffic Signal Cable	LF	X
632.01	Electrical Service Pedestal	EA	X
*6266.1	VIVDS Processor System	EA	X
*6266.2	VIVIDS Camera Assembly	EA	X
*6266.3	VIVDS Communication Cable (Coaxial)	LF	X
*6266.4	VIVDS Set-up System	EA	X
XXXX.XX	Opticom Priority Vehicle Detector	EA	X
XXXX.XX	Opticom Communication Cable	LF	X
XXXX.XX	ILSN Sign	EA	X
XXXX.XX	ILSN Cable - (IMSA Cable #14 4-Cond.)	EA	X

* TxDOT SPECIFICATION AND BID ITEM NUMBERS

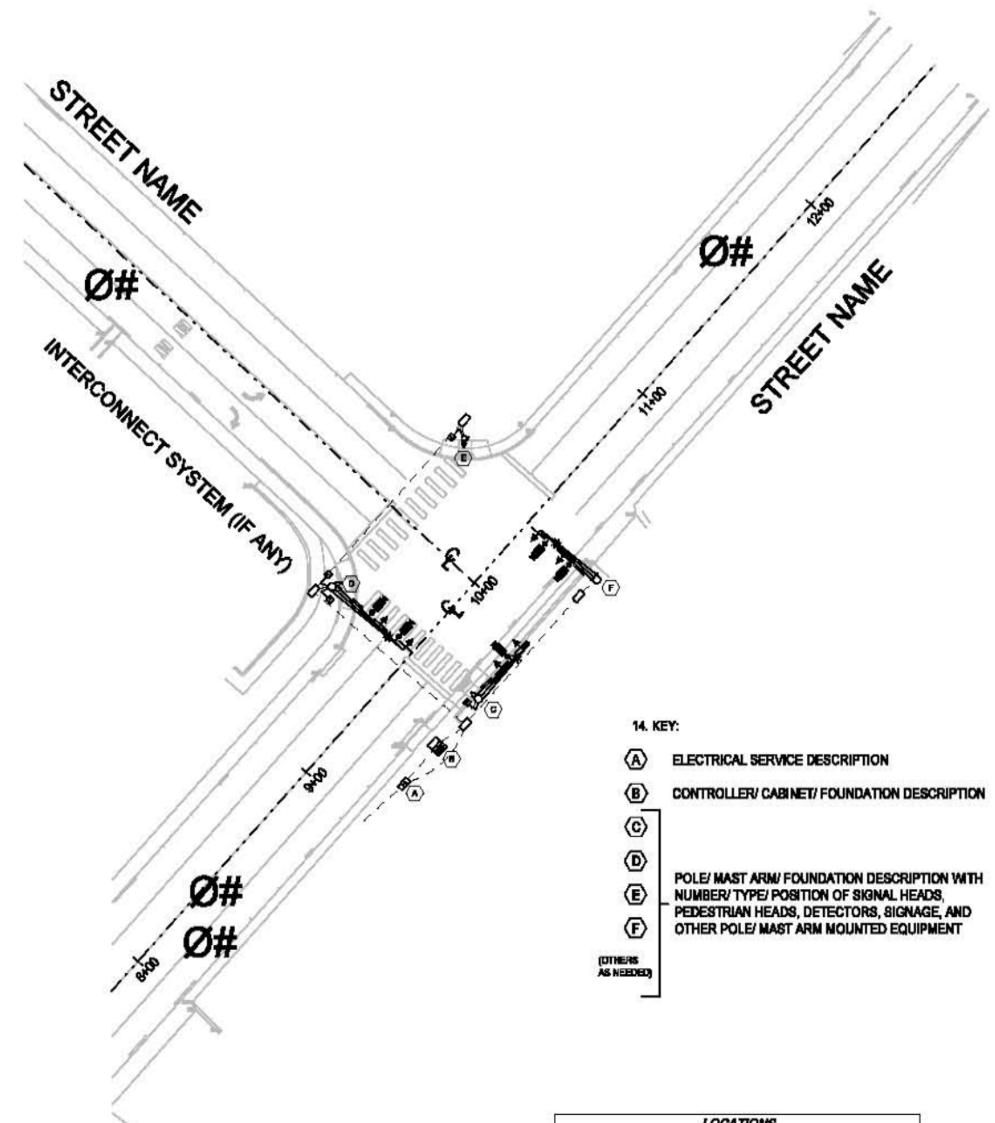
CONSTRUCTION NOTES:

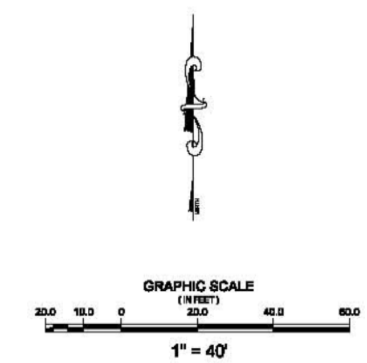
1. CONTRACTOR SHALL NOT BEGIN CONSTRUCTION WITHOUT WRITTEN AUTHORIZATION ISSUED BY THE CITY TRAFFIC SIGNAL ENGINEER (THE ENGINEER).
2. CONTRACTOR SHALL FURNISH ALL INSURANCE DOCUMENTATION TO THE ENGINEER IN ACCORDANCE WITH SPECIAL SPECIFICATION ITEM 600 - TRAFFIC SIGNAL GENERAL CONDITIONS INSURANCE.
3. CONTRACTOR SHALL ATTEND A PRE-CONSTRUCTION MEETING WITH THE ENGINEER PRIOR TO INITIATING ANY TRAFFIC SIGNAL RELATED WORK.
4. CONTRACTOR SHALL CONTACT THE ENGINEER AT LEAST SEVEN (7) DAYS PRIOR TO BEGINNING ANY CONSTRUCTION. THE CITY WILL PROVIDE ALL ON-SITE INSPECTION OF CONSTRUCTION AND SHALL BE THE SOLE AUTHORITY TO DETERMINE ADEQUACY OF MATERIALS AND CONSTRUCTION.
5. CONTRACTOR SHALL UNCOVER AND LOCATE ALL MARKED UNDERGROUND FACILITIES PRIOR TO EXCAVATING FOR DRILLED SHAFT FOUNDATIONS. UTILITIES SHOWN ARE BASED ON INFORMATION PROVIDED BY UTILITY AGENCIES AND VISUAL FIELD OBSERVATION. PROPERTY LINES SHOWN ARE APPROXIMATE, TAKEN FROM BEXAR APPRAISAL MAPS.
6. CONTRACTOR SHALL PROVIDE RED-LINE MARKUPS OF CONSTRUCTION TO THE ENGINEER WITHIN SEVEN (7) WORKING DAYS OF PROJECT ACCEPTANCE.
7. CONTRACTOR SHALL INSTALL TRAFFIC SIGNALS CENTERED OVER LANES WHEN POSSIBLE (MINIMUM 8' APART) OR AS DIRECTED BY THE ENGINEER.
8. CONTRACTOR SHALL INSTALL SIGNAL PHASING/TIMING AND CHANNELIZATION AS DIRECTED BY THE ENGINEER.
9. CONTRACTOR SHALL INSTALL ONE ADDITIONAL 2 INCH CONDUIT STUBBED OUT 2 FEET FROM EACH FOUNDATION AND CAPPED. FURNISHING AND INSTALLATION OF THIS CONDUIT SHALL BE SUBSIDIARY TO THE POLE FOUNDATION.
10. ALL SIGNS MOUNTED ON TRAFFIC SIGNAL EQUIPMENT SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR AS SHOWN ON THE PLANS AND SHALL BE SUBSIDIARY TO ITEM 600 "TRAFFIC SIGNAL CONDITIONS".
11. REMOVAL OF EXISTING SIGNS SHALL BE SUBSIDIARY TO ITEM 600 "TRAFFIC SIGNAL CONDITIONS".
12. THE CONTRACTOR SHALL PROVIDE THE FOLLOWING EQUIPMENT FOR COMMUNICATION TO THE SIGNAL:

Part Number *	Description	Qty
Fixed Port Switches		
WS-C2955S-12	2955 12 TX w/Single Mode Uplinks	1
PWR-2955-AC=	AC to 24 V DC Din Rail Power Brick	1
STK-RACKMNT-2955=	19 in Rack mount kit for Catalyst 2955	1
Mobile Access Router		
C3230-24-49-K9	3230 bundle with (1) 2.4GHz WMIC + (1) 4.9GHz WMIC	1
MA-WC49-5X	Mars MA-WC49-5X 4.9 GHz 17 dbi 60 Degree Sector Antenna - Public Safety	1

* All part numbers refer to Cisco products.

13. THE CONTRACTOR SHALL FURNISH AND INSTALL AN ENCLOSED PHOTOCELL IN THE ELECTRICAL SERVICE TO POWER THE ILSN SIGNS. FURNISHING AND INSTALLATION OF THE PHOTOCELL SHALL BE SUBSIDIARY TO ITEM 632.01 "ELECTRICAL SERVICE PEDESTAL".





14. KEY:

- (A) ELECTRICAL SERVICE DESCRIPTION
- (B) CONTROLLER/ CABINET/ FOUNDATION DESCRIPTION
- (C) (D) (E) (F) (OTHERS AS NEEDED) POLE/ MAST ARM/ FOUNDATION DESCRIPTION WITH NUMBER/ TYPE/ POSITION OF SIGNAL HEADS, PEDESTRIAN HEADS, DETECTORS, SIGNAGE, AND OTHER POLE/ MAST ARM MOUNTED EQUIPMENT

LOCATIONS		
POLE	STATION	OFFSET
A		
B		
C		
D		
E		
F		

TEXT BLOCK

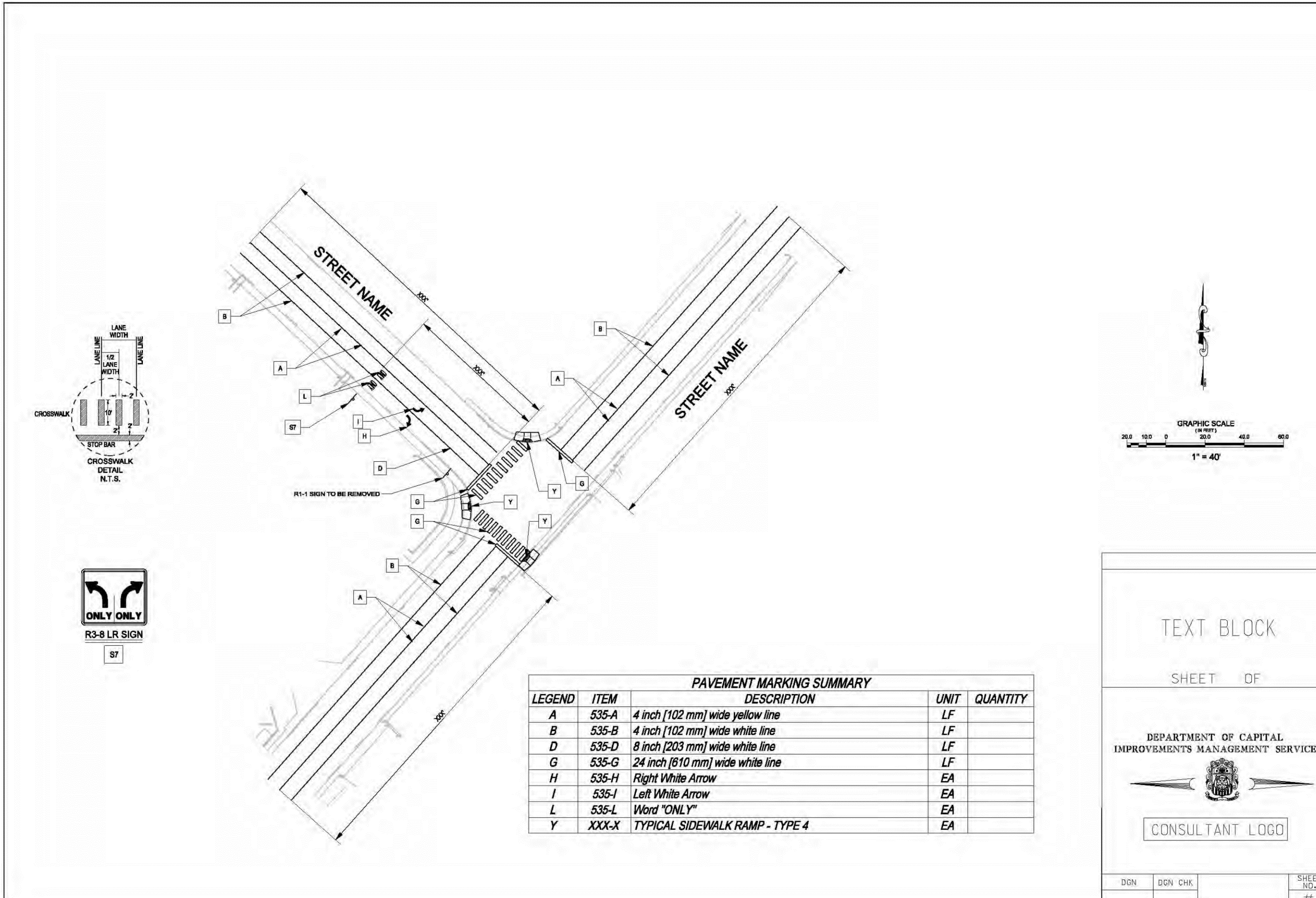
SHEET OF

CITY OF SAN ANTONIO
DEPARTMENT OF CAPITAL IMPROVEMENTS MANAGEMENT SERVICES

CONSULTANT LOGO

DGN	DGN CHK		SHEET NO.
			#

Figure 6-3: Traffic Signal Notes



PAVEMENT MARKING SUMMARY

LEGEND	ITEM	DESCRIPTION	UNIT	QUANTITY
A	535-A	4 inch [102 mm] wide yellow line	LF	
B	535-B	4 inch [102 mm] wide white line	LF	
D	535-D	8 inch [203 mm] wide white line	LF	
G	535-G	24 inch [610 mm] wide white line	LF	
H	535-H	Right White Arrow	EA	
I	535-I	Left White Arrow	EA	
L	535-L	Word "ONLY"	EA	
Y	XXX-X	TYPICAL SIDEWALK RAMP - TYPE 4	EA	

Figure 6-4: Pavement Markings

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Section 7 Roadway, Bicycle, and Pedestrian Design

7.1 Overview

As roadway designers, engineers strive to satisfy the needs of the driving public, while minimizing the impact of the roadway on the surrounding environment. Unique combinations of often conflicting requirements will result in special solutions. The guidance provided in this section is based on established practices conducted at local, state, and national levels. It's intended to provide general guidance in administering, planning, and designing roadways in the City of San Antonio.

Roadway design typically encompasses all aspects of the project development process. Within the roadway design process, tasks associated with preliminary design conferences; data collection; coordination with stakeholders; execution of agreements; geometric design criteria; traffic data collection; ownership data; utility mapping and information; associated plans, studies, and reports; hydraulic data; and survey data must be researched and documented for successful project delivery. As the City of San Antonio is expected to continue to grow significantly, roadway design must provide for multimodal transportation options. (See Section 7.5.1.15, Complete Streets on page 175). San Antonio became a Vision Zero city in 2015, establishing the goal of eliminating roadway fatalities and serious injuries.

7.2 Tasks

Following are tasks a design consultant typically undertakes to successfully design a roadway:

- conduct an Initial scope meeting (ISM)
- discuss Complete Streets requirements
- acquire all available topographic survey data, including aerial, field, and photogrammetric data
- identify appropriate roadway classification and design speed
- identify available or needed right-of-way for the intended facility usage
- define geometric design criteria for roadway, bicycle lanes, and pedestrian components
- develop typical sections
- develop pavement designs, including geotechnical survey needs
- consider drainage design in roadway design development

- consider bridge and retaining wall needs
- determine average daily traffic (ADT) and projected traffic volumes
- determine intersection design considerations, including bus pad designs
- determine access needs for adjacent properties
- identify pedestrian considerations such as pedestrian routes and directing pedestrians to desired crossing areas
- determine bicycle design considerations
- identify safety considerations in plan development (vehicle crash analysis)
- identify and coordinate environmental permits, issues, and commitments (EPIC) with COSA Environmental Management Division (EMD)
- prepare cost estimates

7.3 Preliminary Design Conference

The preliminary design conference—sometimes referred to as a design kickoff meeting—is a meeting of key individuals for the purpose of establishing fundamental aspects of a project. Before the conference, an agenda following the format of a design summary report (DSR) should be prepared and distributed to the COSA project manager and management staff, design consultant project manager, and design task leaders to document the criteria and decisions to be made regarding project development.

The minutes of this meeting should be documented, reduced to a Microsoft Word® document, and distributed to all attendees. A copy of the minutes should be kept in the project files.

This meeting should include discussion of all design criteria to be used in roadway geometrics, based on roadway classification, traffic volumes, and design speed. Its purpose is to establish and agree on fundamental aspects, concepts, and preliminary design criteria of the project. Supporting documents constitute an understanding by COSA, TxDOT, and other local entities of the basic features of the project. See Appendix 7A.

7.4 Data Collection

Data collection for project development includes topographic survey, aerial mapping, record drawings of previous plans, related studies and reports, existing utility maps, property plats, traffic and crash data, FEMA maps, and drainage studies. Information in these various source materials can be valuable when determining an appropriate scope for the project. Adjustments during design and accommodations during construction can help avoid delays and promote successful completion of most projects.

7.5 Appropriate Design Criteria

All roadways within the city limits will be classified as principal arterial, minor arterial, collector, or local streets. The Alamo Area Metropolitan Planning Organization (MPO) has identified all roadways that are eligible for federal funding and classified them accordingly. All other streets and roadways will be considered local streets, with improvement funding coming from the city's allocation.

The American Association of State Highway and Transportation Officials (AASHTO) published A Policy on Geometric Design of Highways and Streets. This manual is updated periodically and contains design considerations and criteria applicable to roadway design.

Furthermore, design guides from the National Association of City Transportation Officials (NACTO) shall be utilized for use on City of San Antonio projects, where applicable.

7.5.1 Design Characteristics

The following characteristics should be considered in optimizing roadway design controls for various roadway classifications:

- Vehicle Types

  Each roadway should be evaluated to determine the type(s) of vehicles that could influence the design criteria most appropriate for the candidate project. The majority of vehicles that use roadways comprise passenger cars, buses, commercial vehicles, and recreational vehicles. The following characteristics should be known when determining design factors:

  - vehicle size
  - turning radii
  - driver performance
  - operating characteristics

- Pedestrians

The quality and presence of pedestrian facilities shall be considered in all roadway projects. Sidewalks are required along San Antonio roadways with few exceptions. Elements such as sidewalks, walking trails, shared use trails, channelization, and crosswalks should be investigated for appropriate inclusion in roadway plans.

Pedestrian facilities should consider aesthetics and enhancements to conform to or provide improvements to the surroundings of the project site. When pedestrian facilities are anticipated for a particular project, the pedestrian elements shall be designed to accommodate requirements associated with:

- Americans with Disabilities Act (ADA) Revised Draft Guidelines for Accessible Public Rights-of-Way.
- United States Access Board (USAB) Public Right of Way Accessibility Guidelines (PROWAG)

The Texas Department of Licensing and Regulation (TDLR) published 2012 Texas Accessibility Standards (2012TAS) Elimination of Architectural Barriers for all facilities with public access. (For a list of all Architectural Barriers Texas Accessibility Standards (TAS) documents, click here.) Where there is a code conflict between the ADA and TDLR standards, the ADA standards shall prevail. It should be noted that ADA standards are minimum. Where appropriate, exceeding the minimum standards is recommended to provide an enhanced pedestrian environment.

TDLR coordination is required during design and post construction. At the completion of design and final plans, the designer shall submit plans for review by TDLR or an approved TDLR accessibility consultant. After construction, the COSA will notify TDLR to request a final inspection and review of the pedestrian features that are complete and in operation. This should be done before the contractor is released.

- Sidewalks
  Sidewalk width shall be based on the existing or future abutting land use. Desirable design development includes:
  - low density single family residential areas: a minimum sidewalk width of four (4) feet if a minimum three (3) foot sidewalk buffer is provided. If the sidewalk abuts the curb, then the minimum width in a low density single family residential area is five (5) feet.
  - commercial, industrial and multifamily residential areas: a minimum six (6) foot sidewalk is desired.
  - areas that are or will be highly urban or mixed use: a minimum ten (10) foot or larger depending on the anticipated pedestrian traffic.

Wherever possible, a sidewalk buffer should be provided, especially along roadways with speed limits 40 miles per hour or higher. Buffers may be stained or stamped concrete in lieu of vegetation. When desirable design dimensions cannot be achieved, defer to the City of San Antonio standard details.

- Bicycles
  In the State of Texas, bicycles are classified as a vehicle. As such and in accordance with the City's Complete Streets Policy, all roadways should be made accessible to people biking. To best accommodate people biking, protected bicycle lanes are preferred, as they provide dedicated, separated space suited for every person biking regardless of age and ability. Safety for persons biking and the bicyclists' skill level should be taken into consideration when planning the type of bicycle facility. Bicycle facilities shall be considered on all collector and arterial roadways. The type of facility to be constructed will be coordinated with TCI Transportation Planning and Operations Division.

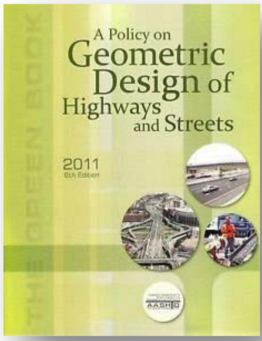
- Design Criteria

This manual outlines the required deliverable information that must be provided to TCI when engineering design or studies are completed. It provides useful information for the steps of deliverable preparation and explanation as to how each element is vital to a complete design.

All engineering designs must be based on national standards and best practices. This allows the transportation engineering designs work together with the other project design elements when engineering the whole project design. The national standards and best practices can be found in documents such as:

- AASHTO (American Association of State Highway and Transportation Officials) Policy on Geometric Design of Highways and Streets.
- MUTCD (Manual on Uniform Traffic Control Devices)
- HCM (Highway Capacity Manual) from the Transportation Research Board.
- UDC (Unified Development Code)
- NACTO (National Association of City Transportation Officials) Urban Street Design Guide

Below is a brief description on the purpose of each manual and how they work together to create a complete project design. (*Please note, in the electronic version of this manual, click a book image (hyperlink) to open to the associated website.*)

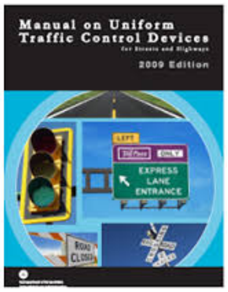


- **AASHTO Green Book[2]:** This policy guides engineers in implementing the roadway geometry required by the Federal Highway Administration to ensure the proper technical engineering principals are followed in design. Research and guidance is given regarding the user and any conditions that may need to be considered.

  An example of a commonly used subject is the parameters regarding the length of a crest vertical curve in the Elements of Design section. This guidance is woven within all national engineering guidance to maintain standards of quality and provide roadways for all users. The AASHTO Green Book is the foundation that all other design guides are based upon and will continue to be the source for technical calculation in design.

- **Manual on Uniform Traffic Control Devices (MUTCD)[3]**:

  The Manual on Uniform Traffic Control Devices (MUTCD) shall be used to determine appropriate pavement markings, signs, and signals to be used in all contexts.

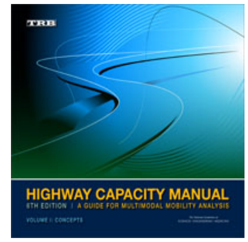


  The MUTDC lists basic principles for the design and use of traffic control devices for all streets, highways, bikeways, and private roads that are open to and utilized by public travel.

- **Highway Capacity Manual (HCM 2016)[4]**: The Highway Capacity Manual shall be the source for standards in determining how the facility will function for vehicles and other modes of transportation.

[2] A Policy on Geometric Design of Highways and Streets, 6th Edition, American Association of State Highway and Transportation Officials ©2011, Washington, D.C.
[3] Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition – with 2012 Revisions 1 & 2, U.S Department of Transportation, Federal Highway Administration ©2012, Washington, D.C.
[4] Highway Capacity Manual, Sixth Edition, A Guide for Multimodal Mobility Analysis, National Research Council (U.S.) Transportation Research Board ©2016, Washington, D.C.

The HCM 2010 edition significantly updates the methodologies that engineers and planners use to assess the traffic and environmental effects of highway projects. Please ensure usage of this version rather than the 2000 version.



- **Unified Development Code (UDC[5])**: Unified Development Code (or UDC) is a single comprehensive document that is used as the primary guide for development within the city. The Unified Development Code incorporates procedures, standards, and regulations for zoning and land use applications.

  The City follows both the International Code Council and Unified Development Code for land development and construction projects.

  The Unified Development Code (UDC) is located in Chapter 35 of the City's Code. It includes regulations for the preparation of land in anticipation of development, such as subdivision platting, zoning, and street and drainage design, as well as historic preservation. As such, the UDC implements the City's Comprehensive Plan and Master Plan Policies. Built into the UDC is a once every five year update program where amendments may be submitted for consideration and recommendation through various boards and commissions.

- **NACTO Urban Street Design Guide[6]:** The Urban Street Design Guide emphasizes city street design as a unique practice with its own set of design goals, parameters, and tools.

[5] San Antonio, Texas, Municipal Code, 2016
[6] Urban Street Design Guide, National Association of City Transportation Officials, ©2013, Washington, D.C.

This guide was created in 2013 to highlight the potential of utilizing existing nationally accepted manuals to create better streets for Urban Environments. This guide brings visualization to the complete street network that is possible in each context of roadway classification. The recommendations are a helpful toolkit to bring a new multimodal experience to our urban landscapes. The minor technical information is based upon design manuals that are already adopted and in use by TCI and other cities across the nation.

This guide relies on the other manuals to determine the specifics of geometric design, assess level of service for all modes, and determine approriate pavement markings and signalization.

The innovative strategies are certainly the spaces that TCI strives to provide in future projects in San Antonio. NACTO has other manuals listed on 175 under Complete Streets that should be consulted, such as the Urban Bikeway Design Guide.

Other factors that affect the design of roadway facilities include:

- drainage requirements (see Section 4 of this manual)
- erosion control and storm water runoff
- driveway and access issues
- intersection design
- bridge geometric considerations
- vertical clearance
- horizontal clearance to obstructions
- right-of-way width
- border widths
- provisions for utilities (see Section 5)
- railroad roadway grade crossings
- street and safety illumination
- traffic-control devices
- landscaping and design enhancements
- environmental issues and permits

When developing roadway plans and details, the designer should give appropriate consideration of each item in the preceding list.

7.5.1.1 Drainage Design

Proper drainage requires the designer to consider design frequency inlet locations, sizes, and types when coordinating with roadway details. Drainage criteria become the basis for all drainage-related designs and details. However, roadway designs can conform to specific drainage improvements depending on the need. Likewise, drainage design can be influenced by roadway design restrictions.

7.5.1.2 Erosion Control and Storm Water Runoff

These considerations are important during design, construction, and post-construction to reduce loss of soils and sediment deposits into receiving waters. Best management practices (BMPs) for the city can be found in section 3.0 of this manual.

7.5.1.3 Driveways and Intersections

Access to roadways through driveways and intersections is an important consideration in the development of roadway plans. The roadway being designed can be influenced by driveway locations, grades, and size. Driveway design should consider the profile grade of the access area, penetration distance, if any, into private property, width, and prevailing vehicle usage when developing details.

Typically, a maximum grade of 14 percent will provide most vehicles with adequate ingress and egress to adjacent properties. If the driveway or intersection will experience a high number of vehicles with trailers attached, special consideration may need to be given at the intersecting grades (maximum algebraic difference) between the roadway and driveway to decrease a “dragging” effect, causing damage to the equipment.

7.5.1.4 Bridge Geometrics

In most cases, bridge geometrics should match the approach roadway regarding overall pavement width. Minimum structural loading capacity and clear roadway widths for new bridges and existing bridges to remain in place are shown in Tables 6–6 and 6–7, respectively, of AASHTO’s publication, A Policy on Geometric Design of Highways and Streets. A bridge is considered to be any structure, including supports, erected over a depression or an obstruction (e.g., water, a highway, or a railway), having a roadway or track for carrying traffic or other moving loads and having an opening measured along the center of the roadway of more than 20 feet between faces of abutments, spring lines of arches, or extreme ends of openings for multiples box culverts.

7.5.1.5 Horizontal Clearance and Border Widths

Roadside obstructions should be located at or near the right-of-way lines and outside of the sidewalks to accommodate safety and sight distance requirements. Horizontal clearance to obstructions for curbed roadways should be a minimum of 1.5 feet, but desirably 3 feet or greater. Border widths can depend upon available right-of-way. Sidewalks, storm drainage, retaining walls, traffic control devices, and utilities should be accommodated in these areas.

7.5.1.6 Utilities

Utilities can affect roadway design, as well as construction sequencing and scheduling. Utility poles should be evaluated for their impact on pedestrians. Utility coordination is addressed in Section 4.0 of this manual. Communication between the city, utility owners, designer, and construction contractor provides the opportunity for appropriate decisions and direction when developing roadway plans. Following the utility coordination process will minimize problems and delays during project development.

7.5.1.7 Railroad Crossings

Early identification of rail crossings and coordination with railroad owners may be required during plan development. Railroad agreements that include details for crossing replacements, roadway typical section, and cost assignment should be executed as early as possible in plan development. In some cases, these agreements can take up to nine months to execute. Early communication between the city, railroad owners, and designers can reduce delay in beginning construction for roadways crossing rail facilities.

7.5.1.8 Illumination

Street and safety illumination requires coordination with CPS Energy. Selecting the appropriate design criteria for illumination in urban areas can depend on traffic volume, adjacent property uses, and the type of lighting desired. For most street projects, CPS Energy will provide appropriate lighting using overhead and underground electric facilities. In special cases, ornamental or aesthetic lighting may be desired for special projects. Coordination between the city, CPS Energy, and the designer should be accomplished as early in the plan development process as possible.

7.5.1.9 Traffic Control Devices

Signs, pavement markings, signals, intelligent traffic systems (ITS), and other traffic control devices are required to conform to the *Texas Manual on Uniform Traffic Control Devices (MUTCD)*. In addition, the city has standard details available to the designer for use in plan preparation. Selection of proper traffic control devices provides effective messages to drivers that improve safety and efficiency.

7.5.1.10 Landscaping and Design Enhancements

Landscape and design enhancements are dependent upon the project type and, sometimes, the funding source. Plantings, architectural treatments, colors, art, etc., can enhance the roadway design to provide a finished product that users can enjoy. Along with beautification items, consideration for native plants, establishing and maintaining plants through irrigation, and impact of the vegetation at maturity to the roadway, in the form of sight distance, should be included in the development of plans. In some cases, properly placed vegetation can provide a buffer and delineate travel ways for the various forms of traffic that use the public rights-of–way, such as separation between motor vehicles and pedestrians and bicyclists. If feasible, Low Impact Development (LID) principles shall be applied to allow natural vegetation to be used as drainage design and storm water management, as well as design amenity.

7.5.1.11 Retaining Walls

Retaining walls should be considered on projects to maximize useable right-of-way when attempting to fit urban features into a narrow corridor. Controlling grades, cross slopes, ADA requirements, and width restrictions for lanes and sidewalks provide opportunities to place various types of retaining walls. Conventional gravity walls, monolithic sidewalk/retaining wall alternatives, concrete block walls, mechanically stabilized earth walls, soil nail/anchor walls, and landscape walls all provide opportunities to overcome steep slopes and narrow rights-of-way if applied properly. When proposing retaining walls, consideration should be given to intersection sight distance and to the easy cleaning, maintenance, and graffiti removal/prevention of the surface finish.

7.5.1.12 Bicycle Accommodation

Accommodating bicycles is an important consideration for projects under development. All roadways, except those where cyclists are legally prohibited, should be designed and constructed under the assumption that they will be used by cyclists. Therefore, bicycles should be considered in all phases of transportation planning, new roadway design, roadway reconstruction, and capacity improvement and transit projects. The *AASHTO Guide for the Development of Bicycle Facilities (2012)* and NACTO *Urban Bikeway Design Guide* provide information on the development of facilities to enhance and encourage safe bicycle travel and guidance to help accommodate bicycle traffic in most riding environments.

7.5.1.13 Environmental Coordination

Environmental coordination must be done with the Environmental Management Division (EMD) and environmental activities associated with the project should be included in the design schedule. Depending on the history of the project site, environmental investigations can reveal common or very complex issues, time consuming delays, and mitigation related solutions to the proposed improvements. Close coordination between designers and city environmental scientists help monitor specific environmental issues and develop accurate and detailed studies and reports concurrently with roadway plans.

Environmental coordination and communication with the COSA Environmental Division is extremely important when it comes to addressing environmental issues in accordance with applicable federal, state, and local regulations and establishing the design schedule. Environmental assessments will be conducted to determine potential environmental impacts that could affect the proposed projects. Some assessments may require permitting, remediation strategies, additional environmental studies (i.e., archeological, cultural resources, endangered species, etc.), or other environmental monitoring or mitigation.

7.5.1.14 Plans, Specifications, and Estimates (PS&E)

This is the final product the design effort achieves. Application of the design criteria to the various roadways results in a set of construction plans and details. Plan set format, components, plan sheet examples, and details are described in more detail in section 9.0, CAD Standards, of this manual.

Specifications provide direction to the designer regarding the item description, measurement, and payment details. For the contractor, it specifies the construction methods, construction materials that must be used, and the basis of how the item should be bid. Quantities are developed based on each bid item as described in the specification. The city has developed Standard Specifications for Public Works Construction that are to be used for all capital improvement projects. Other sources of specifications include TxDOT's Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, and the San Antonio Water System (SAWS) Construction and Materials Specifications, depending on the funding source of individual projects.

Construction cost estimates are developed by the designer based on final quantities, type of project, and nature of the overall scope of construction work. In addition to a total cost for the bid items, other items with costs associated include mobilization, force account items (signals, RR crossings, electrical, etc.), and contingency accounts (a fund intended to cover costs of items that have changed or were beyond the original scope). The COSA maintains a history of unit prices for various bid items taken from bid tabulation data for recent projects that have been let for construction. This should be used as the basis for cost estimates, with consideration given to project-specific conditions that can affect the individual unit prices.

Section 2 of this manual includes a defined process for plan development, including a standard design scope, milestone checklists, and review checklists that contract managers, project managers, design engineers, and reviewers can use in providing effective, successful project delivery for the city.

The use and application of checklists by the project manager and design personnel provides a guide for proper delivery of plan sets at the various stages or milestones during project development. The following checklists are intended to provide guidance to the preparer of plans and the project reviewers to achieve complete plan submittals and improve quality for the city.

- Appendix 7B for Preliminary Engineering Report
- Appendix 7C for 40% Design
- Appendix 7D for 70% Design
- Appendix 7E for 95% Design
- Appendix 7F for 100% Design (Bid Phase)

7.5.1.15 Complete Streets

The City of San Antonio adopted a Complete Streets Policy on September 29, 2011. The Policy is applicable to all new construction and full reconstruction of City roadways. Complete Streets are defined as streets that accommodate the needs of all users (including differing ages and abilities) and all modes of travel (including vehicles, pedestrians, cyclists and transit users).

An important consideration for Complete Streets is that all streets are not the same (e.g. not all streets will have separate bike lanes). As roadway projects are scoped, an early task is to assess the adjacent neighborhood and land use context to identify opportunities for Complete Streets. In some cases, maximizing the roadway for all user groups may generate design recommendations that differ from the minimum criteria for the typical roadway. For example, a collector street traveling through a business district may have a need for on street parking, a wider planting strip, and/or wider sidewalks.

Many of the components necessary to achieve Complete Streets are already included in this manual. The update is that all projects must be assessed to maximize the available right-of- way within the land use context to achieve Complete Streets and maximize the public investment in the community.

See Appendix 7G for the Complete Streets Assessment and Field Analysis Checklist.

7.5.1.16 Complete Street References

Recent policy guides for multimodal travel and urban streets:

- 2010 ADA Standards for Accessible Design, US Department of Justice
- AASHTO Guide for Development of Bicycle Facilities 2012
- Institute of Transportation Engineers (ITE) Urban Street Geometric Design Handbook 2008
- Transportation Research Board (TRB) Highway Capacity Manual (HCM) 2010
- San Antonio River Basin Low Impact Development Technical Guidance Manual, August 2013
- NACTO Urban Street Design Guide
- NACTO Urban Bikeway Design Guide
- NACTO Transit Street Design Guide
- NACTO Urban Street Stormwater Guide
- NACTO Bike Share Station Siting Guide
- NACTO Global Street Design Guide

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Section 8 Environmental Coordination & Permitting

8.1 Introduction

Environmental Coordination and Permitting are important elements when completing the design and implementation of a capital improvement project. As part of the planning and design process, the Environmental Management Division (EMD) works closely with the engineers to identify and address environmental challenges. Effective communication between the engineers and EMD is key for the success of all capital improvement projects.

Permitting is one of the fundamental tools used to help ensure compliance with regulations intended to protect human health, property, and the environment. Through permits, city, county, state, and federal agencies specify and enforce many of the requirements that govern regulated resources and facilities.

Therefore, permits are of great importance and can have significant influence on the final configuration of a project. It is in the interest of all project participants to find ways of drafting and implementing permits that achieve the greatest benefit possible by considering environmental impacts, project schedule, and the cost of implementation.

This section of the Design Guidance Manual is intended to provide guidance to the design consultant and others involved in the design process of horizontal city projects. It is also intended to outline the environmental process and the roles and responsibilities of both EMD and design consultants.

8.2 Process

The environmental coordination process that will be used for capital improvement projects will be based on effective communication between EMD and the design team. The following process outlines the roles and responsibilities of EMD and the design team during the design phases.

8.2.1 Initial Scoping Meeting

Once the proposed project information and potential design layout are provided, EMD will conduct necessary studies to identify environmental challenges associated with the proposed project. EMD will conduct a Phase I Environmental Site Assessment (ESA) on the proposed project area. The purpose of the ESA is to identify known and potential recognized environmental conditions (RECs) within or adjacent to the project limits. EMD will complete and provide the report to the design consultant and project manager by the 40 percent design review meeting.

EMD will conduct other studies related to natural and cultural resources during this phase including a jurisdictional determination study, if necessary, and background studies for both historical and archeological resources. Any initial findings from these studies will be provided during the 40 percent design phase.

Additionally, if a jurisdictional water is located within the project limits, EMD will identify the ordinary high water mark in the field. The design engineer shall survey the jurisdictional limits and incorporate this information into the 40 percent design plans. This information is needed to determine the acreage of impacts within the jurisdictional area, and to determine appropriate 404 permitting requirements for the project.

EMD will begin informal National Environmental Policy Act (NEPA) scoping discussions with the Texas Department of Transportation (TXDOT) San Antonio District during this phase of design for all projects receiving Federal Highway Administration (FHWA) funding and/or located within TXDOT right-of-way (ROW).

8.2.2 40 Percent Design Phase

Once design plans are received and reviewed, EMD will determine whether additional studies are required based on the proposed drainage, street, and utility alignments. Therefore, it is important that the design consultant provide clear utility layouts and profiles for drainage, sanitary sewer, gas, water, and any other utility improvements within the project limits. Generally, this information will be reviewed and compared with the environmental studies conducted to date to determine whether the proposed project will potentially impact natural or cultural resources or be impacted by known environmental issues. EMD will make this determination during this phase.

Upon approval of the 40% design plans and receipt of proposed utility layout locations, EMD will conduct a Phase II Environmental Site Assessment (ESA or subsurface investigation), if necessary, along the proposed corridor to determine if the project has any impacted media from known or suspect recognized environmental conditions that will have to be managed during construction. This investigation includes soil boring installation, collection of soil and groundwater samples, and chemical analysis of samples for potential contaminants. Results of this investigation are generally completed by the beginning of the 70 percent design phase. Additionally, in the event a suspect or known landfill is identified within the project limits, a subchapter T permit work plan will be prepared and submitted to TCEQ for review and approval prior to beginning the Phase II ESA.

Additional natural and cultural resource studies that may be conducted by EMD during this phase of design include: archeological and historical resources surveys, karst surveys, migratory bird surveys, endangered species habitat evaluations, and aquatic resources evaluations. Archeological investigations are coordinated with the THC and the necessary permits are obtained prior to beginning this work. Findings and recommendations of this investigation are provided during the 70 percent design phase.

Permitting and agency coordination conducted by EMD during this phase include technical studies and associated TXDOT coordination required for the NEPA process for projects receiving FHWA funding or projects located within TXDOT ROW, Section 404 permitting and associated USACE coordination, and cultural resources permitting and associated THC coordination.

EMD will consult with the design consultant on resource impact avoidance and minimization opportunities and request their assistance to provide the necessary information to satisfy agency requirements. In the event that design information or mitigation design work is required for a permit, EMD will work closely with the design consultant and project manager to obtain the necessary information.

8.2.3 70 Percent Design Phase

Once plans are received and reviewed, EMD will ensure that the design alignment and utility depths are consistent with the 40 percent design plans. EMD will compare investigative results of the studies conducted to date with the proposed improvements as shown in the 70 percent design plans and determine whether additional environmental assessments are required.

The design consultant shall coordinate with EMD to finalize permitting documentation or to provide additional design detail for studies that may still be required. EMD will notify the design consultant on the level of detail and information needed to continue and complete the environmental assessments and permitting processes. EMD will complete and submit the 404 permit application to the USACE when the 70 percent design plans are approved.

When impacted areas are clearly identified and delineated within the project limits, EMD will begin preparing special environmental specifications to be included in the bid and construction documents. This documentation will be completed after the 95 percent design plans submittals.

The area of ground disturbance should be provided at this phase to initiate work on the Stormwater Pollution Prevention Plan (SW3P). The 70 percent design plans should provide SW3P sheets that include a site plan, draft narrative, general notes, and best management practice (BMP) details.

EMD will also draft the environmental permits, issues and commitments (EPIC) sheet based on the available design and environmental information. The draft EPIC sheet will be provided with the EMD 70 percent design review comment memo.

8.2.4 95 Percent Design Phase

Once plans are received and reviewed, EMD will verify that plans have not changed and confirm that the EPIC sheet, environmental permitting, special environmental specifications (if needed), and related environmental matters are still valid for incorporation into the construction plans and specifications. In the event there are design plan changes, EMD will verify if the obtained project environmental permits are still valid. EMD will also conduct additional studies for specific disciplines, if needed. EMD will also verify the EPIC sheet content and provide additional comments, if necessary, with the 95 percent design review comment memo.

If the project requires removing impacted media and environmental oversight during construction, the design consultant shall provide estimated soil quantities and exhibits for impacted media that will need to be incorporated in the construction and bid documents. The consultant shall also provide estimated construction schedules and phasing for environmental planning and budgeting purposes. Special notes in the design plans may be required to address environmental impacts, such as Section 404 permitting, cultural resources, endangered species, SW3P measures, Edwards Aquifer requirements, etc.

8.2.5 100 Percent Design Phase

Once plans are received and reviewed, EMD will verify that all environmental requirements are addressed appropriately in the design plans and specifications. If the project requires a Subchapter T permit for construction, EMD will initiate the preparation of these documents for TCEQ approval prior to advertisement.

8.2.6 Advertisement and Construction

Prior to construction advertisement, it is highly recommended that the design consultant contacts the EMD representative to ensure all applicable plans and specifications have been incorporated into the final construction plans and specifications. Effective communication and coordination will minimize addendums during the construction advertisement phase.

8.3 Responsibilities

EMD, in coordination with the design team, will typically be responsible for obtaining environmental permits for city projects. Federal permits and approval, such as those required by the U.S. Environmental Protection Agency (USEPA), U.S. Army Corps of Engineers (USACE), Federal Highway Administration (FHWA), U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS), U.S. Department of Housing and Urban Development (HUD), and Federal Aviation Administration (FAA) will be processed through EMD. The design consultant shall work closely with EMD to understand project requirements resulting from the federal permitting process.

EMD will also coordinate state environmental permits and approvals required by the Texas Commission on Environmental Quality (TCEQ), the Texas Historical Commission (THC), Texas Department of Transportation (TxDOT), and Texas Parks and Wildlife Department (TPWD) as well as any other agency requiring permits associated with environmental activities.

The design consultant shall be responsible for acquiring a state environmental approval from the TCEQ for Water Pollution Abatement Plans (WPAP) and Contributing Zone Plans (CZP). Close coordination with EMD is still required as the consultant must keep EMD informed of progress and, if issues develop, seek guidance from EMD as how to proceed. The design consultant shall also be responsible for environmental compliance during construction, providing necessary TCEQ documentation, and completely closing out the regulatory process prior to transferring to City maintenance.

8.4 Permitting Agencies for Environmental Compliance

To comply with environmental laws, rules, and regulations, there are two (2) categories of permitting agencies: Federal and State. The following is a brief synopsis of these categories and the particular agencies within each. This list is not intended to be exhaustive, but representative of level of environmental coordination typically encountered in a capital improvement project in San Antonio and the surrounding area.

8.4.1 Federal Regulatory/Permitting Agencies

At times, City of San Antonio projects will receive funding from federal agencies, be located on or adjacent to federal property, or require a permit from or coordination with a federal agency. Each previously described scenario could require compliance with the National Environmental Policy Act of 1970 (NEPA). The level of effort required would depend on the agency and the triggering activity. EMD will be responsible for coordinating with each agency to determine the level of effort and documentation requirements. It should be noted that although all federal agencies must comply with NEPA requirements, the specific method will differ between agencies. Because of this, it is important for EMD to be made aware of any projects that receive federal funding or are potentially located on or adjacent to federal property. Listed below are agencies that EMD more regularly coordinates with.

- United States Environmental Protection Agency (EPA)
- United States Department of Defense (DOD)
  - U.S. Army Corps of Engineers (USACE)
  - Joint Base San Antonio (JBSA) Facilities

- United States Department of Interior
    - National Park Service
    - United States Fish and Wildlife Service (USFWS)
- United States Department of Transportation

  The United States Department of Transportation (USDOT) is the federal agency responsible for all avenues for the movement people or goods. This includes ground and air transport. For San Antonio projects, this can include coordination with the Federal Highway Administration (FHWA) and the Federal Aviation Administration (FAA).
    - Federal Highway Administration (FHWA)
    - Federal Aviation Administration (FAA)
- United States Department of Housing and Urban Development (HUD)

8.4.1.1 United States Environmental Protection Agency

The United States Environmental Protection Agency (EPA) is the governing federal agency responsible for protecting human health and the environment. Many of the agencies highlighted below are tasked with implementing the regulations that the EPA puts forth to enact and enforce the environmental laws passed by Congress. These laws include, but are not limited to:

- The Clean Air Act (CAA) of 1970
    - National Emission Standards for Hazardous Air Pollutants (NESHAPs)
- The Clean Water Act as amended in 1972
    - Section 401
    - Section 402
    - Section 404
    - National Pollutant Discharge Elimination System (NPDES)
- Comprehensive Environmental Response, Compensation, and Liability Act (Superfund or CERCLA) of 1980
- Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA)
- Endangered Species Act (ESA) of 1973
- National Environmental Policy Act (NEPA) of 1969
- Noise Control Act (NCA) of 1972

- Occupational Safety and Health Act (OSHA) of 1970
- Pollution Prevention Act (PPA)
- Resource Conservation and Recovery Act (RCRA) of 1976
- Safe Drinking Water Act (SDWA) of 1974
- Superfund Amendments and Reauthorization Act (SARA) of 1986

Of the regulations listed above, NEPA is the one that controls all action taken by federal agencies and must be complied with when federal funds or permits are included on a project. This Act imposes specific guidelines that all parties must follow to continue to receive funding and appropriate permits without penalty. How each agency implements the NEPA process is as diverse as the mission of each agency. Because of this, it is imperative that the design consultant and the engineering team work closely with EMD to ensure that each step of the process is completed in the correct order and manner as dictated by the controlling agency.

8.4.1.2 U.S. Army Corps of Engineers

(United States Department of Defense (DOD) agency)

The USACE is responsible for regulating discharges of dredged or fill material into Waters of the U.S., as well as stream channelization or modifications of water bodies. Its authorization is specified under the provisions of Section 404 of the Clean Water Act, as amended in 1972. Individual permits must be applied for, and the resulting process can take considerable time, depending upon the complexity of the project. Nationwide permits are a type of general permit issued by the Chief of Engineers and are designed to regulate, with little, if any, delay or paperwork, certain activities having minimal impacts to the jurisdictional water. An activity is authorized under an NWP only if that activity and the permittee satisfy all of the NWP's general conditions. Some nationwide permits may require pre-construction notification to the USACE based on the proposed activity and the level of disturbance. Mitigation efforts and associated monitoring are typically required for all individual permits and some nationwide permits.

When necessary, EMD will have the jurisdictional areas marked for survey and will coordinate the timing of the marking with the design consultant in order for the delineation to be surveyed and included in the 40 percent design submittal. It is the responsibility of the design consultant to conduct the actual survey and to display the jurisdictional areas on the design plans. It is necessary for the design consultant to keep this survey data on hand as EMD will typically require the assistance of the design consultant in determining the exact acreage and/or linear feet of impacts to the jurisdictional areas. Additionally, when developing a Section 404 permit application, the design consultant will be asked to provide the volume and type of fill within the jurisdictional area.

EMD will be responsible for all permitting negotiations with the USACE and all other natural resources agencies associated with the Section 404 permit. The design consultant shall be responsible for designing (with the guidance and assistance of EMD) any necessary avoidance, minimization, and/or mitigation features and inputting them into the design plans.

8.4.1.3 Joint Base San Antonio (JBSA) Facilities

(United States Department of Defense (DOD) agency)

In 2005, military installations within San Antonio were consolidated under a single command: Joint Base San Antonio (JBSA). At times, City projects may be adjacent to or on JBSA property. The requirements for specific permits are not known for specific activities outside of a Dig Permit when construction is on JBSA property, but there is a need to coordinate the design regarding drainage, utilities, traffic control, or other issues that could affect the operation of federal facilities. The design consultant shall be aware of the potential impact of construction and of certain design decisions around federal facilities and make inquiries during planning and design so permitting and coordination issues are addressed.

8.4.1.4 National Park Service

(United States Department of Interior (DOI) agency)

The National Park Service (NPS) administers the National Park Register of Historic Places Program. Projects that fall under Section 106 regulations, 36 CFR Part 800 (“Protection of Historic Properties”), of the National Historic Preservation Act of 1966, as amended (Section 106), must submit eligibility to the NPS, as the agency is the purview agency for the national register properties. Additionally, projects on lands owned by NPS fall under Section 106, so regulatory procedures must occur between the contractor, NPS, THC, and other interested parties. EMD will contact the NPS to request, document, and verify whether any issues involving NPS exist. Locally, this includes projects that may impact the San Antonio Missions National Historical Park. Projects directly on NPS property could also trigger NEPA requirements. EMD will work with local NPS representatives to determine the extent of documentation required per project. The design consultant shall be aware of the potential impact of construction and of certain design decisions around federal facilities and make inquiries during planning and design so permitting and coordination issues are addressed.

8.4.1.5 United States Fish and Wildlife Service

(United States Department of Interior (DOI) agency)

The U.S. States Fish and Wildlife Service (USFWS) is the principle federal agency tasked to conserve, protect, and enhance natural resources (i.e., plants, animals, and their habitat) of the U.S. To that end, EMD reviews projects in light of the Migratory Bird Treaty Act, and the Endangered Species Act. Since San Antonio falls within the Central Flyway for migrating birds, projects that include the removal of trees and/or work at or near bridges and culverts must be properly documented to alert the contractor of the federal requirements to protect the nests and fledglings of the migratory avian species. In addition, projects within San Antonio could encounter nine (9) animal species listed as endangered under the Endangered Species Act. These include two avian species and seven karst species. EMD will conduct studies based on design information to determine if the project is within critical habitat associated with the listed endangered species. If habitat favoring the protected species is found within the proposed project area, EMD will conduct studies to determine if the protected species is present. If the species is present, EMD will provide the design consultant with the requirements that must be followed during construction to properly protect the federally protected species. During the design process, the design consultant shall work with EMD to determine measures to minimize or avoid impacts to federally protected species. Please note that since the list of species federally protected is subject to change, EMD should be contacted before any project is initiated.

8.4.1.6 Federal Highway Administration

(United States Department of Transportation (USDOT) agency)

The FHWA is responsible for all ground transport in the U.S. In San Antonio, projects are funded by the FHWA through the Alamo Area Metropolitan Planning Organization (AAMPO) and listed on the Metropolitan Transportation Plan for long range projects and on the Transportation Improvement Program (TIP) for more imminent projects. Receipt of FHWA funds requires that the project be environmentally reviewed in accordance with DOT NEPA protocols. In 2014, FHWA delegated much of their environmental review responsibilities to the State of Texas. Please see the Texas Department of Transportation (TXDOT) below for more details.

8.4.1.7 Federal Aviation Administration (FAA)

(United States Department of Transportation (USDOT) agency)

The FAA governs all activities and properties associated with air travel and transport. Project located on FAA property (e.g., airports and associated facilities) are required to comply with FAA NEPA protocols. The design consultant shall be aware of the potential impact of construction and of certain design decisions around federal facilities and make inquiries during planning and design so permitting and coordination issues are addressed.

8.4.1.8 United States Department of Housing and Urban Development (HUD)

The US Department of Housing and Urban Development (HUD) is the federal agency responsible for ensuring that all persons have equal and equitable opportunity to live where they want in quality, affordable homes. The City of San Antonio's Grant Monitoring and Administration (GMA) office will frequently receive grant money from HUD. As part of the agreement for the receipt of funding, the City must comply with NEPA requirements in accordance with HUD protocols. EMD will coordinate with the GMA office to ensure that all requirements are met. The design consultant will support EMD to ensure that all agency requirements are included in the design plans.

8.4.2 State Regulatory / Permitting Agencies

As stated above, oftentimes federal agencies will delegate their environmental review responsibilities to the state (or local municipality). In addition, the state agency will generally add regulations to address more specific needs and goals. Below are several state agencies that EMD coordinates with to ensure compliance with state environmental regulations. The design consultant will support EMD in the manner necessary to complete the coordination process.

- Texas Department of Transportation
- Texas Parks and Wildlife Department
- Texas Historical Commission
- Texas Commission on Environmental Quality
- Texas Department of State Health Services

8.4.2.1 Texas Department of Transportation

The Texas Department of Transportation (TXDOT) is the designated State agency to address local issues on behalf of USDOT and FHWA. TXDOT becomes involved on City projects when FHWA funds are received or when locally funded projects are located within TXDOT right-of-way (ROW). Whether by location or funding, projects that full under TXDOT's purview must comply with TXDOT NEPA process. It is EMD's responsibility to coordinate the environmental review process with environmental personnel at the TXDOT SADO and support the coordination with TXDOT environmental Headquarters in Austin. The specific NEPA process required for environmental review would depend on the type of project and potential resources and recognized environmental conditions that are located within the project area. EMD will obtain the environmental clearance for all work occurring in TXDOT ROW. The design consultant shall support EMD to ensure that all agency requirements are included in the design plans.

8.4.2.2 Texas Parks and Wildlife Department

The Texas Parks and Wildlife Department (TPWD) is the designated State agency to address local issues on behalf of USEPA (for natural resources) and USFWS. TPWD requires compliance with the Texas Parks and Wildlife Code (TPWC). EMD will coordinate with TPWD when projects occur in areas where state listed threatened and endangered species can be encountered (Title 5 Chapter 68/83), when projects require waterways to be dewatered (Title 2 Chapter 12 & Title 5 Chapter 66), or when projects require the change of use of public park land (Title 3 Chapter 26). EMD will support coordination between TxDOT and TPWD as required. During the design process, the design consultant shall work with EMD to determine measures to minimize or avoid impacts to state protected species and ensure that public involvement requirements are properly addressed. Please note that since the list of state protected species is subject to change, EMD should be contacted before any project is initiated.

8.4.2.3 Texas Historical Commission

The Texas Historical Commission (THC) is responsible for enforcing standards and regulations associated with the protection and study of historic properties that may be affected by Federal activities. Also, they are responsible for laws and rules pertaining to the protection, landmark designation and study of historic properties on non-federal public lands in the state. They oversee compliance with the National Historic Preservation Act of 1966 as Amended (NHPA) (16 USC 470 et seq.); Protection of Historic Properties (26 CFR Part 800), National Environmental Policy Act of 1969, as Amended (NEPA) (42 USC 4321 et seq.), Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001 et seq. 43 CFR Part 10); Archaeological Resources Protection Act of 1979, as Amended (ARPA) (16 USC 470aa-mm); Curation of Federally owned and Administered Archeological Collections (36 CFR Part 79); Secretary of the Interior’s Standards and Guidelines for Archeology and Historic Preservation (48 FR 44716); National Register of Historic Places (36CFR Part 60); Certified Local Government Regulations (36 CFR 61.6). State Statues and Rules include the Antiquities Code of Texas (Texas Natural Resource Code Title 9, Chapter 191); General Provisions Relating to Cemeteries (Texas Health and Safety Code, Chapter 711; also, Texas Administrative Code, Title 13, Park 2, Chapter 22; also Texas Penal code, Section 31.03 and Section 42.08; Historic Preservation by Counties (Texas Local Government Code, Chapter 318.

All projects must comply with the federal, state, and local laws, rules and regulations as outlined above as they are applicable. This includes projects involving federal funding, including grants or loans, or projects requiring federal permitting, licensing, or oversight that require compliance with the NHPA. In addition, the City of San Antonio is a political subdivision of the State of Texas and must comply with the Antiquities Code of Texas.

Therefore, the design consultant must work with EMD to understand these requirements, so provisions of these permits are incorporated into the design plans. EMD shall coordinate all federal, state, and local cultural resource compliance responsibilities with the respective federal, state, and local agency. If necessary, the design consultant may be asked to assist with the design of mitigation for historic resources.

8.4.2.4 Texas Commission on Environmental Quality

The Texas Commission on Environmental Quality (TCEQ) is responsible for administering the Texas Pollutant Discharge Elimination System (TPDES). The San Antonio Water System (SAWS) is the authority at the local level designated to ensure compliance with TPDES regulations within city boundaries. To meet TPDES requirements, the design consultant will be responsible for preparing and submitting the SW3P to the City for review and approval. The design consultant will also be responsible for ensuring the SW3P and associated proposed BMPs adhere to permit requirements.

The TCEQ also regulates construction activities over the Edwards Aquifer. Rules regarding the Edwards Aquifer can be found in Texas Administrative Code, Title 30, Part 1, Chapter 213. These will require the development of a WPAP (recharge zone) or CZP (contributing zone) in the event that elements of the project would potentially affect, or directly affect the Edwards Aquifer. The design consultant is responsible for developing the WPAP or CZP, obtaining approval from the TCEQ, and ensuring that the contractor is in compliance with the approved WPAP or CZP.

The TCEQ also regulates the use of land, such as development or public improvements, over a closed municipal solid waste (MSW) landfill, per Chapter 330, Subchapter T Rule 330.954. TCEQ authorization is required to disturb the final cover for non-enclosed structures. Specifically, TCEQ requires a work plan to assess the presence or absence of MSW and associated contaminants. TCEQ also requires the applicant to submit and obtain a Subchapter T Permit for their review and approval prior to construction activities. EMD is responsible for preparation and submittal of the Subchapter T Permit for the project. The design consultant will be responsible with assisting EMD with calculations, exhibits, and final design plans required for the submittal of the Subchapter T Permit application for construction.

8.4.2.5 Texas Department of State Health Services

The Texas Department of State Health Services (TDSHS) administers the National Emissions Standards for Hazardous Air Pollutants (NESHAP) program. The guidelines of this program will apply to city projects that include at least 260 linear feet or 35 cubic feet or 160 square feet of asbestos disturbance. NESHAP applies when asbestos cement (AC) pipe becomes or will become “regulated asbestos-containing material” (RACM). This means that if at least 260 linear feet of AC pipe has become crushed, crumbled, or pulverized, then the project is subject to NESHAP. If the TDSHS's limit of 260 linear feet is exceeded, the contractor is responsible for the TDSHS administrative fee. The Contractor's consultant or its representative shall be responsible for submitting the TDSHS 10-day notification with the proper application fee, with copies of the documentation being sent to SAWS and to the EMD.

TSDHS also regulates demolition of structures for a public improvement project. If more than two structures are to be demolished along a roadway or drainage improvement project, the structures are considered regulated for asbestos. The structures will require an asbestos survey and TDSHS will need to be notified 10 days prior to demolition. Prior to demolition, asbestos abatement will need to be performed and TDSHS notification is required 10 days prior to abatement activities. EMD will be responsible for assessment, coordination, notification and completion of asbestos surveys and abatement activities, and in some cases, demolition activities. EMD will coordinate with OHP when structures require demolition as part of the project.

In addition, coordination between TDSHS and OHP/EMD is required when cemeteries or human remains are encountered on a project.

8.4.3 Local Permits

8.4.3.1 Historic Design and Review Commission

The Historic Design and Review Commission consists of fifteen members who reside in the City of San Antonio and are appointed by the City Council. They review all projects related to exterior changes to properties that are designated as historic as either an individual landmark or as part of a historic district, located within one of the six River Improvement Overlay (RIO) districts (including the Riverwalk), located within the Viewshed Protection district, or that are publicly-owned (i.e. libraries, parks, fire stations, etc.).

The commission serves to assist in an advisory capacity to the City of San Antonio Directors of Planning, Parks and Recreation, Building Inspections, Code Compliance, Public Works, Arts and Cultural Affairs, and other appropriate head of municipal departments, in accordance with Section 49 of the City Charter, and to the City Manager.

For new construction projects, and/or alteration, restoration and rehabilitation of resources within historic districts, and/or river improvement overlay districts (RIO), historic landmarks, and projects on public property or right-of-way, a permit is required. The design consultant or city's project manager must submit an application to the Historic Design and Review Commission (HDRC) for project review. The HDRC must approve the application prior to the project advertisement. Prior to the start or continuance of any activities that would disturb any previously identified archeological site within the city, including either a designated or inventoried site, a study of the effect of the proposed activity on the site must be performed by a Professional Archeologist.

Unidentified archeological sites will, upon discovery, be treated as a late discovery and inventoried, archeological sites and will be reviewed by the City's Historic Preservation Officer.

8.5 Permitting Contacts

Appendix 8A contains a list of agency contacts for the permits discussed in this section.

8.6 Environmental Checklist

The checklist in Table 8-1: Designer's Environmental Permitting Coordination Scope and Checklist will assist the consultant in the submittal process for each design phase. This list corresponds to the environmental processes and responsibilities outlined in this section of this manual.

Table 8-1: Designer's Environmental Permitting Coordination Scope and Checklist

☐	No.	Description	Completion Date
		Design Submittal (40%)	
☐	1	Confirm Phase I Environmental Site Assessment has been completed by EMD	
☐	2	Confirm Jurisdictional Determination has been completed by EMD	
☐	3	Ensure that the Ordinary High Water Mark has been surveyed and is incorporated into the design plans.	
☐	4	Ensure appropriate design information has been provided for the necessary environmental processes and necessary studies, such as cultural resources, endangered species, Phase II Subsurface Investigation, etc.	
		Design Submittal (70%)	
☐	1	Confirm Phase II Environmental Site Assessment has been completed by EMD (if needed)	
☐	2	Confirm Karst Survey has been completed by the EMD	
☐	3	Confirm the Cultural Resource Surveys have been completed by the EMD	
☐	4	Incorporate any additional environmental information provided by EMD into the design plans (i.e. mitigation features, environmental areas of concern, etc.)	
☐	5	Verify SW3P design and narrative sheets specifications are completed accurately	
☐	6	Check permitting status	

Table 8-1: Designer's Environmental Permitting Coordination Scope and Checklist (continued)			
☐	**No.**	**Description**	**Completion Date**
☐	7	Provide design detail information that may be required to complete environmental processes and permitting.	
Submittal (95%)			
☐	1	Finalize all environmental coordination and provide any remaining design information needed to complete special environmental specifications	
☐	2	Check permitting status	
☐	3	Incorporate EPIC Sheet provided by EMD	
☐	4	Verify any revisions or additional SW3P specifications are accurate	
☐	5	Incorporate any special environmental specifications needed	
Bid Set Submittal (100%)			
☐	1	Verify that all environmental information has been incorporated	
☐	2	Verify project design sheets are signed and sealed by the design consultant.	
☐	3	EMD will notify consultant that all pertinent environmental information has been completed and incorporated into bid specifications.	
Construction Phase and Record Drawing Submittal			
☐	1	Continuously update design drawings to reflect changes in BMPs as project construction progresses.	
☐	2	Monitor and ensure compliance with the WPAP during construction; Upon project completion, complete regulatory reporting and necessary actions for properly transferring to City maintenance.	

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Section 9 CAD Standards

9.1 Introduction

This chapter presents computer aided drafting (CAD) standards. Conforming to these instructions is essential to produce a final document consistent in behavior, appearance, and content.

9.2 Plan Set Requirements

This section will address the required informative elements for the various plan sheets associated with a standard project. It will also cover the CAD-related standards and minimum requirements for each type of plan sheet.

All plan sheets will be MicroStation (V7 or later) format.

All plan sheets will be on 11" x 17" sized sheets (Figure 9-1).

All project plan sheets will contain the following:

- A title block in the bottom, right corner of the sheet with the name of the project, or reference to the project as designated by the City of San Antonio (Figure 9-2)
- The name of the design firm(s)
- Any associated Federal Project Designation, state or local information, and sheet number in title block
- Sheet Title, which directly corresponds to the Index, with a collective sheet reference ("Sheet x of xx") per section
- An Engineer's or Land Surveyor seal, interim or final as related to submittal, for all sheets with influence (design, modification of standard, etc.) of a licensed Professional Engineer or Registered Professional Land Surveyor
- A note designating submittal by percent complete or milestone
- Text adhering to minimum scaling standards

All plan sheets showing a planimetric view of the project, or portion of the project, will require an element designating the north direction, and the sheet should be to a scale. If no scale is designated, a note must state as such. Scale should be determined by the size of the project to minimize the overall number of sheets, while still providing a clear, concise view. Preferred scale of plan views is 1" = 40'. Variances to the preferred standard may occur, but only upon approval by the city project manager.

All plan sheets will be to scale (Figure 9-3).

Plans will be submitted in a hard copy and portable document format (.pdf) and Microstation V7 or later (.dgn) at every submittal.

All plan sheets will contain a page number for the overall plan set.

Table 9-1: Standard Order of Plan Sheets lists the sheet types comprising a typical set of plans. The order of these sheets is important and each project requiring drawings will be assembled in the order presented. Not all sheet types are applicable to every project but should be used when necessary.

Table 9-1: Standard Order of Plan Sheets (	
Item No.	**Plan Sheet Description**
1	City Title Block
2	Index of Sheets
3	Project Layout/Control Points
4	Typical Sections
5	General Notes
6	Estimated Quantities Sheet
7	Traffic Control Plan
8	Roadway Plans
9	Drainage Plans
10	Bridge Layouts
11	Storm Water Pollution Prevention Plan
12	Landscaping Plan
13	Traffic Items
14	Joint-bid Utility Plans

9.3 Title Sheet

9.3.1 LAM Title Sheet

Information required on LAM (local area management) title sheets (Figure 9-4):

- the City of San Antonio and TxDOT logos
- project name, limits, length. and layman's description
- a location map with the limits of the project clearly defined with major street or highway names/designations
- signature blocks for all relevant personnel
- names/logos of each design firm responsible for plans
- engineer's seal of project manager
- TDLR number (if required)
- fields for final plans letting date, contractor begin date, accepted date, final contract cost, and contractor completed
- Final plans statement note with signature block

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Figure 9-1: Example Plan Sheet Sized 11” x 17”

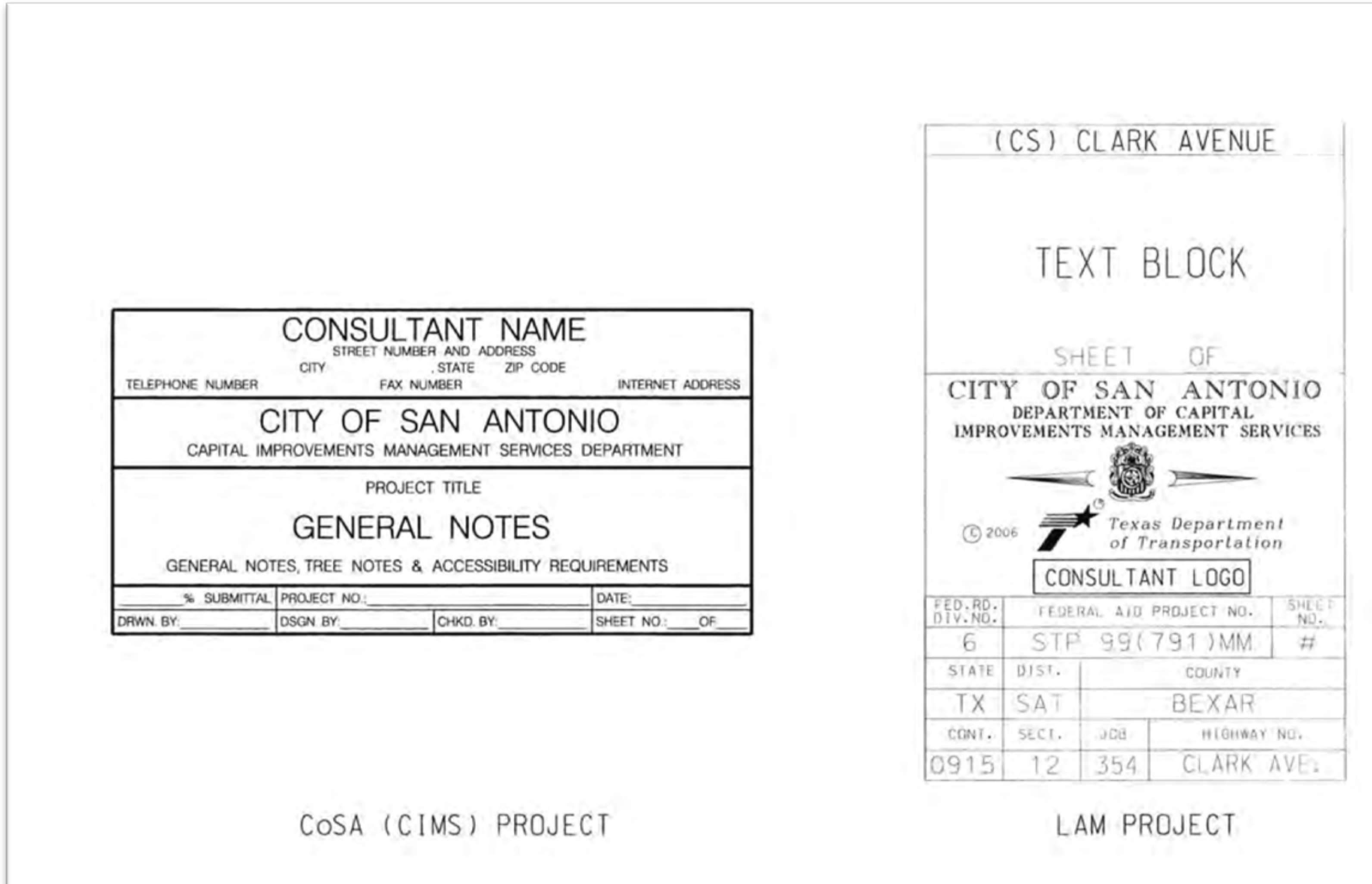


Figure 9-2: Example COSA Title Block

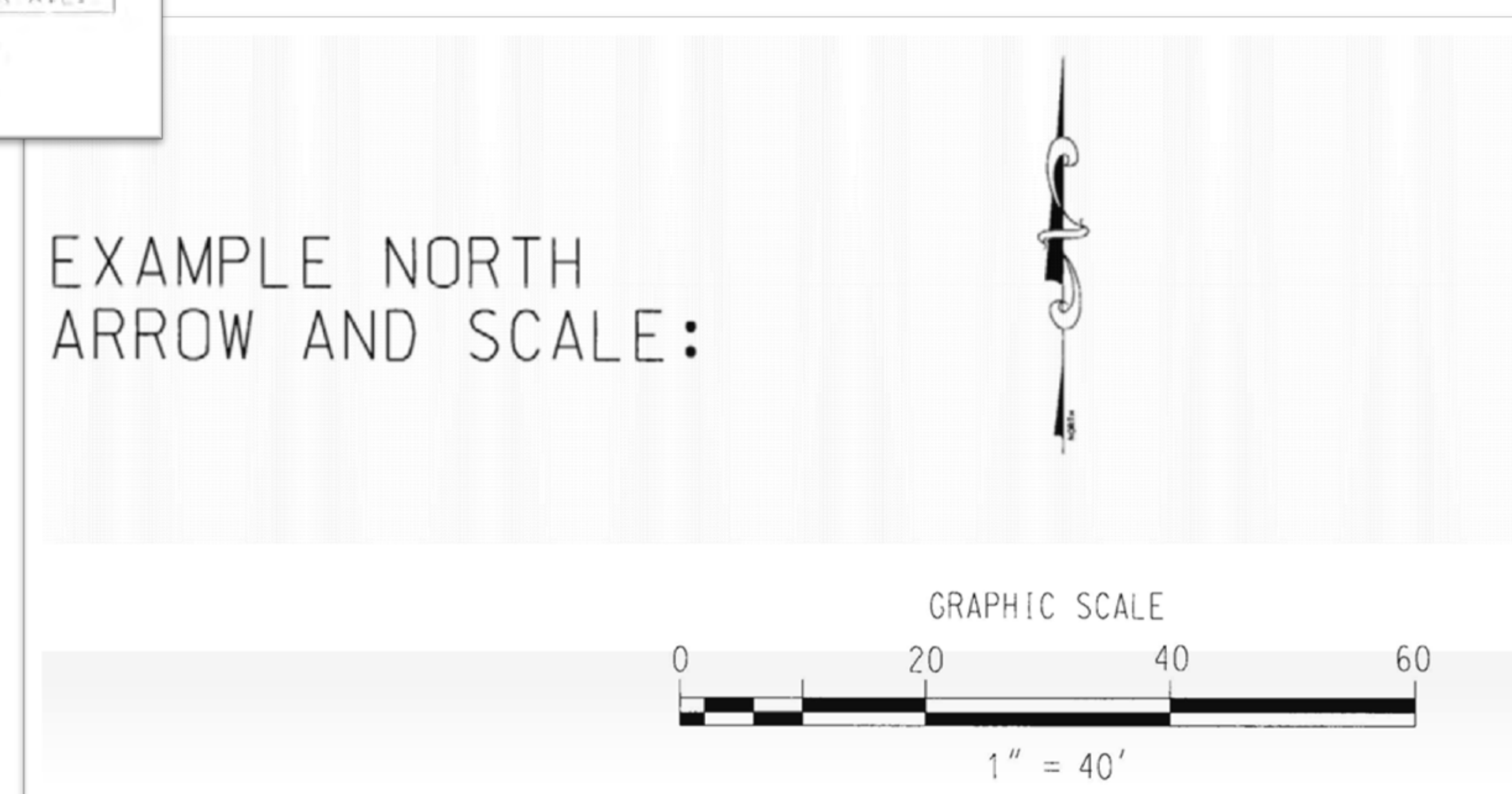
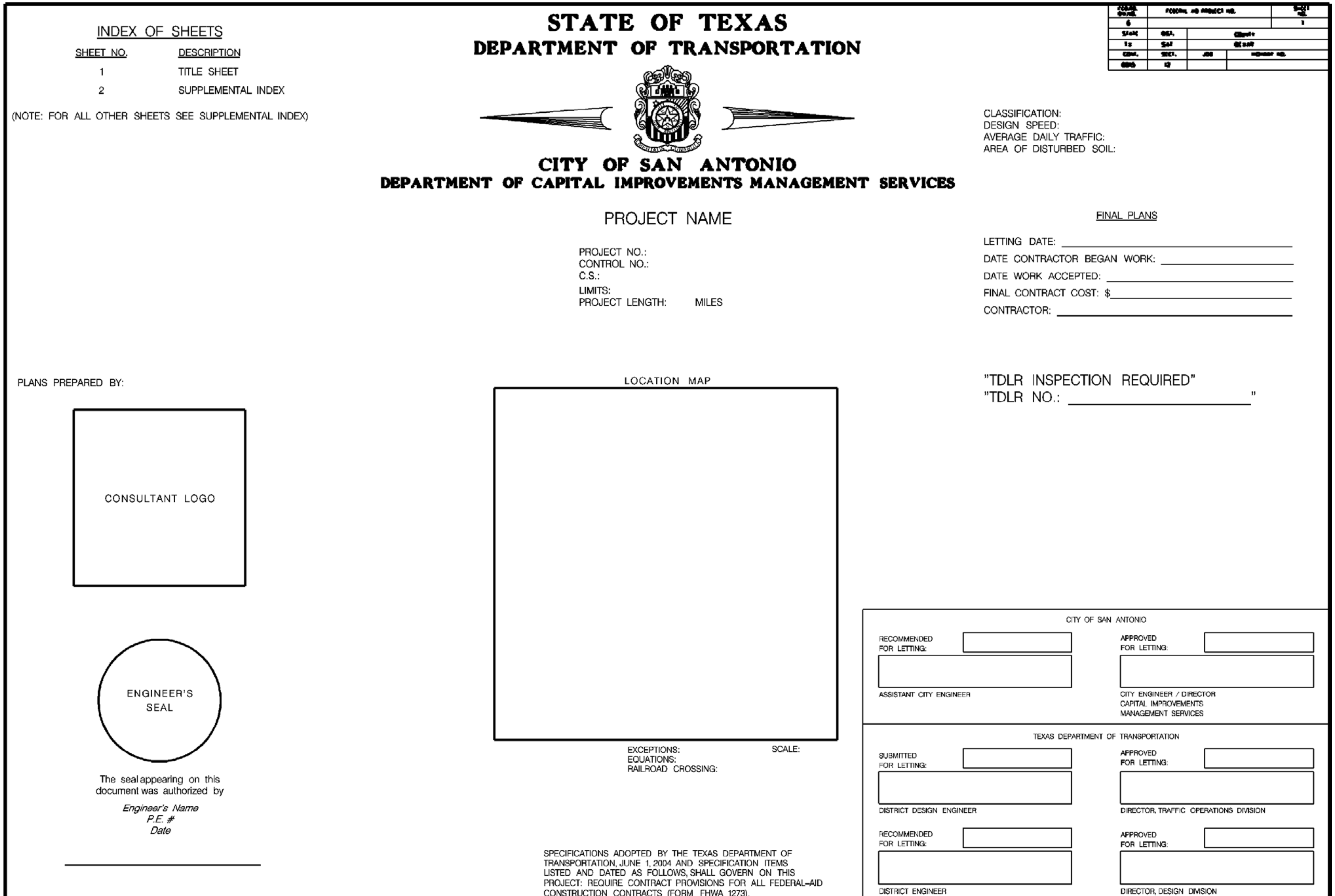


Figure 9-3: Example To-Scale Plan Sheet



INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	SUPPLEMENTAL INDEX

(NOTE: FOR ALL OTHER SHEETS SEE SUPPLEMENTAL INDEX)

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

CITY OF SAN ANTONIO
DEPARTMENT OF CAPITAL IMPROVEMENTS MANAGEMENT SERVICES

PROJECT NAME

PROJECT NO.:
CONTROL NO.:
C.S.:
LIMITS:
PROJECT LENGTH: MILES

CLASSIFICATION:
DESIGN SPEED:
AVERAGE DAILY TRAFFIC:
AREA OF DISTURBED SOIL:

FINAL PLANS

LETTING DATE: ____
DATE CONTRACTOR BEGAN WORK: ____
DATE WORK ACCEPTED: ____
FINAL CONTRACT COST: $____
CONTRACTOR: ____

PLANS PREPARED BY:

CONSULTANT LOGO

LOCATION MAP

EXCEPTIONS:
EQUATIONS:
RAILROAD CROSSING:
SCALE:

"TDLR INSPECTION REQUIRED"
"TDLR NO.: ____"

ENGINEER'S SEAL

The seal appearing on this document was authorized by
Engineer's Name
P.E. #
Date

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, JUNE 1, 2004 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRE CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273).

CITY OF SAN ANTONIO

RECOMMENDED FOR LETTING:
ASSISTANT CITY ENGINEER

APPROVED FOR LETTING:
CITY ENGINEER / DIRECTOR CAPITAL IMPROVEMENTS MANAGEMENT SERVICES

TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED FOR LETTING:
DISTRICT DESIGN ENGINEER

APPROVED FOR LETTING:
DIRECTOR, TRAFFIC OPERATIONS DIVISION

RECOMMENDED FOR LETTING:
DISTRICT ENGINEER

APPROVED FOR LETTING:
DIRECTOR, DESIGN DIVISION

Figure 9-4: Example LAM Title Sheet Information

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9.3.2 City Project Title Sheet

Information required on city project title sheets (Figure 9-5):

- City of San Antonio logo
- project name
- a location map with the limits of the project clearly defined with major street or highway names/designations
- names/logos of each design firm responsible for plans

9.4 Index

The index will list each section of plan sheets with page numbers (Figure 9-6).

9.5 Project Layout and Survey Control Sheets

The project layout will contain the following information:

- scaled plan view(s), based on project size, project alignment(s), ROW, existing features and proposed improvement features
- beginning and ending limits of project with any areas of incidental work
- control points to be used for the project during construction
- benchmarks and description of their location
- Geometric data with horizontal and vertical alignment data

9.6 Typical Sections: Existing and Proposed

Typical section sheets will be scaled at either 1" = 10' or 1" = 20' (Figure 9-7). Provide vertical scale if used.

The existing typical section sheets will show the following:

- existing lane widths
- ROW widths
- cross slopes
- existing pavement section (top and bottom of pavement, bottom of base, bottom of prepared subgrade)
- existing curb

- sidewalk and other cross sectional elements
- centerline location
- traffic flow arrows
- stationing for each condition

The proposed typical sections sheets will show:

- proposed lane widths
- border widths
- ROW widths
- cross slopes
- pavement section (top and bottom of pavement, bottom of base, bottom of prepared subgrade)
- curb
- sidewalk
- other cross sectional elements
- baseline location
- traffic flow arrow
- stationing for each condition
- proposed subsurface utility locations

9.7 General Notes

The general notes shall contain all specific instructions, specifications, and details for the project (Figure 9-8), including notes for joint-bid utilities or a referral to those notes in plans. Consultant will use City's general notes and will not modify without project manager's consent. If modifications or additions are required, they must be included in a supplemental general notes sheet.

9.8 Estimated Quantities

The consultant shall include an estimated quantities sheet (Figure 9-9) as part of the construction plans for each submittal. This sheet shall include all bid items, bid item descriptions, units, a quantity breakdown per sheet, and total quantities.

Data should be pasted into sheet files as “linked” documents, never “embedded.” Linked refers to extraction of data from other programs, such as Microsoft Word or Excel, for use in CAD files for associated item sheet and project totals.

Quantity boxes (Q-Boxes) are required on each sheet that depicts bid items to be completed by the contractor (e.g. plan and profile sheets).

9.9 Summary Sheet

A driveway summary sheet will be standard for COSA projects (Figure 9-10). However, LAM projects will require the following summary sheets: grading, earthwork, traffic control plan (TCP), storm water pollution prevention plan (SW3P), landscape, driveway, drainage, signing and pavement markings, summary of small signs, traffic signals, joint-bid utilities, and tree summary.

Summary sheets will contain the following information:

- name designating type of summary
- a table format for the item numbers, descriptions, units, and sheet totals in columns corresponding to the associated plan sheets in rows
- project totals for each item
- any additional notes required for items or exceptions for the contractor below the table(s)

9.10 Construction Phasing Sheet or Traffic Control Plan Sheets

Typically, these sheets will be at 1" = 20' or 1" = 40' and contain information regarding the following:

- sequence of work narrative, to include general construction phasing
- traffic control and advanced warning devices
- detour layouts
- traffic control plan typical sections
- temporary signal layouts

- traffic control plan phasing layouts

The general construction phasing sheet(s) will contain a scaled plan view(s) of the project with a clearly defined area of construction, alignment(s), ROW, existing features, and proposed improvement features to be built during phase.

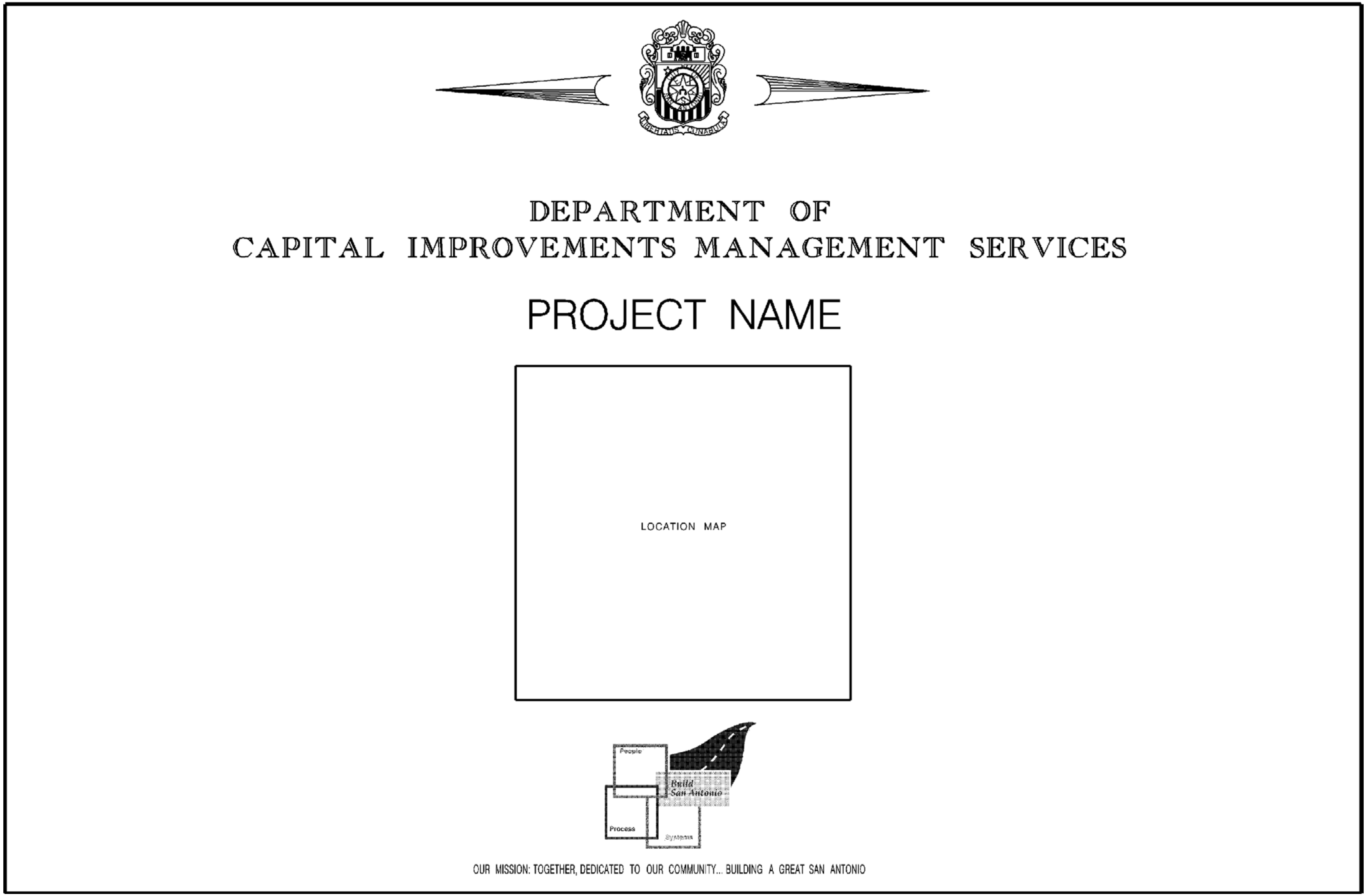

Figure 9-5: Example City Project Title Sheet

INDEX OF SHEETS:

SHEET NO.	GENERAL
1	CITY TITLE BLOCK
2	INDEX OF SHEETS
3–4	PROJECT LAYOUT / CONTROL POINTS
5–6	TYPICAL SECTIONS
7–8	GENERAL NOTES
9	ESTIMATED QUANTITIES SHEET

SHEET NO.	TRAFFIC CONTROL PLAN
10	SEQUENCE OF WORK NARRATIVE
11	CONSTRUCTION PHASING PLAN
12	TRAFFIC CONTROL PLAN TYPICAL SECTIONS
12a	TEMPORARY TRAFFIC SIGNALS
13–19	TCP LAYOUTS
20–23	DETOUR LAYOUTS
24–29	TRAFFIC CONTROL STANDARD DETAILS (AS REQUIRED)

SHEET NO.	ROADWAY PLANS
30	UTILITY BASE MAP
31–53	PLAN & PROFILE SHEETS
54–57	INTERSECTION LAYOUTS
58–60	DRIVEWAY SUMMARY
61–64	MISCELLANEOUS ROADWAY DETAILS
65–74	STREET CROSS SECTIONS

SHEET NO.	DRAINAGE PLANS
75	DRAINAGE AREA MAP
76–78	INTERIOR DRAINAGE AREA MAPS
79–81	HYDRAULIC COMPUTATIONS
82–90	DRAINAGE PLAN AND PROFILE
91–93	INLET CROSS SECTIONS
94–102	DRAINAGE CROSS SECTIONS
103–105	MISC DRAINAGE DETAILS

SHEET NO.	SWPPP & ENVIRONMENTAL PLAN
106–110	STORMWATER POLLUTION PREVENTION PLAN LAYOUT
111	STORMWATER POLLUTION PREVENTION PLAN NARRATIVE

SHEET NO.	LANDSCAPING PLAN
114	TREE SURVEY LIST
115	TREE PRESERVATION LIST
116–117	TREE PROTECTION DETAILS
118	LANDSCAPE LAYOUT

SHEET NO.	TRAFFIC ITEMS
119–121	TRAFFIC SIGNAL LAYOUTS
122–124	WIRING LAYOUTS
125–127	SIGNING AND PAVEMENT MARKING LAYOUTS
128–130	MISCELLANEOUS TRAFFIC AND SIGN DETAILS

SHEET NO.	SAWS WATER AND SANITARY SEWER PLANS
131	TITLE SHEET WATER PLANS
132	GENERAL NOTES
133	WATER SUMMARY SHEET
134	OVERALL WATER LAYOUT
135–142	WATER PLAN SHEETS
143–147	MISCELLAEOUS WATER DETAILS
148	TITLE SHEET SANITARY SEWER
149–150	GENERAL NOTES
151	SEWER SUMMARY
152	OVERALL SEWER LAYOUT
153–159	SANITARY SEWER PLAN/PROFILES
160–162	SANITARY SEWER DETAILS

SHEET NO.	CPS GAS LINE PLANS
163	GAS LINE GENERAL NOTES
164	GAS LINE DETAILS/QUANTITIES
165–173	GAS LINE LAYOUTS

CONSULTANT NAME
STREET NUMBER AND ADDRESS
CITY , STATE ZIP CODE
TELEPHONE NUMBER FAX NUMBER INTERNET ADDRESS

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

CLARKSON AVE.
INDEX OF SHEETS

Figure 9-6: Example Plans Index

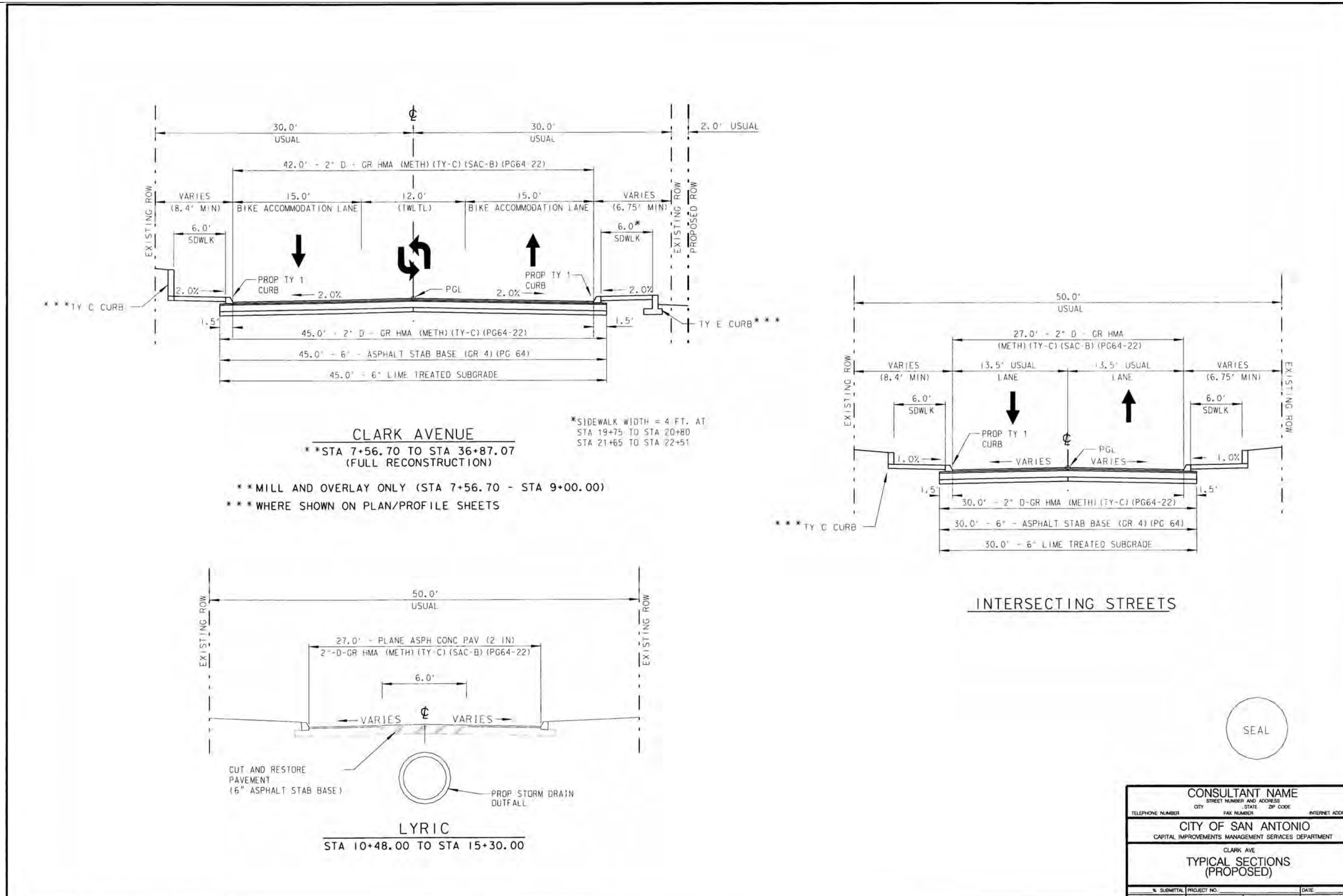

Figure 9-7: Example Typical Sections

GENERAL NOTES

1. ALL CONSTRUCTION SHALL CONFORM TO THE CITY OF SAN ANTONIO STANDARD SPECIFICATIONS FOR CONSTRUCTION JUNE 2008, OR LATEST.
2. NO EXTRA PAYMENT SHALL BE ALLOWED FOR WORK CALLED FOR ON THE PLANS, BUT NOT INCLUDED IN THE BID PROPOSAL. THIS INCIDENTAL WORK WILL BE REQUIRED AND SHALL BE INCLUDED IN THE PAY ITEM TO WHICH IT RELATES.
3. THE CONTRACTOR SHALL PROVIDE ACCESS FOR THE DELIVERY OF MAIL BY THE U.S. POSTAL SERVICE.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING TO ITS ORIGINAL OR BETTER CONDITION ANY DAMAGE DONE TO EXISTING FENCES, CONCRETE ISLANDS, STREET PAVING, CURBS, SHRUBS, BUSHES OR DRIVEWAYS. (NO SEPARATE PAY ITEM).
5. IT IS THE CONTRACTOR'S RESPONSIBILITY TO SEE THAT ALL SIGNS AND BARRICADES ARE PROPERLY INSTALLED AND MAINTAINED. ALL LOCATIONS AND DISTANCES WILL BE DECIDED UPON IN THE FIELD BY THE CONTRACTOR, USING THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES". THE CITY'S CONSTRUCTION INSPECTOR AND TRAFFIC ENGINEERING REPRESENTATIVE WILL ONLY BE RESPONSIBLE TO INSPECT BARRICADES AND SIGNS. IF, IN THE OPINION OF THE TRAFFIC ENGINEERING REPRESENTATIVE AND THE CONSTRUCTION INSPECTOR, THE BARRICADES AND SIGNS DO NOT CONFORM TO ESTABLISHED STANDARDS OR ARE INCORRECTLY PLACED OR ARE INSUFFICIENT IN QUANTITY TO PROTECT THE GENERAL PUBLIC, THE CONSTRUCTION INSPECTOR SHALL HAVE THE OPTION TO STOP OPERATIONS UNTIL SUCH TIME AS THE CONDITIONS ARE CORRECTED.
6. IF THE NEED ARISES, ADDITIONAL BARRICADES AND DIRECTIONAL DEVICES MAY BE ORDERED BY THE TRAFFIC ENGINEERING REPRESENTATIVE AT THE CONTRACTOR'S EXPENSE.
7. DUE TO FEDERAL REGULATIONS TITLE 49, PART 192.171 C.P.S. MUST MAINTAIN ACCESS TO GAS VALVES AT ALL TIMES. THE CONTRACTOR MUST PROTECT AND WORK AROUND ANY GAS VALVES THAT ARE IN THE PROJECT AREA.
8. CONTRACTOR SHALL NOTIFY THE CITY INSPECTOR TWENTY FOUR (24) HOURS PRIOR TO BACKFILL OF ANY UTILITY TRENCHES TO SCHEDULE FOR DENSITY TEST AS REQUIRED.
9. CONTRACTOR SHALL PRESERVE ALL CONSTRUCTION STAKES, MARKS, ETC. IF ANY ARE DESTROYED OR REMOVED BY THE CONTRACTOR OR HIS EMPLOYEES, THEY SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.
10. CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES PRIOR TO CONSTRUCTION TO DETERMINE THE LOCATION OF EXISTING UTILITIES. CONTRACTOR SHALL NOTIFY THE FOLLOWING AT LEAST FORTY-EIGHT (48) HOURS PRIOR TO EXCAVATION OPERATION:

SAN ANTONIO WATER SYSTEM (SAWS)	233-2010
BEXAR METROPOLITAN WATER DISTRICT (BEXAR MET)	354-6538 /357-5741
COSA DRAINAGE	207-8048
COSA SIGNAL OPERATIONS	207-3951
TEXAS STATE WIDE ONE CALL LOCATOR	1-800-344-8377

   - CITY PUBLIC SERVICE ENERGY
   - TIME WARNER
   - AT&T
   - MCI

11. THE EXISTENCE AND LOCATION OF UNDERGROUND UTILITIES INDICATED ON THE PLANS ARE TAKEN FROM AVAILABLE RECORDS AND ARE NOT GUARANTEED, BUT SHALL BE INVESTIGATED AND VERIFIED BY THE CONTRACTOR BEFORE STARTING WORK. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY DAMAGE TO AND FOR THE MAINTENANCE AND PROTECTION OF THE EXISTING UTILITIES EVEN IF THEY ARE NOT SHOWN ON THE PLANS. LOCATION AND DEPTH OF EXISTING UTILITIES SHOWN HERE ARE APPROXIMATE ONLY. ACTUAL LOCATIONS AND DEPTHS MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION AND HE SHALL BE RESPONSIBLE FOR PROTECTION OF SAME DURING CONSTRUCTION.
12. ALL WASTE MATERIAL SHALL BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE HIS SOLE REPONSIBILITY TO DISPOSE OF THIS MATERIAL OFF THE LIMITS OF THE PROJECT. NO WASTE MATERIAL SHALL BE PLACED IN EXISTING LOWS THAT WILL BLOCK OR ALTER FLOW LIMITS OF EXISTING ARTIFICIAL OR NATURAL DRAINAGE.
13. THE CONTRACTOR SHALL NOT PLACE ANY EXCESS MATERIAL IN THE 100-YEAR FLOOD PLAIN WITHOUT FIRST OBTAINING AN APPROVED FLOOD PLAIN DEVELOPMENT PERMIT FROM THE CITY OF SAN ANTONIO PUBLIC WORKS DEPARTMENT.
14. DURING THE PRE-CONSTRUCTION MEETING, THE CONTRACTOR MUST PROVIDE THE CITY CONSTRUCTION INSPECTOR AND THE PROJECT MANAGER THE LOCATION OF THE DISPOSAL SITE FOR EXCESS MATERIAL. THE CONTRACTOR MUST ALSO PROVIDE THE CITY WITH A COPY OF ALL REQUIRED PERMITS AND AGREEMENTS WITH PROPERTY OWNERS PRIOR TO ANY HAULING OF EXCESS MATERIAL FROM THE PROJECT SITE. IF THE DISPOSAL SITE CHANGES, THE CONTRACTOR MUST NOTIFY THE CITY INSPECTOR OF THE NEW SITE PRIOR TO ANY HAULING OF EXCESS MATERIAL.
15. THE CONTRACTOR SHALL MAINTAIN ALL ADJOINING STREETS AND TRAVELED ROUTES FREE FROM SPILLED AND /OR TRACKED CONSTRUCTION MATERIALS AND /OR DEBRIS.
16. IF THE CONTRACTOR ENCOUNTERS ANY ARCHAEOLOGICAL DEPOSITS DURING CONSTRUCTION OPERATIONS, THE CONTRACTOR MUST STOP EXCAVATION IMMEDIATELY, CONTACT THE CITY INSPECTOR, AND CALL THE CITY HISTORIC PRESERVATION OFFICE AT 207-7306 OR 207-3327 FOR AN ARCHAEOLOGICAL INVESTIGATION. THE CONTRACTOR CANNOT BEGIN EXCAVATION AGAIN WITHOUT WRITTEN PERMISSION FROM THE CITY.
   IF MORE THAN THREE (3) DAYS ARE REQUIRED FOR INVESTIGATION (NOT INCLUDING HOLIDAY AND WEEKENDS) AND IF THE CONTRACTOR IS UNABLE TO WORK IN OTHER AREAS, THEN THE CONTRACTOR WILL BE ALLOWED TO NEGOTIATE FOR ADDITIONAL CONSTRUCTION TIME UPON WRITTEN REQUEST WITHIN TEN (10) DAYS AFTER THE FIRST NOTICE TO THE CITY OF ARCHAEOLOGICAL INVESTIGATION FOR EACH EVENT. IF THE TIME REQUIRED FOR INVESTIGATION IS LESS THAN OR EQUAL TO THREE (3) DAYS FOR EACH EVENT, CONTRACT DURATION WILL NOT BE EXTENDED.
17. IF SUSPECTED CONTAMINATION IS ENCOUNTERED DURING CONSTRUCTION OPERATIONS, C.O.S.A. SHALL BE NOTIFIED IMMEDIATELY WHEN CONTAMINATED SOILS AND /OR GROUNDWATER ARE ENCOUNTERED AT LOCATIONS NOT IDENTIFIED IN THE PLANS. THE NOTIFICATION SHOULD INCLUDE THE STATION NUMBER, TYPE OF CONTAMINATED MEDIA, EVIDENCE OF CONTAMINATION AND MEASURES TAKEN TO CONTAIN THE CONTAMINATED MEDIA AND PREVENT PUBLIC ACCESS. THE CONTAMINATED SOIL AND /OR GROUNDWATER SHALL NOT BE REMOVED FROM THE LOCATION WITHOUT PRIOR C.O.S.A. APPROVAL. THE CONTRACTOR MUST STOP THE EXCAVATION IMMEDIATELY AND CONTACT THE C.O.S.A. INSPECTOR. THE CONTRACTOR CANNOT BEGIN EXCAVATION ACTIVITIES WITHOUT WRITTEN PERMISSION FROM THE CITY.
18. CONTRACTOR IS TO INCLUDE A MAILBOX POST BLOCKOUT FOR VACANT LOTS AND ALL RESIDENCES WHICH DO NOT HAVE MAILBOXES AT THE CURB. BLOCKOUTS ARE PROVIDED FOR FUTURE USE BY THE POST OFFICE.
19. CONTRACTOR SHALL NOT REMOVE OR ADJUST ANY VIA FACILITIES. THE CONTRACTOR MUST CONTACT VIA FOURTEEN DAYS PRIOR, FOR THE REMOVAL OF BENCHES, STOP POLES OR ANY OTHER VIA FACILITIES THAT MAY BE PRESENT. PLEASE PROVIDE THIRTY DAYS PRIOR NOTICE FOR SHELTER REMOVAL (TELEPHONE NOS: (210) 362-2155 OR (210) 362-2096). THE CONTRACTOR WILL BE LIABLE FOR ANY DAMAGES TO VIA FACILITIES NOT REMOVED BY VIA. THE CONTRACTOR IS REQUIRED TO REPLACE ALL FLATWORK REMOVED OR DAMAGED IN THE COURSE OF EXECUTING THE CONTRACT UNLESS OTHERWISE NOTED BY VIA. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROTECTING VIA FACILITIES IF ADJACENT TO WORK AREA.
20. POLES SHOWN ON THE PLANS ARE BASED ON ORIGINAL SURVEY, AND MAY NOT REFLECT CONDITIONS DURING CONSTRUCTION. IF POLES ARE IN CONFLICT WITH PROPOSED IMPROVEMENTS, THE CONTRACTOR SHALL EXPECT THE POWER POLES TO BE RELOCATED BY OTHERS TO APPROXIMATELY 1' OFF THE PROPERTY LINE, OR NEW PROPERTY LINE IF ROW IS ACQUIRED. THE CONTRACTOR IS RESPONSIBLE TO TEMPORARILY BRACE/SHORE THESE POLES WHEN EXCAVATION OR TRENCHING IS REQUIRED NEAR A POLE, AND IS RESPONSIBLE TO MAINTAIN OVERHEAD LINE CLEARANCE IN LOCATIONS WHERE LARGE EQUIPMENT MAY BE USED. THIS WORK SHALL BE SUBSIDIARY TO THE WORK IN CONFLICT. DE-ENERGIZING OF PRIMARY LINES OR TRANSMISSION LINES FOR CONSTRUCTION PURPOSES WILL BE AT CONTRACTOR'S EXPENSE.

TREE PROTECTION AND PRESERVATION GENERAL NOTES

1. NO UTILITY OR STREET EXCAVATION WORK SHALL BEGIN IN AREAS WHERE TREE PRESERVATION AND TREATMENT MEASURES HAVE NOT BEEN COMPLETED AND APPROVED.
2. TREE PROTECTION FENCING SHALL BE REQUIRED. TREE PROTECTION FENCING SHALL BE INSTALLED, MAINTAINED AND REPAIRED BY THE CONTRACTOR DURING SITE CONSTRUCTION. DURING CONSTRUCTION ACTIVITY, AT LEAST A SIX-INCH LAYER OF COARSE MULCH SHALL BE PLACED AND MAINTAINED OVER THE ROOT PROTECTION ZONE (NO SEPARATE PAY ITEM).
3. THE CONTRACTOR SHALL AVOID CUTTING ROOTS LARGER THAN ONE INCH IN DIAMETER WHEN EXCAVATING NEAR EXISTING TREES. EXCAVATION IN THE VICINITY OF TREES SHALL PROCEED WITH CAUTION. THE CONTRACTOR SHALL CONTACT THE CITY INSPECTOR FOR GUIDANCE.
4. ROOTS WILL BE CUT WITH A ROCK SAW OR BY HAND, NOT BY AN EXCAVATOR OR OTHER ROAD CONSTRUCTION EQUIPMENT.
5. ALL CURB AND SIDEWALK WORK SHALL USE ALTERNATIVE CONSTRUCTION METHODS TO MINIMIZE EXTENSIVE ROOT DAMAGE TO TREES (REFER TO DETAILS).
6. EXPOSED ROOTS SHALL BE COVERED AT THE END OF THE DAY USING TECHNIQUES SUCH AS COVERING WITH SOIL, MULCH, OR WET BURLAP.
7. NO EQUIPMENT, VEHICLES OR MATERIALS SHALL OPERATE OR BE STORED WITHIN THE ROOT PROTECTION ZONE OF ANY TREE NEAR THE PROJECT. ROOT PROTECTION ZONE IS 1 FOOT OF RADIUS PER INCH OF TREE'S DIAMETER. A 10-INCH DIAMETER TREE WOULD HAVE A 10 FOOT RADIUS ROOT PROTECTION ZONE AROUND THE TREE. ROOTS OR BRANCHES IN CONFLICT WITH THE CONSTRUCTION SHALL BE CUT CLEANLY ACCORDING TO PROPER PRUNING METHODS. OAK WOUNDS SHALL BE PAINTED OVER WITHIN 30 MINUTES TO PREVENT OAK WILT.
8. SAPLINGS, SHRUBS OR BUSHES TO BE CLEARED FROM THE PROTECTED ROOT ZONE AREA OF A LARGE TREE SHALL BE REMOVED BY HAND AS DESIGNATED BY THE INSPECTOR.
9. NO WIRES, NAILS OR OTHER MATERIAL MAY BE ATTACHED TO PROTECTED TREES.
10. TREES, TREE LIMBS, BUSHES AND SHRUBS LOCATED IN THE CITY STREET OR ALLEY RIGHT-OF-WAY OR PERMANENT EASEMENTS WHICH INTERFERE WITH PROPOSED CONSTRUCTION ACTIVITIES SHALL BE PROPERLY PRUNED FOLLOWING THE ANSI A-300 STANDARDS FOR PRUNING. ALL TREE PRUNING SHALL BE COMPLETED BY A CITY OF SAN ANTONIO TREE MAINTENANCE LICENSED CONTRACTOR (ARTICLE 21-171, CITY CODE) ONLY AFTER APPROVAL FROM THE CAPITAL PROJECTS MANAGEMENT THROUGH THE INSPECTOR.
11. NO EXCESSIVE TREE TRIMMING WILL BE PERMITTED.
12. ALL DEBRIS GENERATED BY THE PRUNING AND TRIMMING OF THE TREES AND /OR BUSHES SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF PROPERLY (NO SEPARATE PAY ITEM).
13. TREES MUST BE MAINTAINED IN GOOD HEALTH THROUGHOUT THE CONSTRUCTION PROCESS. MAINTENANCE MAY INCLUDE, BUT NOT LIMITED TO: WATERING THE ROOT PROTECTION ZONE, WASHING FOLIAGE, FERTILIZATION, PRUNING, ADDITIONAL MULCH APPLICATIONS AND OTHER MAINTENANCE AS NEEDED ON THE PROJECT.
14. ANY TREE REMOVAL SHALL BE APPROVED BY THE CITY ARBORIST. (207-0278)
15. TREES WHICH ARE DAMAGED OR LOST DUE TO THE CONTRACTOR'S NEGLIGENCE DURING CONSTRUCTION SHALL BE MITIGATED TO THE CITY'S SATISFACTION.
16. TREE PLANTING FOR MITIGATION OR ENHANCEMENT: ALL PLANTED TREES SHALL BE MAINTAINED IN A HEALTHY CONDITION AT ALL TIMES. THIS INCLUDES IRRIGATION, FERTILIZING, PRUNING AND OTHER MAINTENANCE AS NEEDED ON THE PROJECT. TREES THAT DIE WITHIN TWELVE (12) MONTHS SHALL BE REPLACED WITH A TREE OF EQUAL SIZE AND SPECIES.

ACCESSIBILITY REQUIREMENTS

1. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN VEHICULAR AND PEDESTRIAN ACCESS AT ALL TIMES TO LOCAL RESIDENCES AND BUSINESSES.
2. WHEN THE WORK REQUIRES THE EXCAVATION OF THE STREET AND THE REMOVAL OF THE EXISTING DRIVEWAY APPROACHES AND SIDEWALKS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING TEMPORARY ALL-WEATHER ACCESS TO THE BUSINESSES AND RESIDENCES. THE TEMPORARY DRIVEWAY APPROACHES SHALL BE CONSTRUCTED WITH FLEXIBLE BASE OR GRAVEL MATERIAL AT NO SEPARATE COST TO THE CITY.
3. PRIOR TO INITIATING THE CONSTRUCTION OF NEW DRIVEWAY APPROACHES, THE CONTRACTOR SHALL GIVE ADVANCE WARNING IN PERSON, OR IN WRITING, OF AT LEAST 48 HOURS TO EACH RESIDENCE THAT WILL BE IMMEDIATELY AFFECTED, SO THAT ALTERNATE PLANS MAY BE MADE BY THE RESIDENTS.
4. FOR BUSINESSES WITH MORE THAN ONE DRIVEWAY, AT LEAST ONE DRIVEWAY SHALL REMAIN OPEN WHILE THE OTHER NEW DRIVEWAY APPROACHES ARE CONSTRUCTED. FOR BUSINESSES WITH ONLY ONE DRIVEWAY, THE NEW DRIVEWAY APPROACH SHALL BE CONSTRUCTED IN HALF WIDTHS, UNLESS A TEMPORARY ASPHALT DRIVEWAY IS FIRST INSTALLED AT NO SEPARATE COST TO THE CITY.

OCTOBER 2011

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

CITY OF SAN ANTONIO
GENERAL NOTES

% SUBMITTAL	PROJECT NO.:		DATE:
DRWN. BY:	DSGN. BY:	CHKD. BY:	SHEET NO.: OF

Figure 9-8: Example General Notes

ESTIMATED QUANTITIES

CITY OF SAN ANTONIO			ROADWAY SHEETS										DRAINAGE SHEETS										SW3P SHEETS					TRAFFIC SHEETS					TOTAL
ITEM NO.	BID ITEM DESCRIPTION	UNIT	30	31	32	33	34	35	36	37	38	39	60	61	62	63	64	65	66	67	68	69	79	80	81	82	83	85	86	87	88	89	QUANTITIES
100.1	MOBILIZATION	LS	1																														1
100.2	INSURANCE & BOND	LS	1																														1
101.1	PREPARING RIGHT OF WAY	LS	1																														1
103.2	REMOVE CONC TRAFFIC BARRIER	LF	25	55	55																												135
104.1	STREET EXCAVATION	CY	65	122	124	60	53	73	44	95	65	12																					713
105.1	CHANNEL EXCAVATION	CY				100	164																										264
107.1	EMBANKMENT (FINAL) (DENS CONT) (TY A)	CY	9		12	80	24	32	56			23																					236
108.1	LIME TREAT SUBGRADE (6" COMPACTED DEPTH)	SY	123	320	320		320	320	320	375	300	189																					2587
108.2	LIME	TON	2	4	4			4	4	5	4	2																					29
203.1	TACK COAT	GAL	12	44	44			44	44	44	44	10																					286
205.2	HOT MIX ASPHALTIC PAVEMENT TYPE B (6" COMP. DEPTH)	SY	123	320	320			320	320	375	300	189																					2267
205.4	HOT MIX ASPHALTIC PAVEMENT TYPE D (2" COMP. DEPTH)	SY	120	310	310			310	310	384	231	184																					2139
208.1	SALVAGING, HAULING & STOCKPILING RECLAIMABLE ASPHALTIC PAVM'T 1.5" DEPTH	SY	123																														123
307.5	ENERGY DISSIPATOR	EA														1	1																2
401.1	REINFORCED CONCRETE PIPE (CL III) (24" DIA)	LF	48										20	100	50					50	100	35											403
401.1	REINFORCED CONCRETE PIPE (CL V) (30" DIA)	LF	56															100	100	50													306
403.2	JUNCTION BOX (COMPLETE) 5'X5'X5'	EA	1										1	1	1			1	1	1													7
403.8	INLET (COMPLETE) 10'	EA	3										2	2	1				2	2													12
410.2	GRAVEL SUBGRADE FILLER	CY	30										1	4	2			4	4	4	4	2											55
500.1	CONCRETE CURBING	LF	50	240	240			240	240	280	220	75																					1585
502.1	CONCRETE SIDEWALKS	SY	33	160	160			160	160	200	140	30																					1043
503.2	PORTLAND CEMENT CONCRETE DRIVEWAYS-COMMERCIAL	SY	31	26				52		23	36																						168
503.4	ASPHALTIC CONCRETE DRIVEWAY	SY	20									10																					30
505.1	CONCRETE RIP-RAP (6" THICK)	SY				203	186																										389
506.1	CONCRETE RETAINING WALLS-COMB. TYPE	CY	6	23	36			18																									83
515.1	TOP SOIL	CY	86	150	150			126	158	143	103	75																					991
516.1	BERMUDA SODDING	SY	86	150	150			126	158	143	103	75																					991
530.1	BARRICADES, SIGNS & TRAFFIC HANDLING	LS	1																														1
531.3	R1-1 STOP (30")(HIGH DENSITY)	EA																										2					2
531.57	9 INCH STREET NAME, BLOCK NUMBERS (VARIESx9")(HIGH DENSITY)	EA																										2					2
535.1	4 INCH WIDE YELLOW LINE	LF																										130	200	200	200	30	760
535.2	4 INCH WIDE WHITE LINE	LF																										130	200	200	200	30	760
535.7	24 INCH WIDE WHITE LINE	LF																														50	50
537.6	TRAFFIC BUTTON (TYPE I-C)	EA																										6	11	10	10	6	43
537.8	TRAFFIC BUTTON (TYPE II A-A)	EA																										6	11	10	10	6	43
540.1	ROCK FILTER DAMS (INSTALL/REMOVE)(TYPE 2)	LF	400																				400	200	200								1200
540.1	ROCK FILTER DAMS (INSTALL/REMOVE)(TYPE 3)	LF	55																				55	20	25								155
540.6	CONSTRUCTION EXITS (INSTALL/REMOVE)	SY	156																				156	123	133								568
540.9	TEMPORARY SEDIMENT CONTROL FENCE	LF	300																				300	150	150								900
540.10	CURB INLET GRAVEL FILTERS	LF	125																				40	10	0	50							225

TXDOT BID ITEMS			ROADWAY SHEETS										DRAINAGE SHEETS										SW3P SHEETS					TRAFFIC SHEETS					TOTAL
ITEM NO.	BID ITEM DESCRIPTION	UNIT	30	31	32	33	34	35	36	37	38	39	60	61	62	63	64	65	66	67	68	69	79	80	81	82	83	85	86	87	88	89	QUANTITIES
360 2004	CONC PVMT (CONT REINF - CRCP) (11")	SY				15	15																										30
416 2002	DRILL SHAFT (24" DIA.)	LF				270	270																										540
416 2003	DRILL SHAFT (30" DIA.)	LF				660	660																										1320
416 2031	DRILL SHAFT (TRF SIG POLE) (30 IN)	LF				5	6																										11
416 2032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF				7	6																										13
420 2003	CL C CONC (ABUT)	CY				26	26																										52
420 2004	CL S CONC (BENT)	CY				117	118.5																										235.5
420 2029	CL S CONC (SLAB)	CY				140	140																										280
420 2033	CL S CONC (APPR SLAB)	CY				60	60																										120
420 2034	CL S CONC (BRIDGE SIDEWALK)	CY				65	65																										130
425 2016	PRESTR CONC SLAB BEAM(4SB15)	LF				1050	1050																										2100
425 2017	PRESTR CONC SLAB BEAM(5SB15)	LF				735	735																										1470
432 2023	RIP-RAP (STONE PROTECTION) (24")	CY				90	90																										180
442 2005	STR STL (MISCELLANEOUS)	LB				350	350																										700
450 2166	RAIL (TY C223)	LF				250	250																										500
454 2005	ARMOR JOINT (WITH SEAL)	LF				97	97																										194
496 2010	REMOVE STRUCTURE (BRIDGE 100-499FT LENGTH)	EA				1																											1

(ADDITIONAL SHEET AS NEEDED)

CONSULTANT NAME
STREET NUMBER AND ADDRESS
CITY, STATE, ZIP CODE
TELEPHONE NUMBER FAX NUMBER INTERNET ADDRESS

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

PROJECT TITLE
ESTIMATED QUANTITIES
SHEET SUBTITLE

% SUBMITTAL	PROJECT NO.:		DATE:
DRWN. BY:______	DSGN. BY:______	CHKD. BY:______	SHEET NO.:___OF___

Figure 9-9: Example Estimated Quantities Sheet

SHEET NO.	DRIVEWAY	STATION AT CENTERLINE	SIDE	LENGTH FT.	WIDTH FT.	DRIVEWAY PENETRATIONS LENGTH FT.	503.10 PORTLAND CEMENT CONCRETE DRIVEWAYS SY	503.20 PORTLAND CEMENT CONCRETE DRIVEWAYS-COMM. SY	503.40 DRIVEWAY PENETRATIONS (ASPHALT) SY	503.50 DRIVEWAY PENETRATIONS (GRAVEL) SY	503.10 DRIVEWAY PENETRATIONS (CONCRETE) SY
64	D1	14+82.85	RT	21.2	24.0	0.0	0	61	0	0	0
64	D2	15+26.60	RT	19.4	24.0	0.0	0	57	0	0	0
65	D3	17+36.47	LT	18.0	10.0	0.0	25	0	0	0	0
65	D4	20+07.34	LT	18.0	24.0	0.0	0	53	0	0	0
65	D5	17+80.62	RT	19.0	19.0	0.0	0	43	0	0	0
66	D6	21+30.31	LT	18.0	24.0	0.0	0	53	0	0	0
66	D7	11+01.25/MALONE	LT	5.1	24.0	0.0	0	16	0	0	0
66	D8	23+54.49	LT	18.0	30.0	0.0	0	13	0	0	0
66	D9	24+34.36	LT	18.0	30.0	0.0	0	65	0	0	0
66	D10	20+89.29	RT	18.0	30.0	0.0	0	66	0	0	0
66	D11	23+57.39	RT	18.0	30.0	0.0	0	65	0	0	0
66	D12	24+08.20	RT	18.0	24.0	0.0	0	53	0	0	0
67	D13	25+24.97	LT	18.0	93.0	0.0	0	193	0	0	0
67	D14	26+19.76	LT	18.0	12.0	0.0	0	38	0	0	0
67	D14A	26+56.92	LT	18.0	24.0	0.0	0	48	0	0	0
67	D15	27+41.60	LT	18.0	30.0	5.4	0	65	0	0	10
67	D15A	10+76/LINARES	LT	11.0	12.0	0.0	15	0	0	0	0
67	D15B	10+61/LINARES	RT	12.0	14.0	0.0	19	0	0	0	0
67	D16	24+77.67	RT	18.0	24.0	0.0	0	53	0	0	0
67	D17	10+80.26/THEO	RT	7.3	24.0	0.0	0	22	0	0	0
67	D18	26+42.08	RT	23.0	30.0	0.0	0	82	0	0	0
67	D19	27+73.53	RT	23.0	30.0	0.0	0	82	0	0	0
68	D20	29+90.79	LT	18.0	12.0	4.0	0	66	0	5	0
68	D21	32+08.37	LT	18.0	24.0	0.0	53	0	0	0	0
68	D22	32+57.84	LT	18.1	24.0	0.0	53	0	0	0	0
68	D23	32+91.81	LT	18.0	12.0	0.0	0	29	0	0	0
68	D24	33+30.83	LT	18.0	25.0	0.0	55	0	0	0	0
68	D25	29+48.51	RT	18.0	76.0	4.4	0	156	37	0	0
68	D26	30+50.72	RT	18.0	80.0	0.0	0	166	0	0	0
69	D27	10+94.38/CAVALIER	RT	6.8	12.0	0.0	16	0	0	0	0
69	D28	35+50.90	LT	18.1	20.0	4.7	44	0	10	0	0
69	D29	35+92.12	LT	18.1	12.0	0.0	0	29	0	0	0
69	D30	11+01.66/JENNINGS	RT	10.5	15.0	0.0	21	0	0	0	0
69	D31	10+94.93/JENNINGS	LT	9.4	10.0	0.0	12	0	0	0	0
69	D32	35+17.18	RT	17.9	30.0	0.0	0	64	0	0	0
69	D33	35+80.28	RT	17.9	30.0	0.0	0	65	0	0	0
70	D34	38+43.23	LT	18.0	12.0	5.6	29	0	7	0	0
70	D35	39+06.96	LT	18.0	26.0	3.1	0	57	5	5	0
70	D36	39+88.89	LT	18.0	15.0	3.8	0	35	6	0	0
70	D37	11+20.55/CARROLL	RT	15.3	24.0	0.0	0	43	0	0	0
70	D38	38+23.29	RT	18.0	20.0	10.4	0	45	23	0	0
70	D39	39+12.31	RT	18.0	20.0	11.8	0	48	26	0	0
70	D40	41+12.82	RT	17.9	30.0	2.3	0	65	8	0	0
71	D41	44+05.41	LT	19.5	27.0	0.0	0	65	0	0	0
71	D42	42+70.85	RT	18.0	30.0	0.0	0	65	0	0	0
71	D43	12+86.88/WALTON	RT	13.5	24.0	0.0	0	38	0	0	0
71	D44	12+85.06/WALTON	LT	11.5	24.0	0.0	0	33	0	0	0
71	D45	44+18.37	RT	19.7	20.0	0.0	0	44	0	0	0
		ZARZAMORA TOTALS					342	2241	123	10	10

NO.	REVISION	BY	DATE
△			
△			
△			

CONSULTANT NAME

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT
ZARZAMORA DRAINAGE PROJECT #39

ZARZAMORA
DRIVEWAY SUMMARY

SHEET 1 OF 2

100% SUBMITTAL | PROJECT NO: 40-00069 | DATE: NOV 2010
DESIGNED: RG | DRAWN: JA | CHECKED: JA | SHEET 14 OF 381

Figure 9-10: Example Driveway Summary Sheet

The sequence of work narrative (Figure 9-11) should contain the following information:

- general notes pertaining to the TCP
- recommended sequencing of construction activities, including all joint-bid utilities
- descriptions of each phase of construction in detail
- exhibit of overall construction phasing
- description of incidental activities

Detour layouts (Figure 9-12) should contain the following:

- map of overall area with a clearly defined project limits, construction area, detour route and street labels
- sign designations and placement locations for the detour route
- arrows representing traffic direction for detour

Traffic control plan phasing layouts (Figure 9-13) should contain the following:

- scaled plan view(s) of the project with a clearly defined area of construction, alignment(s), ROW, existing features, and proposed improvement features to be built during phase
- symbols of representative elements (such as barriers, signing, traffic direction, etc.) with corresponding legend
- typical sections with a clear depiction of travel lanes, construction area, temporary pavement, traffic barriers, elevation differences during excavation, etc.
- any additional notes required for contractor’s information

9.11 Environmental Details

These sheets will typically be scaled at 1" = 20' or 1" = 40' and include the storm water pollution prevention plan (SW3P) layouts; SW3P narrative; environmental permits, issues, and commitments (EPIC) sheet and all applicable standards.

The storm water pollution prevention plan (SW3P) layouts (Figure 9-13) should contain the following information:

- refer to “traffic control phasing layouts” for requirements
- SW3P measures
- runoff directional arrows
- sizing calculations for various SW3P items

- tree protection measures with accompanying details if needed

At the engineer's judgment, the SW3P layouts can be combined with the traffic control plan phasing layouts, if all elements can still be shown without risk of error.

The SW3P narrative (Figure 9-14) should contain the following:

- general site data (project limits and description, sequence of major soil disturbing activities, existing and proposed conditions, receiving waters)
- best management practices (soil stabilization practices, structural practices, storm water management, non-storm water discharges)
- other requirements and practices (maintenance, inspection, waste materials, offsite vehicle tracking, other items)

The environmental permits, issues, and commitments (EPIC) sheet is shown in Figure 9-15.

The requirements for all environmental permits, issues, and commitments should be listed on this sheet and shall be broken down into the following sections:

- Clean Water Act, Section 402;
- Clean Water Act, Sections 401 and 404;
- cultural resources;
- soil/groundwater contamination;
- federal and state endangered species, critical habitats, candidate species, and migratory birds;
- vegetation resources
- aquifer (if present)
- other environmental issues

9.12 Roadway Details

Plan and Profile sheets will be at 1"=40' (Horizontal) and 1"=10' (Vertical). The Consultant can request a change of scale, horizontal or vertical, and obtain approval from city project manager as long as the ratio between the horizontal scale and vertical scale is 4:1. They will include: geometric data sheets, roadway plan/profile sheets, intersection grading plans, driveway grading plans, retaining wall layouts, utility layouts, miscellaneous roadway details, and all applicable standards.

Geometric data sheets (Figure 9-16) should contain horizontal and vertical alignment names and descriptions for all referenced alignments in roadway plans.

Roadway plan and profile sheet (Figure 9-17 and Figure 9-18) information should include: Plan View:

- scaled plan view of the project with alignment(s), ROW, existing features, and proposed improvement features
- legend for both plan and profile view line styles and elements
- match lines defining limits of alignment for plan sheet
- labels for existing properties, streets, addresses, or other areas of interest
- quantity call-out notes for pay items with corresponding quantity box (for LAM projects only)
- arrows designating lane configuration with notes for width and cross slope
- driveway numbering coinciding with driveway summary sheet
- station and offset from centerline notes for all curb returns and transitions
- bearings and horizontal information for all centerlines, including angles between two alignments
- any additional notes required for contractor’s information

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CLARK AVE (FROM FAIR TO SOUTHCROSS)
CSJ: 0915-12-354
SEQUENCE OF WORK NARRATIVE

DETOURS, BARRICADES, WARNING SIGNS AND SEQUENCE OF WORK, ETC.

I. GENERAL

COOPERATE IN THE USE OF THE RIGHT OF WAY WITH THE CITY OF SAN ANTONIO, AND VARIOUS PUBLIC UTILITIES AND THEIR CONTRACTORS, AS MAY BE REQUIRED TO ALLOW ADJUSTMENTS TO BE MADE BY OTHERS.

TRAFFIC MUST BE HANDLED OVER THE ENTIRE PROJECT DURING CONSTRUCTION.

PROVIDE A MINIMUM OF 7 DAYS PRIOR NOTICE OF INTERSECTING STREET CLOSURES SO APPROPRIATE AUTHORITIES CAN BE NOTIFIED.

PROVIDE ACCESS TO ALL ADJACENT PROPERTY THROUGHOUT ALL PHASES OF CONSTRUCTION. ADEQUACY OF ACCESS WILL BE AT THE DISCRETION OF THE ENGINEER.

RESTORE TO ORIGINAL OR BETTER CONDITION ALL DAMAGE DONE TO EXISTING FENCES.

REGULATE ALL CONSTRUCTION TRAFFIC TO MINIMIZE INCONVENIENCE TO THE TRAVELING PUBLIC. AT POINTS WHERE IT IS NECESSARY FOR TRUCKS TO STOP AND UNLOAD, PROVIDE WARNING SIGNS AND/OR FLAGGERS.

A STORM WATER POLLUTION PREVENTION PLAN (SW3P) IS INCLUDED IN THESE CONSTRUCTION DOCUMENTS. INCORPORATE THIS PLAN INTO SEQUENCE OF WORK AS NEEDED WITH THE SCHEDULE OF IMPLEMENTATION OF THESE SW3P MEASURES BEING BASED ON THE SEQUENCE OF SOIL DISTURBING ACTIVITIES. WHEREVER POSSIBLE PRESERVE THE EXISTING VEGETATION. MINIMIZE THE AMOUNT OF DISTURBED GROUND ON THE ENTIRE PROJECT.

II. SEQUENCE OF WORK

PRIOR TO BEGINNING WORK IN ANY SECTION OF THE PROJECT, PLACE ALL ROADSIDE SIGNS ON TEMPORARY SUPPORTS AT AN APPROVED LOCATION AND AS WORK PROGRESSES. INSTALL PROPOSED TRAFFIC SIGNALS (VIVDS)AS WELL AS ONE NEW SIGNAL POLE AT THE INTERSECTION OF SOUTHCROSS AND CLARK AVE.

IN ADDITION, THE FOLLOWING ADJUSTMENTS WILL BE COMPLETED BY OTHERS PRIOR TO CONSTRUCTION:

1. POWER POLES ON BOTH SIDES OF THE ROADWAY MOVED TO ROW.
2. INSTALL TEMPORARY ILLUMINATION, IF ANY.

III. ROADWAY CONSTRUCTION

PERFORM ALL ROAD WORK IN PHASES 1 AND 2 THROUGH THE TYPE C HOT MIX ASPHALT APPLICATION UNDER ONE-WAY TRAFFIC CONTROL AS SHOWN ON DETOUR LAYOUTS. THE WORK WILL BE UNDERTAKEN IN HALF WIDTHS OF THE NEW ROADWAY SECTION. PROVIDE POSITIVE GUIDANCE TO TRAFFIC THROUGH THE WORK AREA, INCLUDING TRAFFIC ENTERING THE WORK AREA FROM INTERSECTING STREETS AND DRIVEWAYS. NOTICES OF DETOURS SHALL BE PLACED AT LEAST 2 WEEKS PRIOR TO ROAD CLOSURES. WHEN ANY PROCESS OF THE WORK IS NOT COMPLETED IN ONE DAY, PROVIDE A TEMPORARY RAMP BETWEEN THE NEW SURFACE AND THE EXISTING ROADWAY SURFACE AT A SLOPE NOT TO EXCEED 8:1 TO ALLOW SAFE PASSAGE OF TRAFFIC DURING NON-WORK PERIODS. THE MATERIAL USED SHALL CONFORM TO ITEM 334 HOT-MIX COLD-LAID ASPHALT CONCRETE PAVEMENT OR MATERIAL APPROVED BY THE ENGINEER. THIS WORK WILL BE SUBSIDARY TO VARIOUS BID ITEMS.

FOR PURPOSES OF CONSTRUCTION-SEQUENCING, THE ROADWORK IS SPLIT INTO DISTINCT AND SEPARATE PHASES AS FOLLOWS:

PHASE 1

PHASE 1 STAGE 1 - CPS GAS MAIN ADJUSTMENTS SHALL BEGIN AT SOUTH LIMIT OF CONSTRUCTION ALONG CLARK AVE. INSTALL SANITARY SEWER LINES "A" AND "B" BETWEEN STATIONS 21+33 - 24+53. MAINTAIN TRAFFIC USING DAILY LANE CLOSURES ACCORDING TO THE DETOUR LAYOUTS FOR PHASE 2, STAGES 1 AND 2 AS NECESSARY.

AS WORK PROGRESSES NORTH TO THE FAIR AVE INTERSECTION, THE PHASE 1 STAGE 1 DETOUR ROUTE SHALL BE IMPLEMENTED TO BEGIN ROADWAY CONSTRUCTION.

CONSTRUCT INTERSECTION OF CLARK AVE & FAIR AVE - CLOSE THE PORTION OF CLARK AVENUE FROM GLOVER TO FAIR AVE. PLACE DETOURS TO ROUTE CLARK AVENUE TRAFFIC FROM HIAWATHA TO KIPLING VIA WALTERS AS SHOWN ON DETOUR LAYOUT SHEETS FOR PHASE 1 - STAGE 1. BEGIN CONSTRUCTION OF IMPROVEMENTS TO FAIR AVENUE, INCLUDING UTILITIES, STORM DRAIN AND ALL ROADWAY ELEMENTS.

AT THE END OF THIS STAGE, THE DETOUR SHALL BE REMOVED AND THE NEXT AREA OF CONSTRUCTION SHALL BEGIN. NO OTHER WORK SHALL BEGIN UNTIL THIS STAGE OF OPERATION IS COMPLETE AS FAIR AVENUE IS CRITICAL TO SUBSEQUENT DETOURS.

PHASE 1 STAGE 2A - CONSTRUCT OUTFALL AT GOLIAD ROAD - CLOSE GOLIAD ROAD AT LYRIC AND DETOUR TRAFFIC VIA CLARK AVENUE. GOLIAD ROAD SHALL BE CLOSED DURING DAYLIGHT HOURS ONLY. NO OVERNIGHT CLOSURE WITH DETOURS SHALL BE ALLOWED. TWO WEEKS PRIOR TO ROAD CLOSURE, CONTRACTOR SHALL PLACE NOTICES OF DETOUR AND NOTIFY VIA OPERATIONS TO ALLOW FOR IMPLEMENTATION OF BUS ROUTE DETOURS.

BEGIN OPERATIONS TO CONSTRUCT THE PROPOSED DRAINAGE OUTFALL STRUCTURE IN THE INTERSECTION. ALL CUTS IN THE ROADWAY SHALL BE BACKFILLED AT THE END OF EACH WORK DAY. IN THE EVENT CONTRACTOR IS UNABLE TO DO THIS, STEEL PLATES WILL BE USED TO COVER THE CUTS OVERNIGHT. ONCE WORK IN THE INTERSECTION IS COMPLETE, CONTRACTOR SHALL OPEN GOLIAD ROAD TO TRAFFIC.

PHASE 1 STAGE 2B - CONSTRUCT OUTFALL ALONG LYRIC - NOTIFY PROPERTY OWNERS ALONG LYRIC AT LEAST TWO DAYS PRIOR TO CONSTRUCTION. PLACE BARRICADES AT BOTH ENDS OF LYRIC AND CLOSE THE ROAD TO TRAFFIC. PROVIDE CONTINUOUS ACCESS TO PROPERTIES ALONG LYRIC DURING PERIODS OF NON-WORK. CONTRACTOR SHALL PLACE STEEL PLATES TO COVER ANY OPEN CUTS IN THE ROADWAY AT THE END OF THE WORK DAY.

PHASE 2

PHASE 2 STAGE 1 - RECONSTRUCT CLARK AVENUE (WEST SIDE) - DETOUR SOUTHBOUND CLARK AVE TRAFFIC TO GOLIAD ROAD AS SHOWN ON DETOUR LAYOUT SHEET. PROVIDE A 10 FT WIDE (MINIMUM) TRAVEL LANE ALONG CLARK AVE FOR NORTHBOUND TRAFFIC FROM SOUTHCROSS AVE TO GLOVER. SEE TRAFFIC CONTROL PLAN TYPICAL SECTIONS. CONTRACTOR SHALL MAINTAIN ACCESS TO ALL BUSINESSES AND RESIDENTIAL DRIVEWAYS DURING CONSTRUCTION.

ALL GAS LINES, WATER AND SEWER FACILITIES, DRAINAGE STRUCTURES, SIDEWALKS, VARIOUS CURBS AND DRIVEWAYS SHALL BE CONSTRUCTED ALONG THE WEST SIDE OF CLARK AVENUE AND EACH INTERSECTING STREET. STORM DRAIN LATERALS SHALL BE CONSTRUCTED IN TWO SECTIONS. CONSTRUCT DOWNSTREAM SECTION OF LATERAL TO A MINIMUM OF 2 FEET BEYOND THE CENTER OF ROADWAY AND STUB OUT. USE FLOWABLE FILL AS BACKFILL AROUND THE STUB OUT AREA AS SHOWN ON THE TRAFFIC CONTROL PLAN LAYOUT SHEETS. THIS WORK WILL BE CONSIDERED SUBSIDARY TO VARIOUS BID ITEMS.

CONSTRUCT THE WEST SIDE OF CLARK AVE AND INTERSECTING STREETS TO THE TYPE C HOT MIX ASPHALT. CONSTRUCT INTERSECTING STREETS IN HALF-WIDTHS WHEN POSSIBLE. CONTRACTOR SHALL NOT PERFORM OPERATIONS ON TWO CONSECUTIVE INTERSECTIONS SIMULTANEOUSLY, WITH THE EXCEPTION OF KASHMUIR AND MCDOUGAL AVENUES. RECONSTRUCTION OF KASHMUIR AND MCDOUGAL AVENUES SHALL BE PERFORMED AT THE END OF STAGE 1. ALL OPERATIONS SHALL BE COMPLETED AS TO ALLOW ACCESS TO PROPERTIES AT THE END OF EACH WORKING DAY. DAILY CLOSURES WILL BE ALLOWED TO RECONSTRUCT INTERSECTIONS WHEN HALF-WIDTH CONSTRUCTION IS NOT POSSIBLE.

PHASE 2 STAGE 2 - RECONSTRUCT CLARK AVENUE (EAST SIDE). DETOUR NORTHBOUND CLARK AVE TRAFFIC TO GOLIAD ROAD, AS SHOWN ON DETOUR LAYOUT SHEET. CONTRACTOR SHALL MOVE ALL BARRICADES AND BARRIERS TO RECONFIGURE THE TRAVEL LANE ALONG CLARK AVE FOR SOUTHBOUND TRAVEL. SEE TRAFFIC CONTROL PLAN TYPICAL SECTIONS.

CONSTRUCT THE EAST SIDE OF CLARK AVE AND INTERSECTING STREETS TO THE TYPE C HOT MIX ASPHALT. ALL GAS LINES, WATER AND SEWER FACILITIES, DRAINAGE STRUCTURES, SIDEWALKS, VARIOUS CURBS AND DRIVEWAYS SHALL BE CONSTRUCTED ALONG THE EAST SIDE OF CLARK AVENUE AND EACH INTERSECTING STREET. CONSTRUCT UPSTREAM SECTION OF STORM DRAIN LATERAL AND TIE-IN AT STUB OUT (SEE PHASE 2 - STAGE 1).

CONSTRUCT INTERSECTING STREETS IN HALF-WIDTHS AS PROPOSED GRADE/PROFILE ALLOWS. CONTRACTOR SHALL NOT PERFORM OPERATIONS ON TWO CONSECUTIVE INTERSECTIONS SIMULTANEOUSLY. ALL OPERATIONS SHALL BE COMPLETED AS TO ALLOW ACCESS TO PROPERTIES AT THE END OF EACH WORKING DAY.

PHASE 3

PHASE 3 - FINAL OVERLAY OF CLARK AVENUE. APPLY FINAL SURFACE ALONG CLARK AVE IN HALF WIDTHS. MILL 2 INCHES OFF THE EXISTING SURFACE AT THE GLOVER/CLARK INTERSECTION TO ACCOMMODATE THE NEW OVERLAY DURING THESE OPERATIONS. PLACE PERMANENT STRIPING AND RAISED PAVEMENT MARKINGS IN ACCORDANCE WITH THE GOVERNING SPECIFICATIONS. ALL MARKER TABS INCLUDING THOSE USED AS GUIDE MARKS SHALL BE REMOVED.

IV. ROADSIDE SIGN RELOCATION/INSTALLATION

AS THE WORK PROGRESSES, SET THE EXISTING SIGNS ON TEMPORARY SUPPORTS AND WHEN ALL GRADING AND ROADWORK HAS BEEN PERFORMED IN THE AREA OF THE NEW SIGNS, INSTALL THE NEW SIGNS AT THE LOCATIONS SHOWN ON THE SIGNING LAYOUT SHEETS. PROVIDE NEW FOUNDATIONS,POSTS AND HARDWARE FOR ALL SIGNS. ALL EXISTING POSTS, FOUNDATIONS AND HARDWARE WILL BE DISPOSED OF IN AN APPROVED MANNER. ANY SIGNS TO BE REMOVED WILL REMAIN THE PROPERTY OF THE CITY. STOCKPILE THE REMOVED SIGNS IN AN APPROVED LOCATION. REPLACE ANY SIGNS DAMAGED BY THE CONSTRUCTION ACTIVITIES.

V. FINAL CLEANUP

REMOVE ALL SURPLUS MATERIALS FROM THE PROJECT. SOD ALL AREAS REQUIRING REVEGETATION IN ACCORDANCE WITH THE PLANS. COMPLETE ALL LANDSCAPE MAINTENANCE AND INSPECTION PERIODS FOR TRAFFIC SIGNALS. COMPLETE FINAL INSPECTION ITEMS AND CLEANUP.

VI. PAYMENT

UNLESS OTHERWISE INDICATED ON THE PLANS OR SPECIFICATIONS, ALL WORK AND MATERIALS REQUIRED BY THESE PROVISIONS ARE NOT PAID FOR DIRECTLY, BUT CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS FOR THIS CONTRACT.

SEAL

CONSULTANT NAME
STREET NUMBER AND ADDRESS
CITY STATE ZIP CODE
TELEPHONE NUMBER FAX NUMBER INTERNET ADDRESS

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT
CLARK AVE
SEQUENCE OF WORK NARRATIVE
CLARK AVE

% SUBMITTAL | PROJECT NO. | DATE:
DRWN BY: | DSGN. BY: | CHKD BY: | SHEET NO. OF

Figure 9-11: Example Sequence of Work Narrative

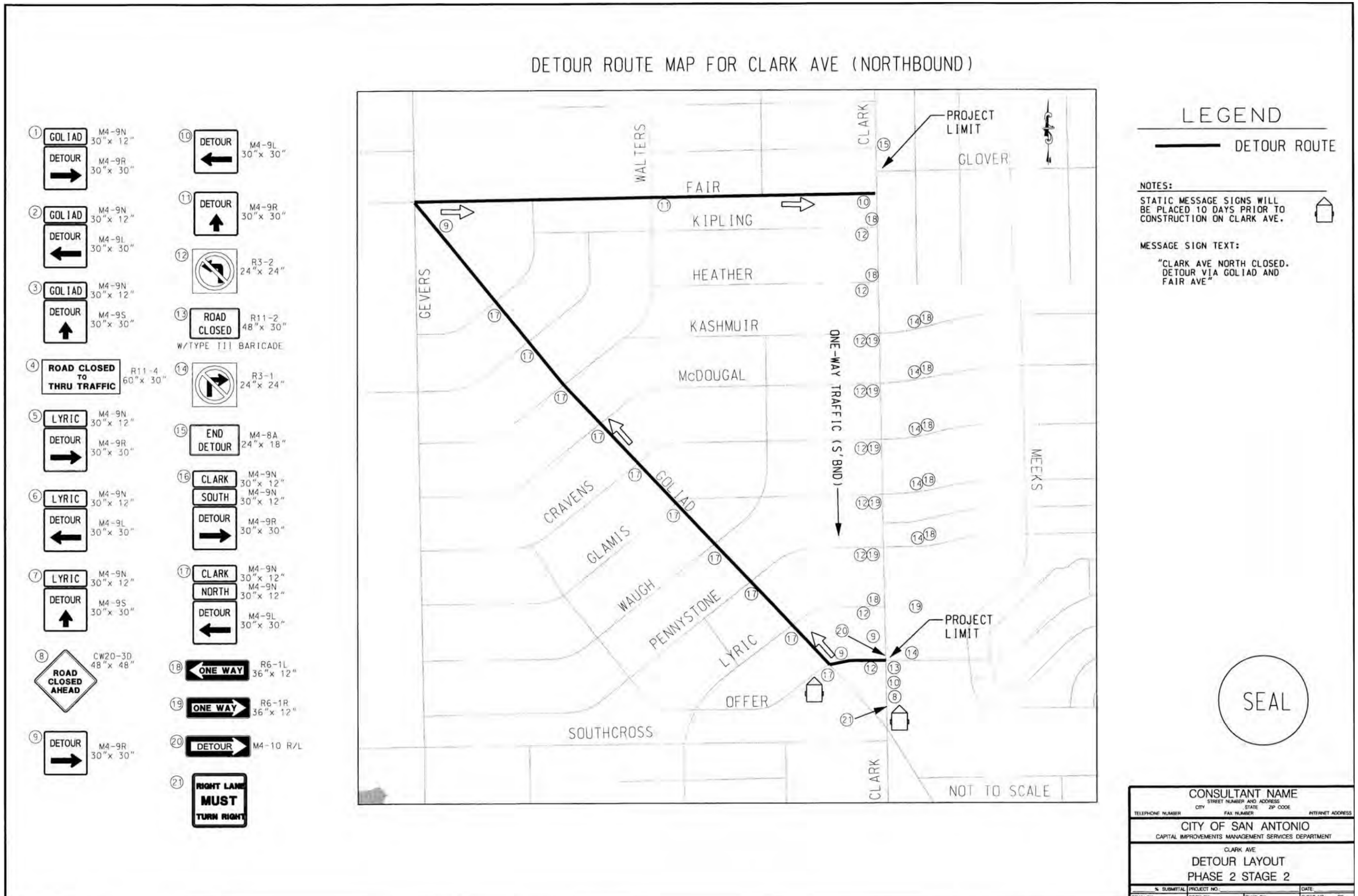


Figure 9-12: Example Detour Layouts

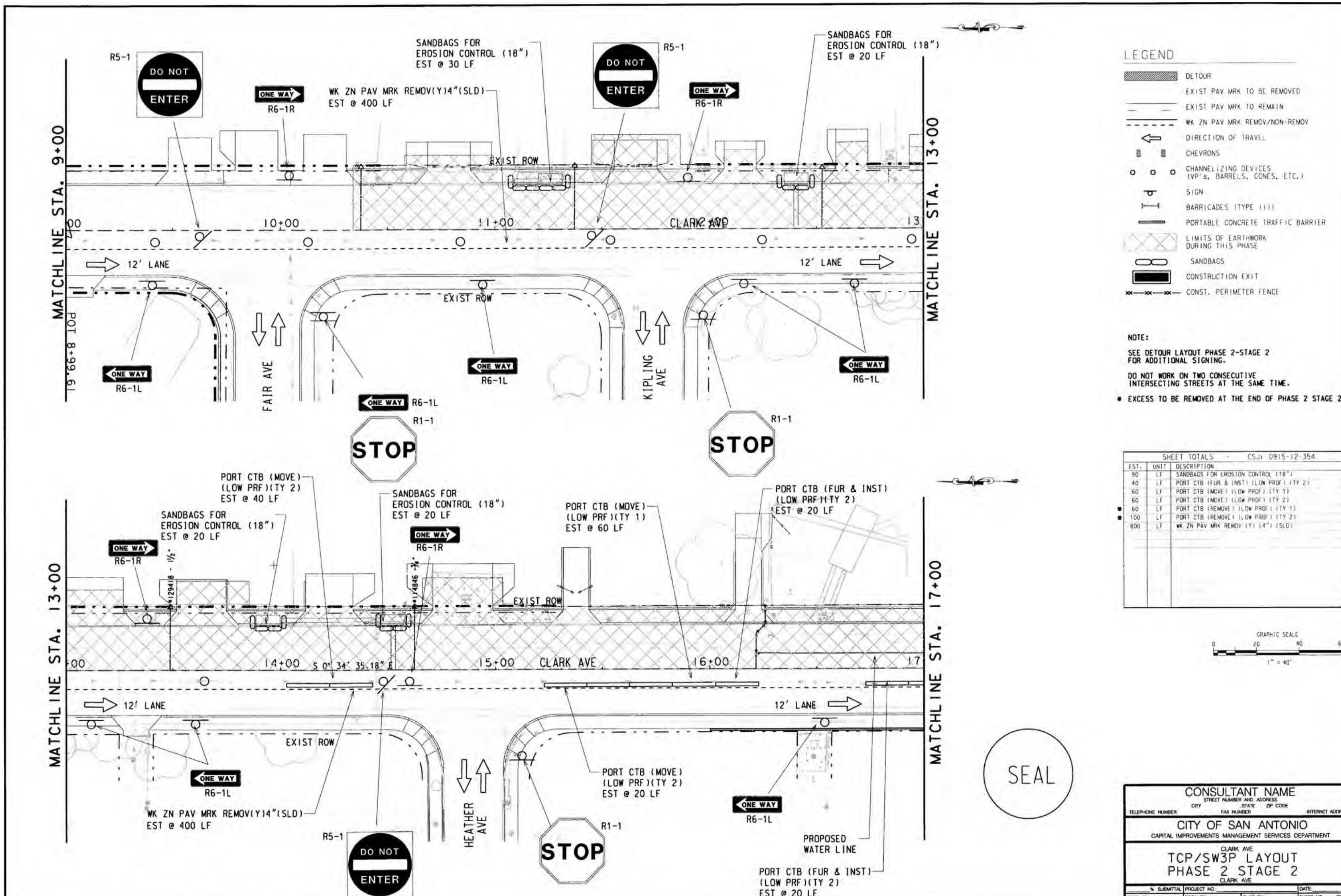


Figure 9-13: Example Traffic Control Plan / SW3P Phasing Layouts

A. GENERAL SITE DATA

1. PROJECT LIMITS: From Fair Ave to E.Southcross

2. PROJECT SITE MAPS:
   - Project Latitude N 29-22.79-83 Project Longitude W 98-26.87-82
   - Project Location Map: Shown on Title Sheet
   - Drainage Patterns: Shown on Drainage Area Maps (Sheets 131-134)
   - Approx. Slopes Anticipated After Major Gradings and Areas of Soil Disturbance: Shown on Typical Sections (Sheets 5-6)
   - Major Controls and Locations of Stabilization Practices: Shown on SW3P Sheets (Sheets 23-34)
   - 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 (Sheets 138-146)

3. PROJECT DESCRIPTION: Rehab & Widen Narrow Pavement (Curbs,Sdwlk & Drainage)
   - Joint-bid utilities are covered by this SW3P (Sheets 23-34)

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
   ___ Extensive ditch grading
   ___ Upgrading or replacing culverts or bridges
   ___ Temporary detour road(s)
   X Other: Storm Drainage System Construction

5. EXISTING AND PROPOSED CONDITIONS:

   Description of existing vegetative cover: (Provide type and description of vegetative cover)
   Percentage of existing vegetative cover: (Provide percentage)
   Existing vegetative cover: (mark one) X Thick or uniformly established / ___ Thin and Patchy / ___ None or minimal cover
   Description of soils: (Provide classification and description of soils)
   Site Acreage: 4.0 Acreage disturbed: 3.95
   Site runoff coefficient (pre-construction): 78.5 Site runoff coefficient (post-construction): 86.0

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: San Antonio River

   X USACE Wetlands are not located on project.
   ___ USACE Wetlands are present. Contractor shall not disturb without specific authorization.
   Location/Plan Sheet Info.: ______

   X Project is not on Edwards Aquifer Recharge Zone or Contributing Zone.
   ___ Project is on Edwards Aquifer Recharge Zone.
   ___ Project is on Edwards Aquifer Contributing Zone.

   X No Water Pollution Abatement Plan or Contributing Zone Plan required.
   ___ A Water Pollution Abatement Plan or Contributing Zone Plan applies to project.

   Site is in a Municipal Seperate Storm Sewer System (MS4).
   MS4 Operator (name): San Antonio Water System

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

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

   ___ SILT FENCES
   ___ HAY BALES
   ___ 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
   ___ VELOCITY CONTROL DEVICES
   T OTHER: (SANDBAGS)

NOTE: SEE SHEETS NO. 23-34 FOR TCP/SW3P LAYOUTS

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 to 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.
   ___ The design includes provisions for permanent erosion controls provided by strategically placed pervious and impervious surfaces.
   ___ Project includes permanent sedimentation controls (other than grass).
   ___ Velocities do not require dissipation devices.
   ___ 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. Condensation from air conditioners.
   6. Uncontaminated groundwater,spring water or accumulated stormwater.
   7. Foundation or footing drains where flows are not contaminated with process materials such as solvents.
   8. 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 wash-out locations must be shown on the SW3P Layout and included in the inspections.

   Hazardous material spill/leak discharges of hazardous substances shall be prevented or minimized. At a minimum,this includes asphalt products,fuels,oils,lubricants,solvents,paints,acids,concrete curing compounds and additives and chemical additives for soil stabilization. BMPs shall be implemented to the storage areas of these products. All spills must be cleaned up by the Contractor, disposed properly and reported to the Engineer. The Contractor is to immediately 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 inspectionAn 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.

SEAL

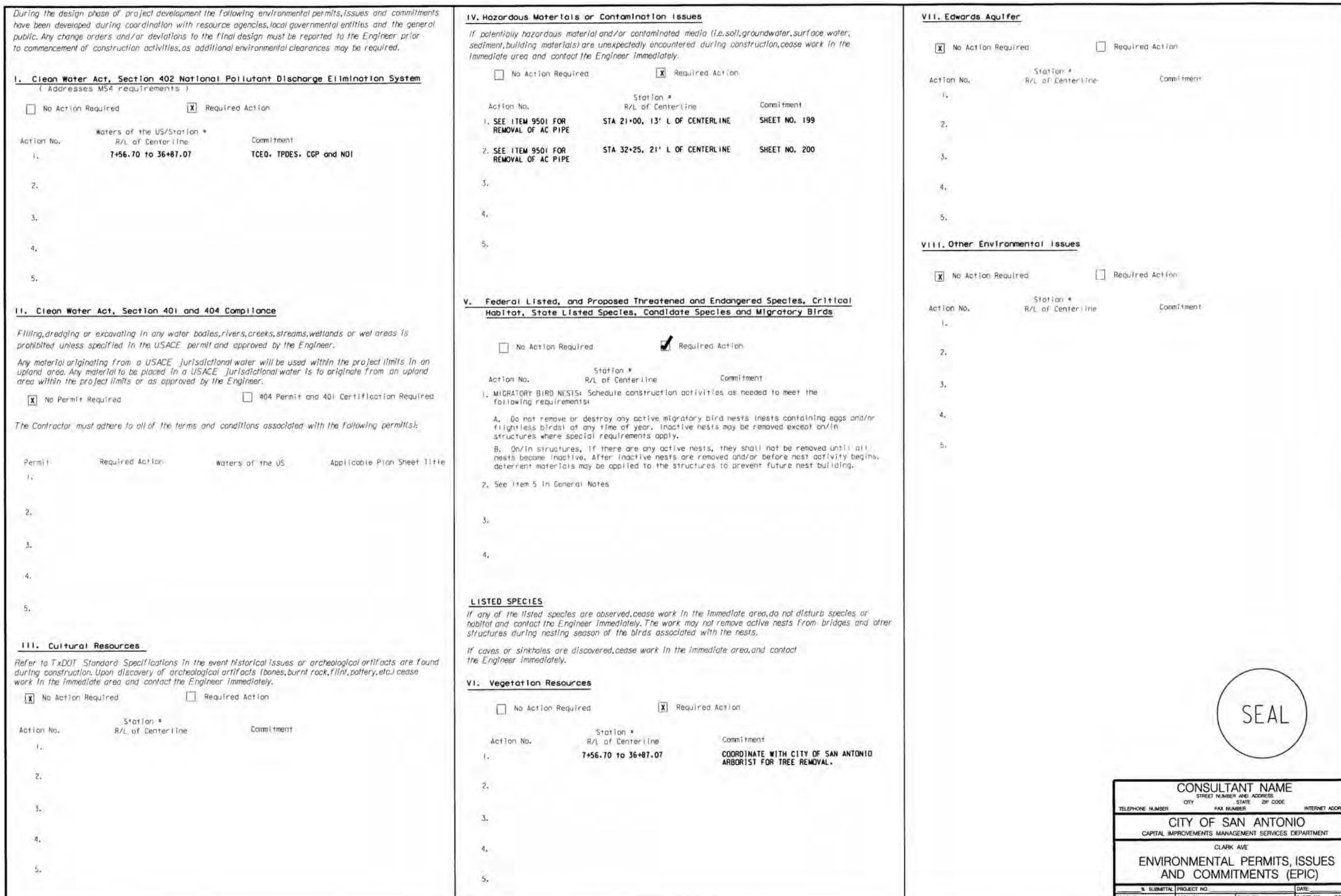
CONSULTANT NAME
STREET NUMBER AND ADDRESS
CITY STATE ZIP CODE
TELEPHONE NUMBER FAX NUMBER INTERNET ADDRESS

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

CLARK AVE
STORM WATER POLLUTION PREVENTION PLAN (SW3P)
CLARK AVE

___ % SUBMITTAL	PROJECT NO.		DATE:
DRWN. BY:	DSGN. BY:	CHKD. BY:	SHEET NO. OF

Figure 9-14: Example SW3P Narrative



During the design phase of project development the following environmental permits,issues and commitments have been developed during coordination with resource agencies,local governmental entities and the general public. Any change orders and/or deviations to the final design must be reported to the Engineer prior to commencement of construction activities,as additional environmental clearances may be required.

I. Clean Water Act, Section 402 National Pollutant Discharge Elimination System
(Addresses MS4 requirements)

☐ No Action Required [X] Required Action

Action No.	Waters of the US/Station * R/L of Centerline	Commitment
1.	7+56.70 to 36+87.07	TCEQ. TPDES. CGP and NOI
2.		
3.		
4.		
5.		

II. Clean Water Act, Section 401 and 404 Compliance

Filling,dredging or excavating in any water bodies,rivers,creeks,streams,wetlands or wet areas is prohibited unless specified in the USACE permit and approved by the Engineer.

Any material originating from a USACE jurisdictional water will be used within the project limits in an upland area. Any material to be placed in a USACE jurisdictional water is to originate from an upland area within the project limits or as approved by the Engineer.

[X] No Permit Required ☐ 404 Permit and 401 Certification Required

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

Permit	Required Action	Waters of the US	Applicable Plan Sheet Title
1.			
2.			
3.			
4.			
5.			

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.

[X] No Action Required ☐ Required Action

Action No.	Station * R/L of Centerline	Commitment
1.		
2.		
3.		
4.		
5.		

IV. Hazardous Materials or Contamination Issues

If potentially hazardous material and/or contaminated media (i.e.soil,groundwater,surface water, sediment,building materials) are unexpectedly encountered during construction,cease work in the immediate area and contact the Engineer immediately.

☐ No Action Required [X] Required Action

Action No.	Station * R/L of Centerline	Commitment
1. SEE ITEM 9501 FOR REMOVAL OF AC PIPE	STA 21+00, 13' L OF CENTERLINE	SHEET NO. 199
2. SEE ITEM 9501 FOR REMOVAL OF AC PIPE	STA 32+25, 21' L OF CENTERLINE	SHEET NO. 200
3.		
4.		
5.		

V. Federal Listed, and Proposed Threatened and Endangered Species, Critical Habitat, State Listed Species, Candidate Species and Migratory Birds

☐ No Action Required ✔ Required Action

Action No.	Station * R/L of Centerline	Commitment

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. Inactive nests may be removed except on/in structures where special requirements apply.

   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.

4.

LISTED SPECIES

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. Vegetation Resources

☐ No Action Required [X] Required Action

Action No.	Station * R/L of Centerline	Commitment
1.	7+56.70 to 36+87.07	COORDINATE WITH CITY OF SAN ANTONIO ARBORIST FOR TREE REMOVAL.
2.		
3.		
4.		
5.		

VII. Edwards Aquifer

[X] No Action Required ☐ Required Action

Action No.	Station * R/L of Centerline	Commitment
1.		
2.		
3.		
4.		
5.		

VIII. Other Environmental Issues

[X] No Action Required ☐ Required Action

Action No.	Station * R/L of Centerline	Commitment
1.		
2.		
3.		
4.		
5.		

SEAL

CONSULTANT NAME
STREET NUMBER AND ADDRESS
CITY STATE ZIP CODE
TELEPHONE NUMBER FAX NUMBER INTERNET ADDRESS

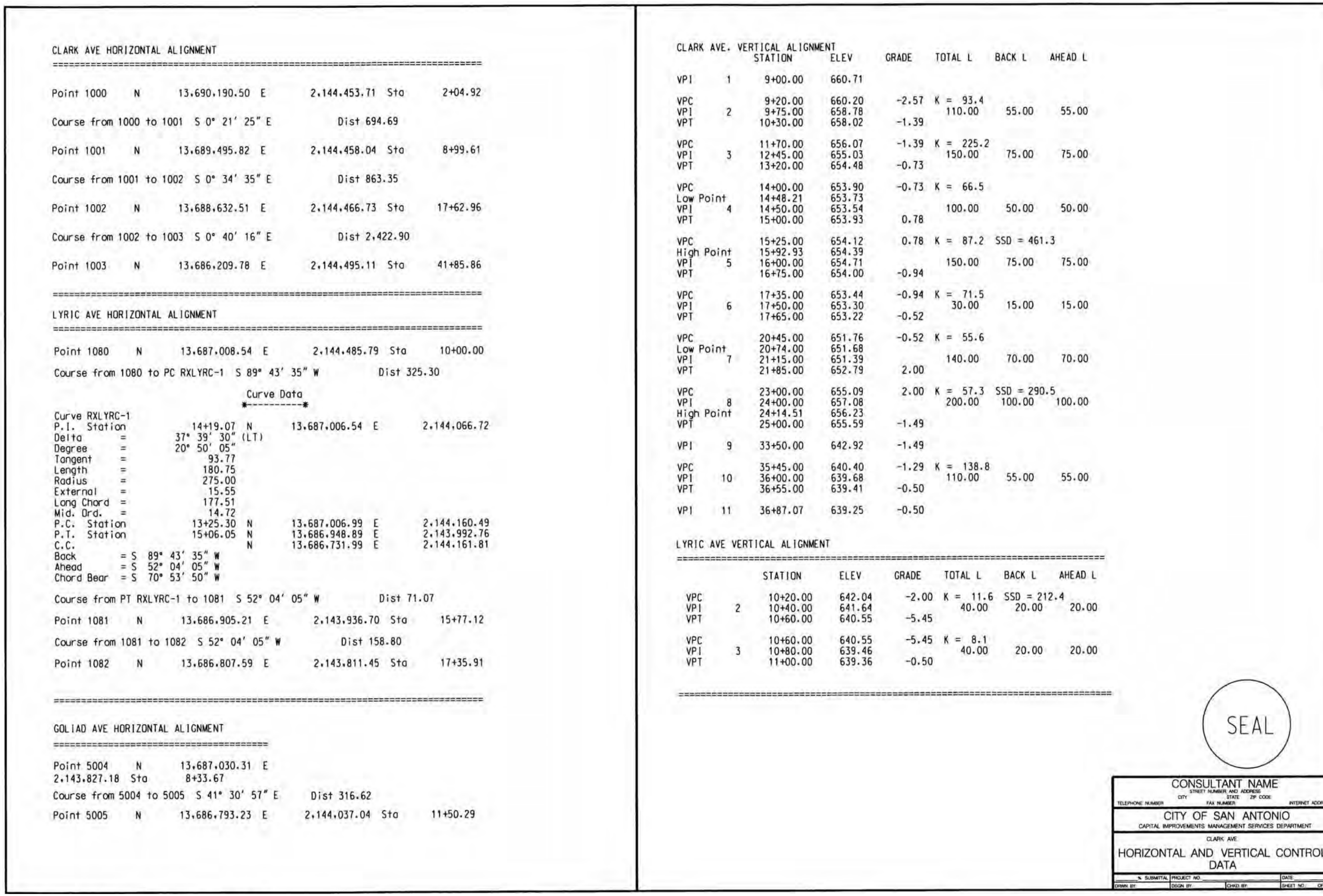
CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

CLARK AVE

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

____% SUBMITTAL	PROJECT NO.		DATE:
DRWN. BY:	DSGN. BY:	CHKD. BY:	SHEET NO. OF

Figure 9-15: Example Environmental Permits, Issues, and Commitments (EPIC) Sheet



CLARK AVE HORIZONTAL ALIGNMENT

Point 1000 N 13,690,190.50 E 2,144,453.71 Sta 2+04.92

Course from 1000 to 1001 S 0° 21′ 25″ E Dist 694.69

Point 1001 N 13,689,495.82 E 2,144,458.04 Sta 8+99.61

Course from 1001 to 1002 S 0° 34′ 35″ E Dist 863.35

Point 1002 N 13,688,632.51 E 2,144,466.73 Sta 17+62.96

Course from 1002 to 1003 S 0° 40′ 16″ E Dist 2,422.90

Point 1003 N 13,686,209.78 E 2,144,495.11 Sta 41+85.86

LYRIC AVE HORIZONTAL ALIGNMENT

Point 1080 N 13,687,008.54 E 2,144,485.79 Sta 10+00.00

Course from 1080 to PC RXLYRC-1 S 89° 43′ 35″ W Dist 325.30

Curve Data

Curve RXLYRC-1				
P.I. Station		14+19.07 N	13,687,006.54 E	2,144,066.72
Delta	=	37° 39′ 30″ (LT)		
Degree	=	20° 50′ 05″		
Tangent	=	93.77		
Length	=	180.75		
Radius	=	275.00		
External	=	15.55		
Long Chord	=	177.51		
Mid. Ord.	=	14.72		
P.C. Station		13+25.30 N	13,687,006.99 E	2,144,160.49
P.T. Station		15+06.05 N	13,686,948.89 E	2,143,992.76
C.C.		N	13,686,731.99 E	2,144,161.81
Back	=	S 89° 43′ 35″ W		
Ahead	=	S 52° 04′ 05″ W		
Chord Bear	=	S 70° 53′ 50″ W		

Course from PT RXLYRC-1 to 1081 S 52° 04′ 05″ W Dist 71.07

Point 1081 N 13,686,905.21 E 2,143,936.70 Sta 15+77.12

Course from 1081 to 1082 S 52° 04′ 05″ W Dist 158.80

Point 1082 N 13,686,807.59 E 2,143,811.45 Sta 17+35.91

GOLIAD AVE HORIZONTAL ALIGNMENT

Point 5004 N 13,687,030.31 E
2,143,827.18 Sta 8+33.67

Course from 5004 to 5005 S 41° 30′ 57″ E Dist 316.62

Point 5005 N 13,686,793.23 E 2,144,037.04 Sta 11+50.29

CLARK AVE. VERTICAL ALIGNMENT

		STATION	ELEV	GRADE	TOTAL L	BACK L	AHEAD L
VPI	1	9+00.00	660.71				
VPC		9+20.00	660.20	-2.57	K = 93.4		
VPI	2	9+75.00	658.78		110.00	55.00	55.00
VPT		10+30.00	658.02	-1.39			
VPC		11+70.00	656.07	-1.39	K = 225.2		
VPI	3	12+45.00	655.03		150.00	75.00	75.00
VPT		13+20.00	654.48	-0.73			
VPC		14+00.00	653.90	-0.73	K = 66.5		
Low Point		14+48.21	653.73				
VPI	4	14+50.00	653.54		100.00	50.00	50.00
VPT		15+00.00	653.93	0.78			
VPC		15+25.00	654.12	0.78	K = 87.2	SSD = 461.3	
High Point		15+92.93	654.39				
VPI	5	16+00.00	654.71		150.00	75.00	75.00
VPT		16+75.00	654.00	-0.94			
VPC		17+35.00	653.44	-0.94	K = 71.5		
VPI	6	17+50.00	653.30		30.00	15.00	15.00
VPT		17+65.00	653.22	-0.52			
VPC		20+45.00	651.76	-0.52	K = 55.6		
Low Point		20+74.00	651.68				
VPI	7	21+15.00	651.39		140.00	70.00	70.00
VPT		21+85.00	652.79	2.00			
VPC		23+00.00	655.09	2.00	K = 57.3	SSD = 290.5	
VPI	8	24+00.00	657.08		200.00	100.00	100.00
High Point		24+14.51	656.23				
VPT		25+00.00	655.59	-1.49			
VPI	9	33+50.00	642.92	-1.49			
VPC		35+45.00	640.40	-1.29	K = 138.8		
VPI	10	36+00.00	639.68		110.00	55.00	55.00
VPT		36+55.00	639.41	-0.50			
VPI	11	36+87.07	639.25	-0.50			

LYRIC AVE VERTICAL ALIGNMENT

		STATION	ELEV	GRADE	TOTAL L	BACK L	AHEAD L
VPC		10+20.00	642.04	-2.00	K = 11.6	SSD = 212.4	
VPI	2	10+40.00	641.64		40.00	20.00	20.00
VPT		10+60.00	640.55	-5.45			
VPC		10+60.00	640.55	-5.45	K = 8.1		
VPI	3	10+80.00	639.46		40.00	20.00	20.00
VPT		11+00.00	639.36	-0.50			

SEAL

CONSULTANT NAME
STREET NUMBER AND ADDRESS
CITY STATE ZIP CODE
TELEPHONE NUMBER FAX NUMBER INTERNET ADDRESS

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

CLARK AVE
HORIZONTAL AND VERTICAL CONTROL DATA

____% SUBMITTAL PROJECT NO.____ DATE:____
DRWN BY: DSGN BY: CHKD BY: SHEET NO.: OF

Figure 9-16: Example Geometric Data Sheets

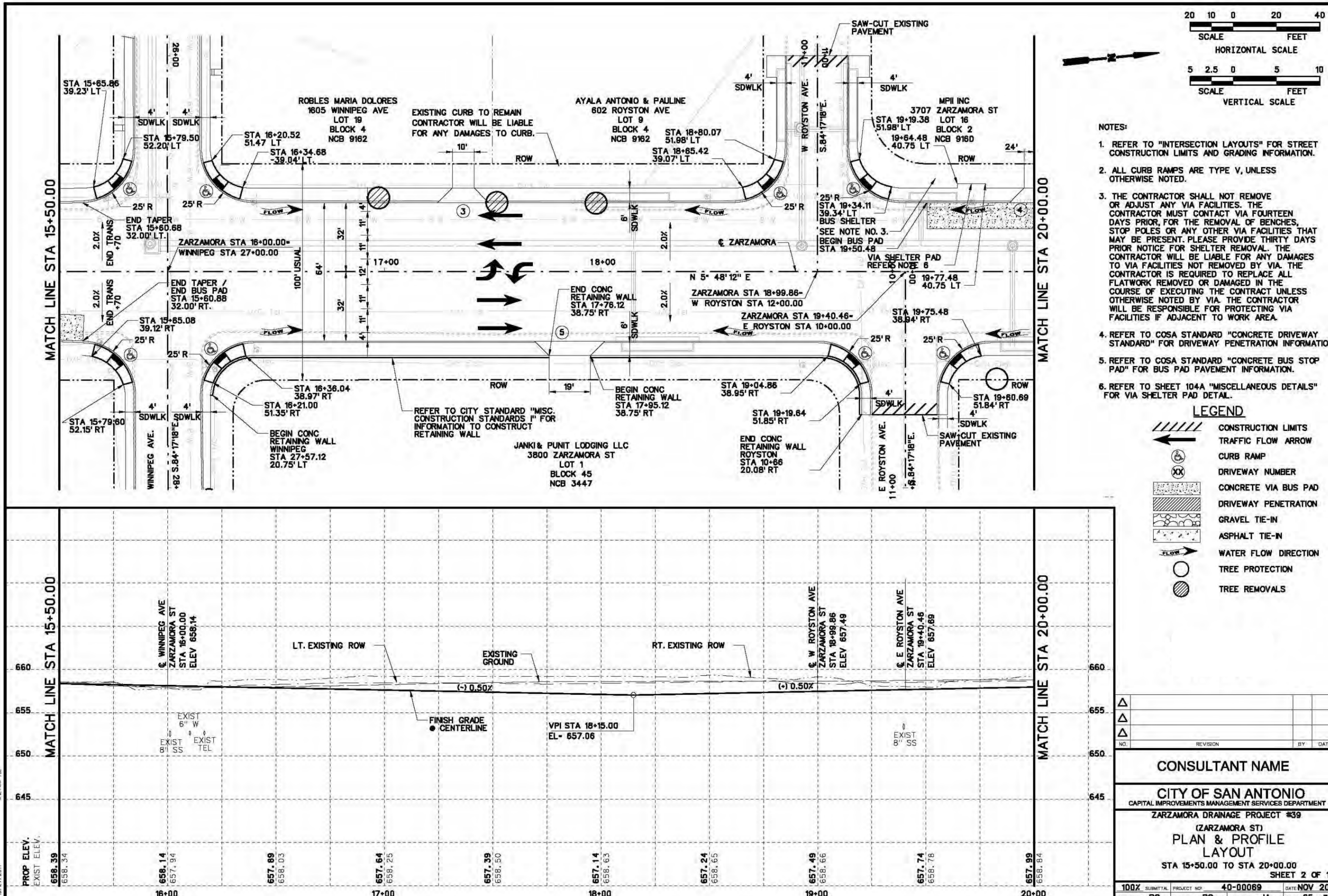


Figure 9-17: Example Roadway Plan Sheet

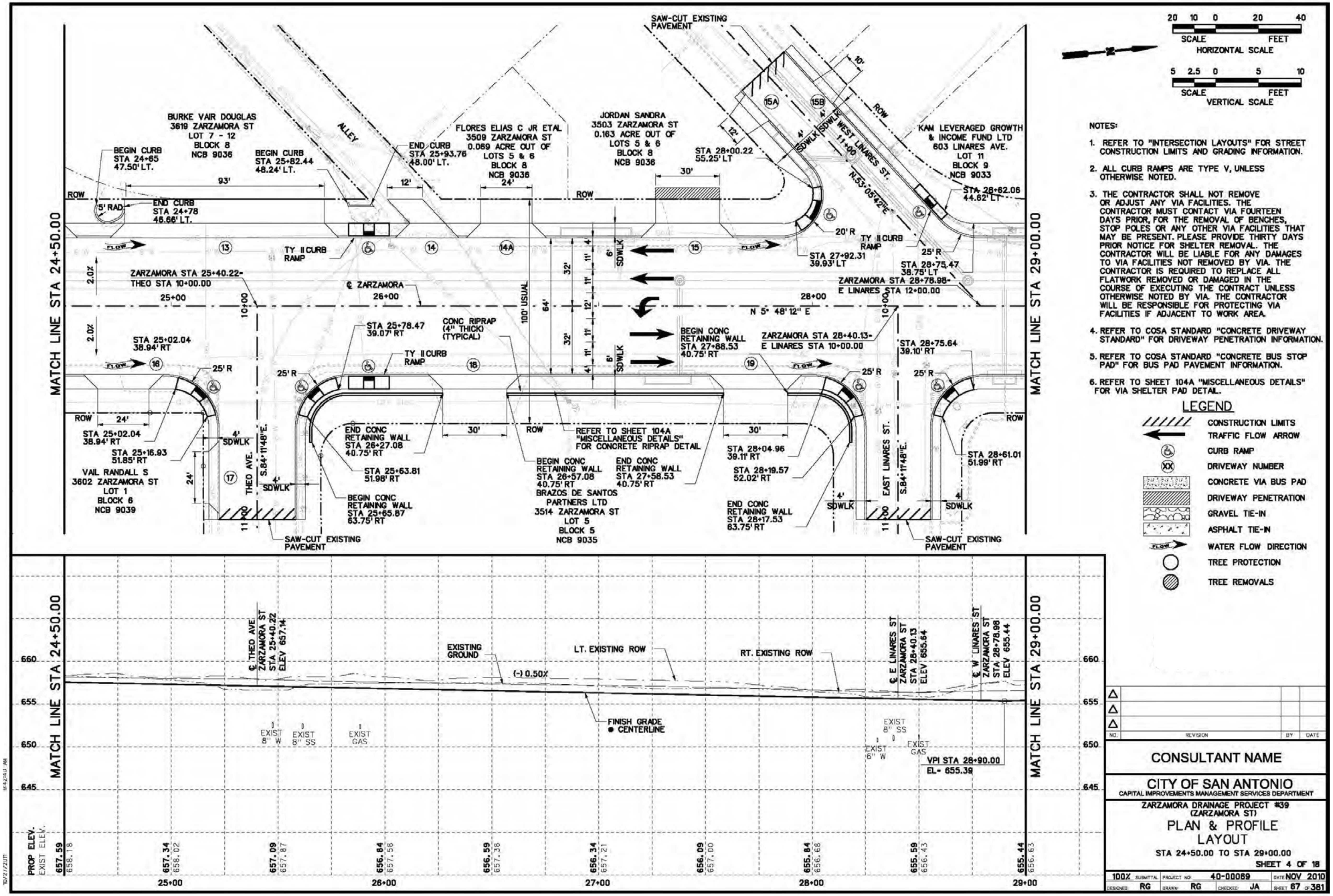


Figure 9-18: Example Profile Sheet

Profile View:

- scaled 1" = 10' profile view of the proposed roadway, showing proposed profile(s), existing ground profiles, and ROW and centerline of roadway
- elevations of existing centerline and proposed top of curbs. Consultant may substitute top of curbs elevations with proposed centerline elevations with approval of City's project manager
- stations and elevations along lowest horizontal and grid line
- vertical data notation, including vertical points of intersection and tangency, vertical curve data, profile grade values, etc.
- horizontal and vertical grid lines at incremental spacings based on sheet scale

Retaining wall layouts will require the following information:

- scaled plan view of the project with alignment(s), ROW, existing features, and proposed improvement features
- legend for both plan and profile view line styles and elements
- match lines defining limits of alignment for plan sheet
- beginning and end station notes for retaining wall(s), including offset from alignment
- scaled profile view of the proposed roadway, showing proposed top of wall, bottom of wall profiles, and existing ground profiles or finished grade at wall
- stations and elevations
- notes at points of interest (beginning, end, angle points, etc.) with station and elevation
- horizontal and vertical grid lines at incremental spacing based on sheet scale; and
- typical retaining wall section with labels designating points of control on wall.

Utility layout sheets should contain information as noted in Section 5.0, Utility Coordination, and include the following:

- scaled plan view of the project with alignment(s), ROW, existing features, and proposed improvement features
- proposed and existing utility files with clearly labeled lines and mains
- legend for plan view line styles and elements

Miscellaneous roadway details will contain in-depth construction drawings, guidelines, and instructions on specific elements of interest for the project. These drawings do not have to be to scale, but must contain a set unit of measurement.

9.13 Drainage Details

Drainage details will include drainage area map, interior drainage map, hydraulic computations, storm drain plan and profile sheets, drainage cross sections, miscellaneous drainage details, and all applicable standards. Refer to Section 4.0, Drainage, and storm water pollution prevention plans for further drawing requirements and examples regarding drainage.

Signing and Pavement Marking Details

Signing and pavement marking details will be scaled at 1" = 20' or 1" = 40' and will include pavement marking layouts, signing layouts, signing details, special sign details, and all applicable standards. Pavement marking layouts (Figure 9-19) should contain the following:

- scaled plan view(s) of proposed pavement marking configurations
- symbols of representative elements (such as lanes, cross walks, etc.) with corresponding legend
- any additional notes required for contractor’s information
- station call-outs for beginning and ending of transitions, tapers, etc.

9.14 Signing layouts should contain the following:

- scaled plan view(s) of proposed signing locations with station call-outs
- symbols of representative elements (such as signs, delineators, etc.) with corresponding legend
- •any additional notes required for contractor’s information

At the engineer’s judgment, pavement markings and signing layouts can be combined, provided all elements can still be shown without risk of error.

Signing and special sign details will contain in-depth information for mounting, bracketing, guidelines, and instructions on specific lettering and numbering for project signs. These drawings do not have to be to scale, but must contain a defined unit of measurement.

9.15 Traffic Details

Typical traffic details will be scaled at 1" = 20' or 1" = 40' and include traffic signal layouts, wiring/conduit layouts, traffic signal details, illumination layouts, and all applicable standards. Traffic signal layouts (Figure 9-20) should contain the following information:

- scaled plan view of area with alignment(s), ROW, existing features, and proposed improvement features;
- legend for plan view line styles and elements, traffic elements, etc.
- match lines defining limits of interest for plan sheet or separation of intersection if needed
- labels for existing properties, streets or other areas of interest, phases, poles, proposed and existing signing, etc.
- quantity call-out notes for pay items with corresponding quantity box
- arrows designating traffic movements
- phasing diagram with both vehicular and pedestrian movement
- flash sequence diagram
- any additional notes for contractor, including contact personnel

Wiring/conduit layouts (Figure 9-21) should contain the following information:

- scaled plan view of identical area as shown in corresponding traffic signal layout
- labels for existing properties, streets or other areas of interest, phases, poles, proposed and existing signing, etc.
- conduit and conductor schedule in tabular format
- pole schedule in tabular format
- ductbank details, if required

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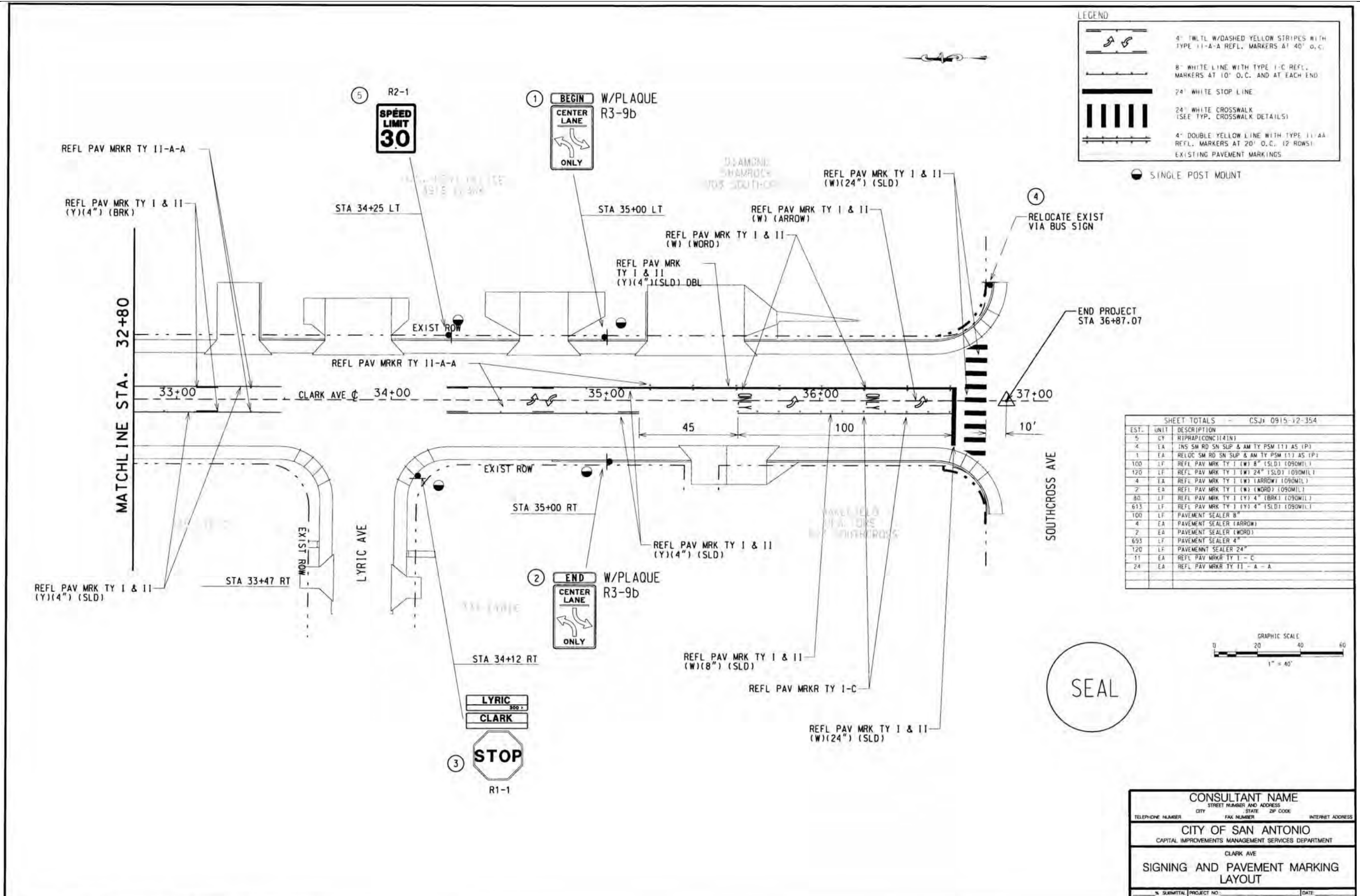


SHEET TOTALS - CSJ: 0915-12-354

EST.	UNIT	DESCRIPTION
5	CY	RIPRAP(CONC)(4IN)
4	EA	INS SM RD SN SUP & AM TY PSM (1) AS (P)
1	EA	RELOC SM RD SN SUP & AM TY PSM (1) AS (P)
100	LF	REFL PAV MRK TY I (W) 8" (SLD) (090MIL)
120	LF	REFL PAV MRK TY I (W) 24" (SLD) (090MIL)
4	EA	REFL PAV MRK TY I (W) (ARROW) (090MIL)
2	EA	REFL PAV MRK TY I (W) (WORD) (090MIL)
80	LF	REFL PAV MRK TY I (Y) 4" (BRK) (090MIL)
613	LF	REFL PAV MRK TY I (Y) 4" (SLD) (090MIL)
100	LF	PAVEMENT SEALER 8"
4	EA	PAVEMENT SEALER (ARROW)
2	EA	PAVEMENT SEALER (WORD)
693	LF	PAVEMENT SEALER 4"
120	LF	PAVEMENNT SEALER 24"
11	EA	REFL PAV MRKR TY I - C
24	EA	REFL PAV MRKR TY II - A - A

Figure 9-19: Example Pavement Marking Layouts

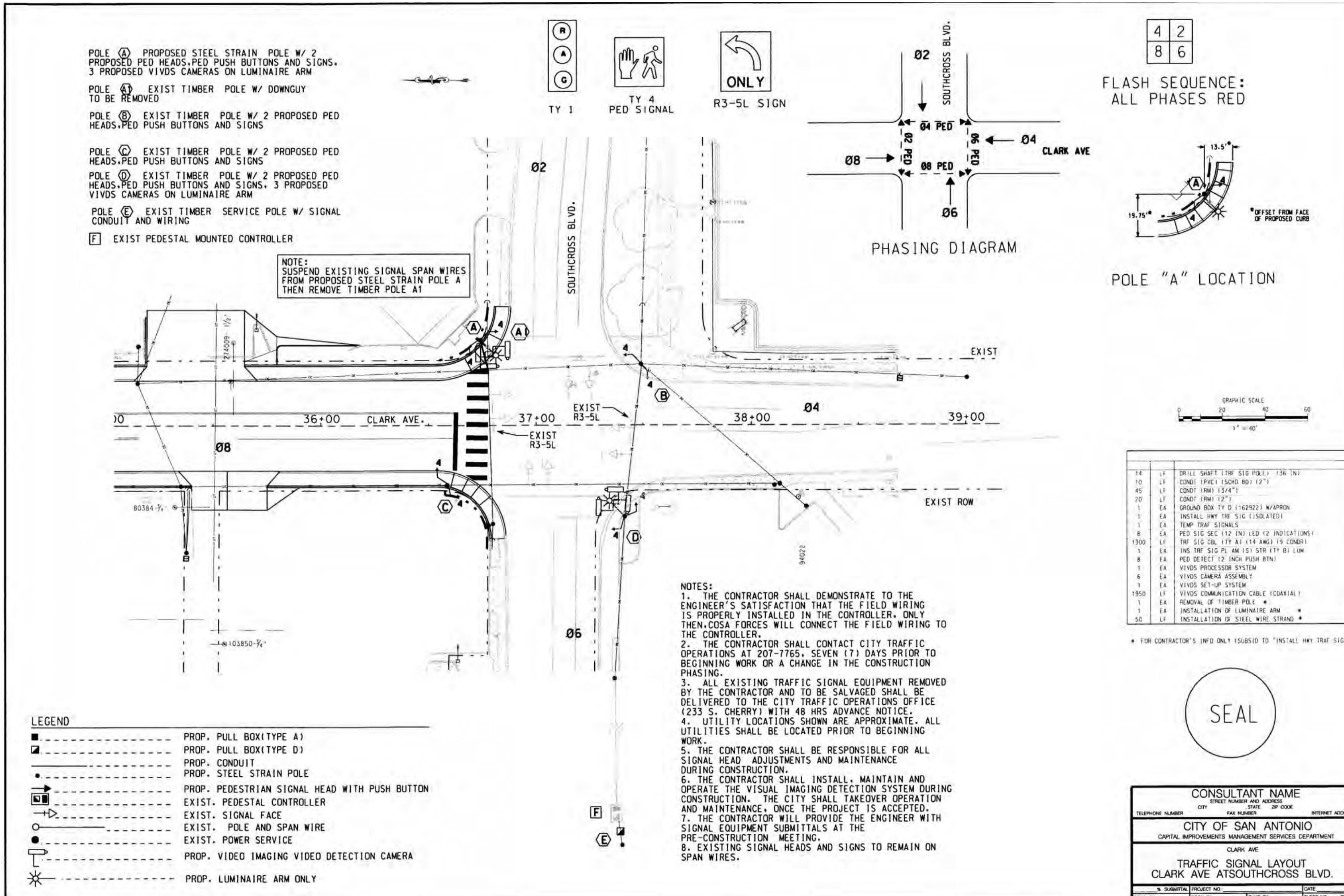


Figure 9-20: Example Traffic Signal Layouts

POLE (A) PROPOSED STEEL STRAIN POLE W/ 2 PROPOSED PED HEADS, PED PUSH BUTTONS AND SIGNS, 3 PROPOSED VIVDS CAMERAS ON LUMINAIRE ARM

POLE (A1) EXIST TIMBER POLE W/ DOWNGUY TO BE REMOVED

POLE (B) EXIST TIMBER POLE W/ 2 PROPOSED PED HEADS, PED PUSH BUTTONS AND SIGNS

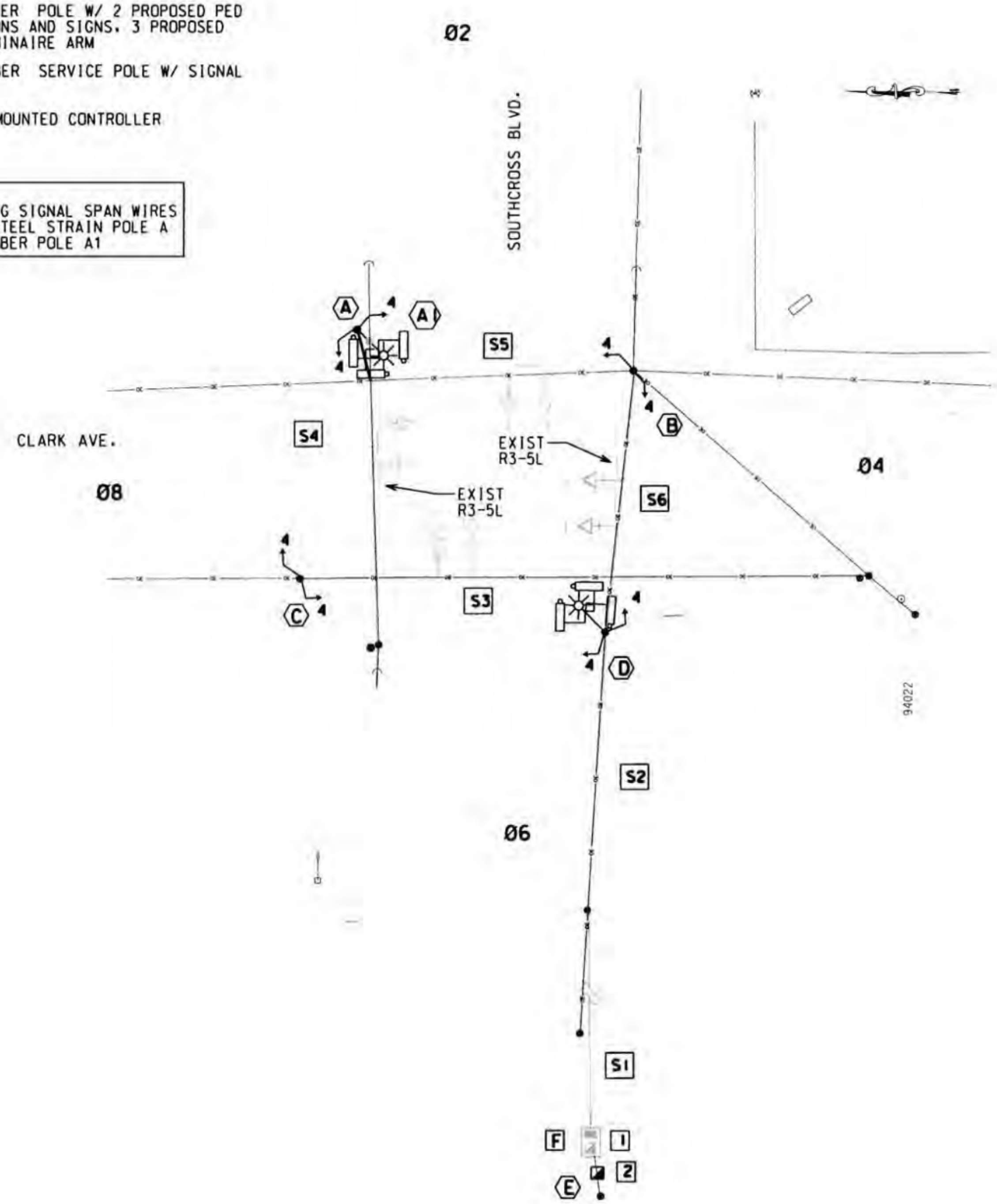
POLE (C) EXIST TIMBER POLE W/ 2 PROPOSED PED HEADS, PED PUSH BUTTONS AND SIGNS

POLE (D) EXIST TIMBER POLE W/ 2 PROPOSED PED HEADS, PED PUSH BUTTONS AND SIGNS, 3 PROPOSED VIVDS CAMERAS ON LUMINAIRE ARM

POLE (E) EXIST TIMBER SERVICE POLE W/ SIGNAL CONDUIT AND WIRING

F EXIST PEDESTAL MOUNTED CONTROLLER

NOTE:
SUSPEND EXISTING SIGNAL SPAN WIRES FROM PROPOSED STEEL STRAIN POLE A THEN REMOVE TIMBER POLE A1



CONDUIT AND CONDUCTOR SCHEDULE (SPAN WIRE)										
	RUN NUMBER		1	2	S1	S2	S3	S4	S5	S6
	CONDUIT SIZE IN INCHES		CNTRLLR	2	SPAN	SPAN	SPAN	SPAN	SPAN	SPAN
	NUMBER OF CONDUIT(S)		_	1						
	LENGTH OF CONDUIT (FT)		_	10						
	TRENCH (T) / BORE (B)		_	T						
	CIRCUIT			NUMBER OF CONDUCTORS						
#6 XHHW	120 POWER HOT		EXIST TO REMAIN							
	120 POWER COMMON		EXIST TO REMAIN							
#8 BARE	BARE BOND GROUND		EXIST TO REMAIN							
7 / C#14	SIGNALS	02	EXIST TO REMAIN		EXIST TO REMAIN					
		04	EXIST TO REMAIN		EXIST TO REMAIN					
		06	EXIST TO REMAIN		EXIST TO REMAIN					
		08	EXIST TO REMAIN		EXIST TO REMAIN					
9 / C#14	PED SIGNALS		4	4	4	4	2	1	_	1
RG-59 COMM CABLE W/ 3 - COND 18 AWG POWER CABLE	VIVDS	02	2	2	2	2	1	1	_	_
		04	1	1	1	1	1	1	_	_
		06	2	2	2	2	1	1	_	_
		08	1	1	1	1	_	_	_	_

POLE SCHEDULE							
	POLE		A	B	C	D	E
	POLE HEIGHT		30	EXIST	EXIST	EXIST	EXIST
	FOUNDATION TYPE		36A	EXIST	EXIST	EXIST	EXIST
	FOUNDATION DEPTH (FT)		13.2	EXIST	EXIST	EXIST	EXIST
CONDUIT	3/4 " RIGID METAL ON POLE			1	1	1	
	2" RIGID METAL ON POLE						1
#6 BARE	BARE BOND GROUND		EXIST	EXIST	EXIST	EXIST	EXIST
7 / C#14	SIGNALS	02	_	_	_	_	EXIST
		04	_	_	_	_	EXIST
		06	_	_	_	_	EXIST
		08	_	_	_	_	EXIST
9 / C#14	PED SIGNALS		1	1	1	1	4
RG-59 COMM CABLE 18 AWG POWER CABLE	VIVDS	02	1	_	_	1	2
		04	1	_	_	_	1
		06	1	_	_	1	2
		08	_	_	_	1	1

GRAPHIC SCALE
0 20 40 60
1" = 40'

SEAL

CONSULTANT NAME
STREET NUMBER AND ADDRESS
CITY STATE ZIP CODE
TELEPHONE NUMBER FAX NUMBER INTERNET ADDRESS

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

CLARK AVE
WIRING LAYOUT
CLARK AVE AT SOUTHCROSS BLVD.

% SUBMITTAL PROJECT NO. DATE
DRWN BY DSGN BY CHKD BY SHEET NO. OF

Figure 9-21: Example Wiring / Conduit Layouts

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Illumination layouts (Figure 9-22 and Figure 9-23) should contain the following information:

- scaled plan view of the project with alignment(s), ROW, existing features, and proposed improvement features
- line work representing the illumination plan, including labels for each fixture associated with the plan
- legend for plan view line styles and elements
- match lines defining limits of interest for the plan sheet
- labels for existing properties, streets or other areas of interest
- quantity call-out notes for pay items with corresponding quantity box

9.16 Design Enhancement Details

Enhancement details are independent and specific for each project, when required. No standard is provided for these details other than the enhancement plan. The plan should be clearly presented and understood and be installed in a manner consistent with the public artist’s intent. Measurement and payment provisions should be provided, if items do not reference an existing bid item. These sheets will be scaled at 1" = 20' or 1" = 40'.

9.17 Cross Sections

Cross sections should be shown at an interval along the roadway(s), at centerline of each driveway, and other areas of interest along the project. The interval should be dictated by the size and amount of proposed roadway cut/fill. A 50' interval is recommended for most projects. In addition, cross sections will be required at points of curvature and points of tangency. Estimates of cut and fill volumes shall also be provided at each section taken.

Below are the minimum requirements for presentation of the deliverables for a city project. Cross section sheets (Figure 9-24) should contain the following:

- the proposed roadway, with accompanying improvements such as sidewalks, curbs, retaining walls, driveways, etc.
- the cross section, reflecting each pavement section component clearly
- limits of construction (excavation)
- existing ground at cross section
- stations and name of baseline

- elevation labels of existing and proposed features at centerline/baseline and top of subgrade (at minimum)
- ROW lines for both existing and proposed (if needed)
- proposed utilities, including the proposed storm drain system
- datum elevations for each individual cross section
- Offset labels left and right of baseline/centerline
- Cut/Fill quantities

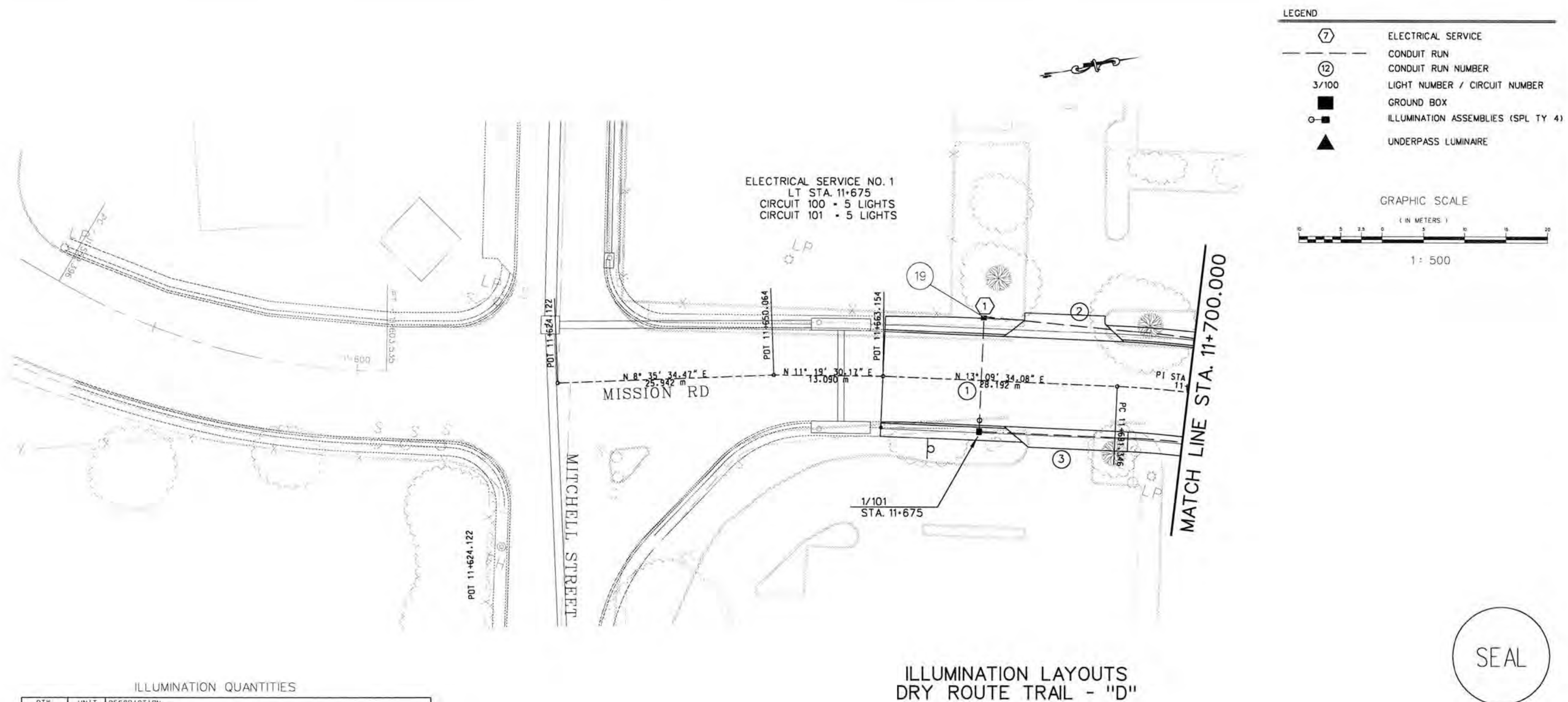
9.18 Joint-Bid Utility Notes, Plans, and Details

The consultant will coordinate with the utility owner on plan development, so all the owner's requirements are met and formatted to provide a uniform look to the overall set of plans.

All joint-bid utility plans will be scaled at 1" = 20' or 1" = 40' and will include the minimum requirements as designated by the owner of the facility. Included will be the following:

- title sheet with a reference to the owner and project name
- general notes sheet
- summary sheet
- project layout
- plan or plan/profile sheets
- details
- a cross sectional view of the driveway with elevations at curbline, back of sidewalk (if present), property line, and at end of driveway (dimensions from centerline of roadway will be provided at each of the aforementioned elevation locations)
- a plan view with information as listed above, with all improvements adjacent to driveway shown, including width of driveway

The driveway plats will not be included in a set of plans, but will be required with the PS&E package.



ILLUMINATION QUANTITIES

QTY	UNIT	DESCRIPTION
1	EA	RDWY ILLUM ASSEM (SPL TY 4)
	EA	RDWY ILLUM ASSEM (SPL TY 5)
	EA	RDWY ILLUM ASSEM (SPL TY 6)
	EA	REMOV RDWY ILL ASSEM (BR MOUNT)
83	M	CONDUIT (PVC)(SCHD 80)(32 mm)
13	M	CONDUIT (PVC)(SCHD 80)(50 mm)
	M	ELEC CONDUCTOR (NO. 12) BARE
102	M	ELEC CONDUCTOR (NO. 6) BARE
	M	ELEC CONDUCTOR (NO. 12) INSULATED
204	M	ELEC CONDUCTOR (NO. 6) INSULATED
1	EA	GROUND BOX TY A (122311) w/ APRON
1	EA	ELEC SERV TYS (120/240) 060 (NS) AL (N) SP (U)
1.8	M	FND FOR RDWY ILL ASM (TY E)(600 mm DR SH)

CONDUCTOR AND CONDUIT SUMMARY

RUN NO.	GROUND NO. & LENGTH m		CONDUCTOR NO. & LENGTH m		CONDUIT LENGTH m		REMARKS
	#6 BARE		#6 INSUL		PVC 32 mm	PVC 50 mm	
1	1-15		2-15			13	
2	1-32		2-32		30		
3	1-55		2-55		53		
TOTALS	102		204		83	13	

ELECTRICAL SERVICES DATA

Elec. Service No.	Sheet No.	Electrical Service Description (see ED (4) - 00)	Service Conduit Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amp	Two-Pole Contactor Amps	Panelbd/ Loadcenter Amp Rating	Circuit No.	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
1		ELEC SERV TY D(120/240)060(NS)AL(N)SP(U)	1 1/2"	3/#6	N/A	2P/60	N/A	70	A B	2P/20 2P/20	8 8	3.8
2		ELEC SERV TY D(120/240)060(NS)AL(N)SP(U)	1 1/2"	3/#6	N/A	2P/60	N/A	70	A	2P/20	6	1.4
3		ELEC SERV TY D(120/240)060(NS)AL(N)SP(U)	1 1/2"	3/#6	N/A	2P/60	N/A	70	A B	2P/20 2P/20	12 6	4.3
4		ELEC SERV TY D(120/240)060(NS)AL(N)SP(U)	1 1/2"	3/#6	N/A	2P/60	N/A	70	A	2P/20	9	2.2
5		ELEC SERV TY D(120/240)060(NS)AL(N)SP(U)	1 1/2"	3/#6	N/A	2P/60	N/A	70	A	2P/20	15	3.6
6		ELEC SERV TY D(120/240)060(NS)AL(N)SP(U)	1 1/2"	3/#6	N/A	2P/60	N/A	70	A	2P/20	15	3.6

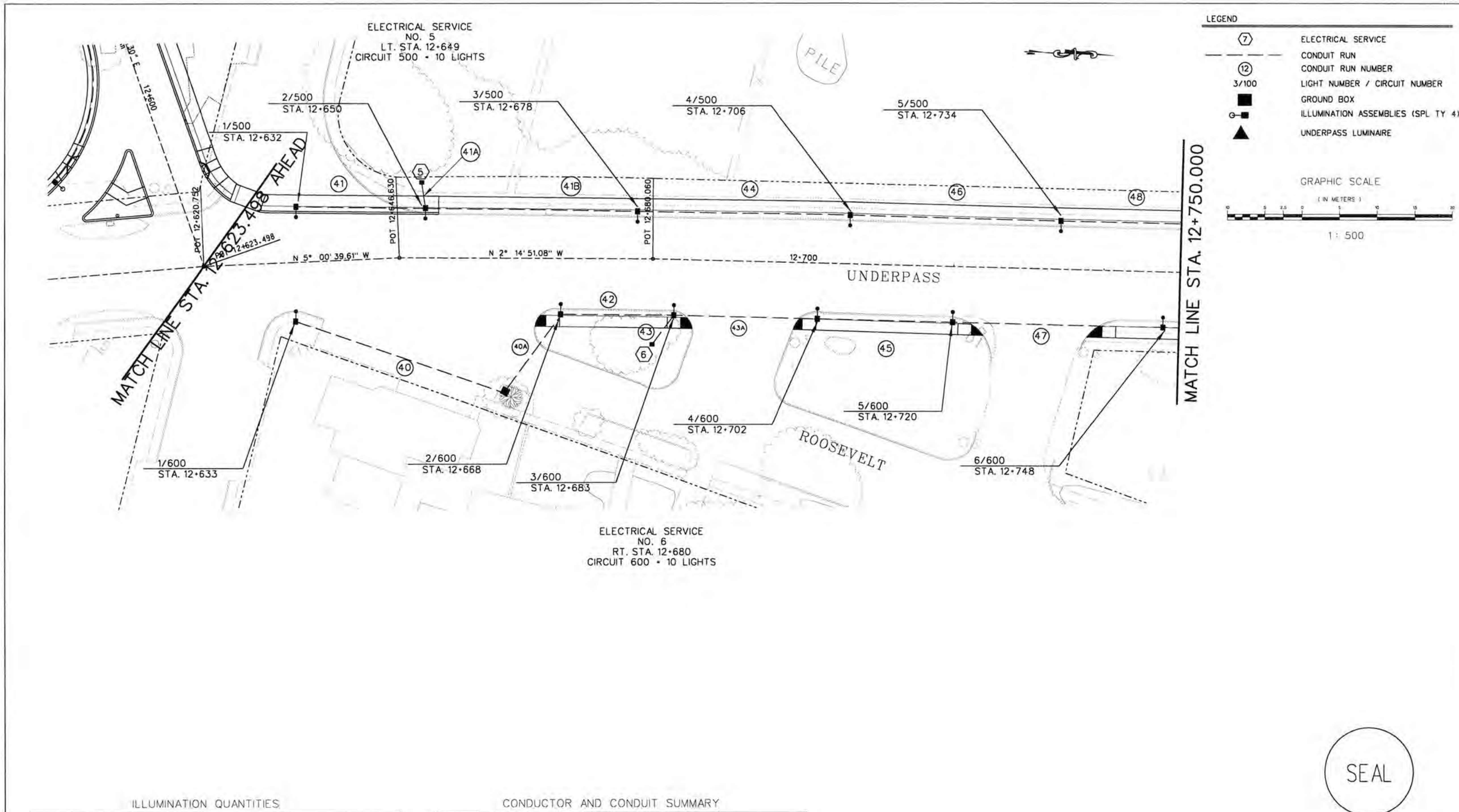
CONSULTANT NAME
STREET NUMBER AND ADDRESS
CITY , STATE ZIP CODE
TELEPHONE NUMBER FAX NUMBER INTERNET ADDRESS

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

MISSION TRAILS
ILLUMINATION LAYOUTS
DRY ROUTE TRAIL "D"

___% SUBMITTAL PROJECT NO.: DATE:
DRWN. BY: DSGN. BY: CHKD BY: SHEET NO.: ___ OF ___

Figure 9-22: Example Illumination Layout (1)



ILLUMINATION QUANTITIES

QTY	UNIT	DESCRIPTION
	EA	RDWY ILLUM ASSEM (SPL TY 4)
11	EA	RDWY ILLUM ASSEM (SPL TY 5)
	EA	RDWY ILLUM ASSEM (SPL TY 6)
	EA	REMOV RDWY ILL ASSEM (BR MOUNT)
	M	CONDUIT (PVC)(SCHD 80)(32 mm)
	M	CONDUIT (PVC)(SCHD 80)(50 mm)
	M	ELEC CONDUCTOR (NO. 12) BARE
	M	ELEC CONDUCTOR (NO. 6) BARE
	M	ELEC CONDUCTOR (NO. 12) INSULATED
	M	ELEC CONDUCTOR (NO. 6) INSULATED
3	EA	GROUND BOX TY A (122311) w/ APRON
2	EA	ELEC SERV TYS (120/240) 060 (NS) AL (N) SP (U)
19.6	M	FND FOR RDWY ILL ASM (TY E)(600 mm OR SH)

CONDUCTOR AND CONDUIT SUMMARY

RUN NO.	GROUND NO. & LENGTH m		CONDUCTOR NO. & LENGTH m		CONDUIT LENGTH m		REMARKS
	#6 BARE		#6 INSUL		PVC 32 mm	PVC 50 mm	
40	1-32		2-32		30		
40A	1-15		2-15		13		
41	1-20		2-20		18		
41A	1-5		2-5		3		
41B	1-30		2-30		28		
42	1-17		2-17		15		
43	1-7		2-7		5		
43A	1-21		2-21		19		
44	1-30		2-30		28		
45	1-20		2-20		18		
46	1-30		2-30		28		
47	1-30		2-30		28		
48	1-30		2-30		28		
TOTALS	287		574		261		

CONSULTANT NAME
STREET NUMBER AND ADDRESS
CITY STATE ZIP CODE
TELEPHONE NUMBER FAX NUMBER INTERNET ADDRESS

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

MISSION TRAILS
ILLUMINATION LAYOUTS
DRY ROUTE TRAIL "D"

_% SUBMITTAL | PROJECT NO.: | DATE:
DRWN BY: | DSGN BY: | CHKD. BY: | SHEET NO.:__ OF__

Figure 9-23: Example Illumination Layout (2)

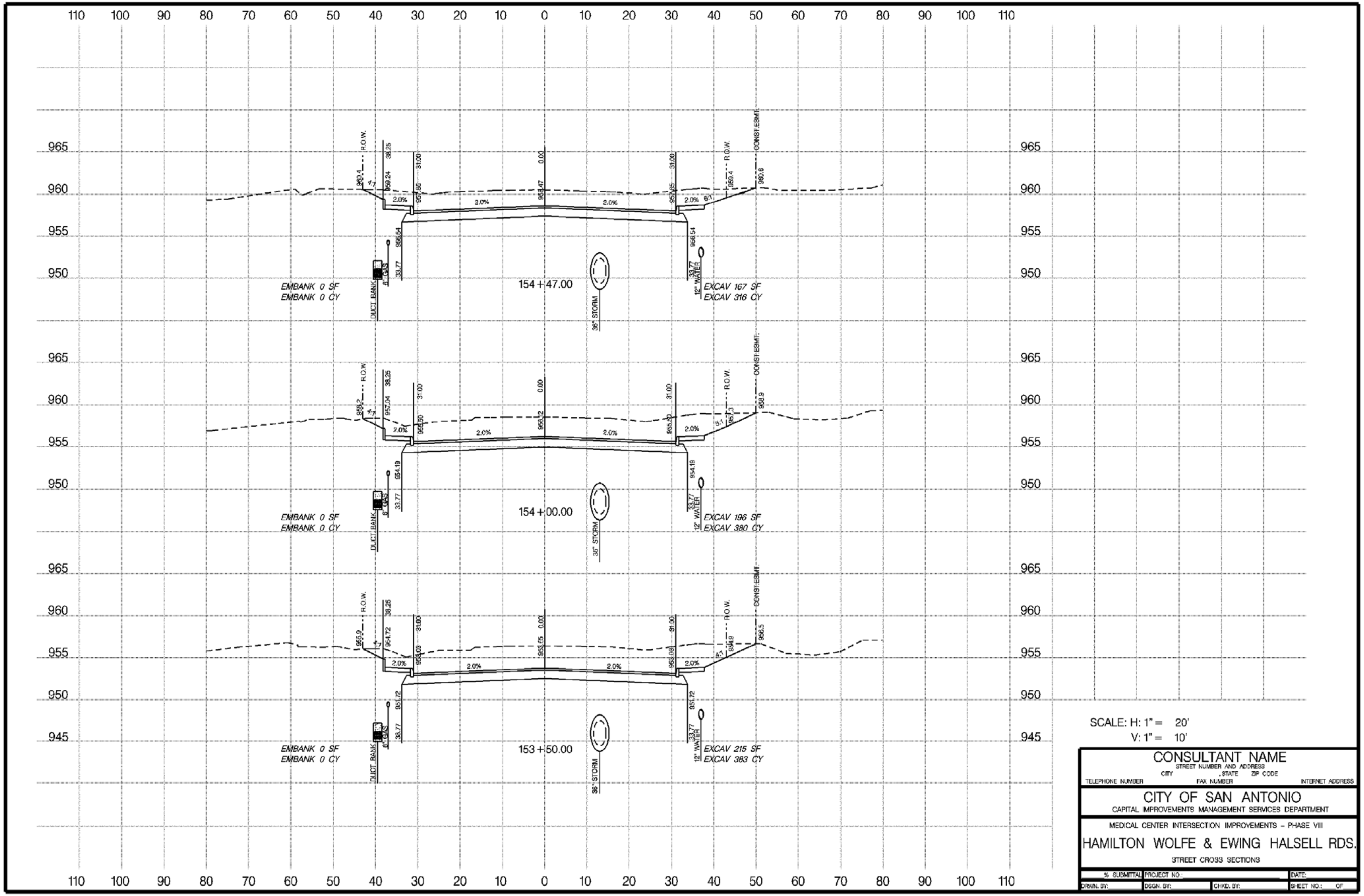


Figure 9-24: Example Cross Section Sheets

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9.19 Driveway Plats

Driveway Plats are used to present improvements to property owners by the city public involvement officer. The information shown on a plat (Figure 9-25) will include:

- project name
- owner's name
- address for driveway plat
- statement approving plat and improvements by the city, to proceed with lot numbers and signature blocks for owner and witness

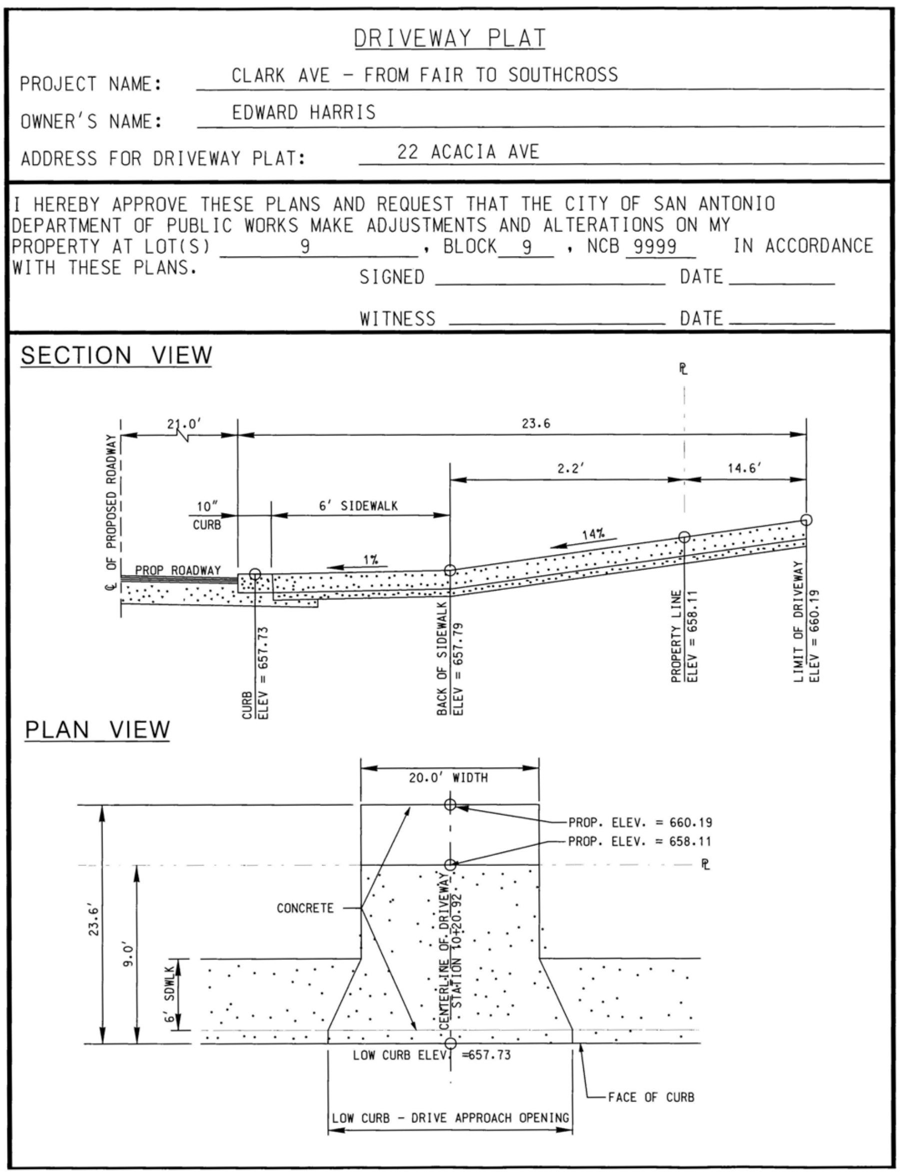

Figure 9-25: Example Driveway Plat

9.20 CAD Requirements

This section of the addresses the CAD-related standards and minimum values for each type of plan sheet.

9.20.1 CAD File Management System

The consultant should use a file management system that provides organization among not only CAD files, but all accompanying files, including calculations, reports, spreadsheets, Word documents, plot drivers, project control files, etc.

There is an established file management system in current use for LAM projects which could provide consistency for city projects.

9.20.2 CAD File Naming Convention

All CAD files should consist of reference (as described below) and sheet files.

All files should be named in a logical format, using naming filters to describe content and number if part of a series.

Some example reference file names are:

- MAP_2D_Street X.dgn

  2D survey mapping for Street X

- TCP_Street X_PHASE_01.dgn

  Traffic Control Plan phase 1

- PRO_Street X.dgn

  profile drawing for Street X

- ALIGN_Street X.dgn

  alignment file for Street X

Some example Sheet file names are:

- PLNPRO_01.dgn

  plan profile sheet 1

- TYPSECT_PROP_01.dgn

  proposed typical section sheet 1

- SW3P_05.dgn

  storm water pollution prevention plan sheet 5

There are established naming filters in current use for LAM projects which could provide consistency for city projects.

For whatever naming convention is used, a supplemental listing of the files with corresponding names should be provided with the final deliverables CD.

9.20.3 Seed Files

The coordinate system used for seed files on all city projects will be the Texas State Plane (South Central Zone) horizontal NAD83(93) or NAD 83(CORS) and vertical NAVD 88. Both 2D and 3D seed files are to be set to this standard.

The following working units will be used for civil drawings and standard details and general details:

- MU set to SF
- SU set to TN
- 10 SU to TN
- 100 POS units per SU

9.20.4 Reference files

All CAD files will be in MicroStation format.

Reference, or layout, files will be used in all plan sheet drawings to keep sheet file sizes at a minimum. Reference files comprise survey mapping, proposed features (roadway and utilities), alignments, profiles, and any other layouts showing proposed improvements. All reference files should be 2D, unrotated, full scale, real world coordinates (state plane). 3D files are to be used only for development of existing and proposed surfaces.

Level symbology will be used in sheet files for line style and weight manipulation to achieve results that conform to the criteria described below. While the following provides a guideline, the requirements can be adjusted based on individual project needs and presentation.

NOTE: Since level symbology is specific to the resource (RSC) files contained on the system developing each project, all RSC files should be included in all CDs used for digital submittals to the city.

9.20.5 Level Conventions

All levels will be in an organized, filtered format for ease of identification. Example file filters and format are as follows:

RDWY_ALIGN_[user defined name]

DRAIN_STORMDRAIN_[user defined name]

SW3P_SILTFENCE_[user defined name

PROFILE_PROPOSED_[user defined name]

There are established level filters in current use for LAM projects which could provide consistency for city projects. The design firm will provide a listing of all used levels for each project so it is recommended that levels be used efficiently.

9.20.6 Line Weights

Proposed features should be thicker and darker than existing features to provide a clearer presentation of the improvements and proposed features. Existing features could be shown on a gray scale, provided they are reproducible.

9.20.7 Line Styles

Most elements should be drawn in a continuous line style. Such items include:

- proposed edge of pavement, curbs, retaining walls, driveways, sidewalks, drainage, or any instance where a feature is exposed to the view as shown
- text, notations and dimensions, match lines, and graphic scales

Other elements will be represented by the following:

- ROW should be dash-dash-solid
- all baselines should be solid-dash-solid
- fence lines should be solid with “x” in line or other to designate specific type of fence
- utilities should be shown with a brief description of the type and size of facility within a solid line style in accordance with Section 5.0, Utility Coordination
- existing features will be shown with a dash line style
- flow lines will be shown with a solid-dot-dot-dot-solid line

9.20.8 Color Table

There are standard color tables available. While there is no required table, the designer(s) will use the same for consistency in electronic file appearance and shading.

9.20.9 Text Styles and Sizes

The text styles acceptable are: Leroy, Engineering, Bridge, or Arial. Fancy styles will not be allowed except for logos. Text sizes will be used as dictated by purpose:

Table 9-2: CAD Text Styles and Sizes (

Text Usage	Leroy Size	WT	1"=20'	1"=40'	1"=60'	1"=80'	1"=100'	1"=200'
Min	60	0-1	1.2	2.4	3.6	4.8	6	12
Usual	70	1-2	1.4	2.8	4.2	5.6	7	14
Emphasized	100	2-3	2	4	6	8	10	20
Sheet Title	120	3-4	2.4	4.8	7.2	9.6	12	24

Text will be placed to facilitate reading from the bottom or the right-hand edge of the drawing. Make every reasonable effort to place text horizontally. Special care shall be taken to place text uniformly and properly. The technician shall use consistent justification and place multiple lines of text as nodes. Use linear leaders only if terminated with an arrow on item called out.

9.20.10 Dimensioning

Presented are general standards regarding dimensioning:

- dimensions of 12 inches or more are to be lettered as feet (e.g., 1.0');
- dimensions less than 12 inches are to be lettered as inches only.

Exceptions to these guides are as follows:

- pipe diameters (e.g., 30 " DIA)
- weld dimensions (e.g., 4-16, show no inch marks)
- reinforcing spacing (e.g., #4 @ 12")

9.20.11 CAD Design Software

GeoPak® will be used for all design work within MicroStation. A GeoPak database (. ddb) file will be used to draft all elements associated with reference and layout files, such as alignments, profiles, and cross sections. However, the .ddb file will not be required for miscellaneous line work for quantifying purposes (i.e., pavement markings, curbs, etc.).

All elements drawn with the GeoPak database will conform to the established level and filter conventions.

Section 10 Geotechnical Services

10.1 Introduction

The purpose of this section is to provide general guidelines for geotechnical engineering studies for city projects.[7] If necessary these may be adjusted, based on site-specific subsurface conditions, by qualified geotechnical engineers who are licensed engineers in the State of Texas.

This section is organized as follows:

- Geotechnical Qualifications

  Minimum qualifications/accreditations and test procedures required to provide geotechnical services.

- Geotechnical Engineering Studies for Pavement Design
- Geotechnical Engineering Studies for Structures
- Field Operations

  Requirements for drilling, sampling, and field testing

- Soils and Bedrock Logging

  Material order, level of description, and classification

- Foundation Design:

  Selecting foundation types, drilled shafts, piling, and requirements for scour analysis

- Retaining Walls

  Retaining wall selection, layouts, design, and excavation support

- Slope Stability

  Requirements for design and analysis

[7] The information and procedures contained herein provide the minimum requirements expected for geotechnical engineering and pavement design for the City of San Antonio. In special cases, or instances where additional guidance may be required, the designer shall refer to the latest version of the Texas Department of Transportation *Geotechnical Manual*, the *Bridge Design Manual*, and/or the *Pavement Design Manual* for further information.

10.2 Geotechnical Qualifications

Minimum Accreditation/Qualifications Required

10.2.1 Introduction

The city requires all geotechnical engineering firms providing services to them to be accredited, qualified, and in compliance with the requirements of the following:

- ASTM D3740 Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection and/or Testing
- Firms must present a copy of the current, official accreditation by one of the following:
    - American Association for Laboratory Accreditation (A2LA)
    - American Association of State Highway and Transportation Officials (AASHTO)

10.2.2 List of the Minimum Standards to Meet

The A2LA and AASHTO certificate presented to the city will include the accredited procedures in Table 10-1: Required Accredited Test Procedure.

Table 10-1: Required Accredited Test Procedures	
Test Procedure	**Description**
ASTM D422	Test Method for Particle-Size Analysis of Soils
ASTM D558	Test Methods for Moisture-Density Relations of Soil-Cement Mixtures
ASTM D698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))2
ASTM D854	Test Method for Specific Gravity of Soil Solids by Water Pycnometer
ASTM D1140	Amount of Material in Soils Finer than No. 200 Sieve
ASTM D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))2
ASTM D1883	Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils
ASTM D2166	Test Method for Unconfined Compressive Strength of Cohesive Soil
ASTM D2216	Water (Moisture) Content of Soil and Rock

Table 10-1: Required Accredited Test Procedures (continued)	
Test Procedure	**Description**
ASTM D2435	Test Method for One-Dimensional Consolidation Properties of Soils
ASTM D2487	Classification of Soils for Engineering Purposes
ASTM D2850	Test Method for Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression
ASTM D2938	Test Method for Unconfined Compressive Strength of Intact Rock Core Specimens
ASTM D4318	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

10.3 Geotechnical Engineering Studies for Pavement

10.3.1 Introduction

All transportation systems are built either on, in, or with soil and products from the ground. The characterization and evaluation of soils is critical to the performance of pavement structures. The following guidelines will address only geotechnical considerations necessary for the design and evaluation of pavement structures.

This discussion is intended to provide city personnel, consultants, and contractors guidance in establishing soil properties and characteristics to be used in pavement design and determining influencing site characteristics that might require modifications to the pavement structure or adjacent works to accommodate those characteristics. In particular, determination of soil strength, applicable modulus (its stiffness), and matrix stability descriptive of a pavement project, a portion of a project, or materials, respectively, will be the result of the analysis. From this information, a report should be prepared that documents the findings from the geotechnical investigation. Once the subgrade properties are determined, the pavement section should be designed in accordance with COSA Pavement Design Standards.

10.4 Subsurface Exploration

10.4.1 Borings

- Prior to performing geotechnical field investigations, the geotechnical engineer or representative should perform field reconnaissance to determine existing pavement conditions, site access, and traffic conditions.
- Frequency of Borings is to be determined by the project geotechnical engineer.
- Final boring spacing should be determined by the geotechnical engineer, but in no case should exceed 1,000 linear feet
- Depth of Sampling:

  Sample materials at 2.5 foot intervals to a depth of at least 10 feet. Where cuts are required that exceed this depth, sampling should be conducted to roadbed depth plus 5 additional feet. When materials change physical characteristics, a new bulk sample should be started.
- Backfilling of Test Borings

  Drill holes must be filled or plugged to prevent injury to livestock or people in the area and to minimize the entry of surface water into the bore hole. If surface contamination of lower aquifers or cross contamination is a concern, the backfilling should be done using bentonite pellets or grout. All borings drilled over the Edwards Aquifer Recharge Zone should be backfilled in accordance with TCEQ's regulatory requirements. Where borings penetrate asphalt and/or concrete, the borings should be patched with similar materials.

10.4.2 Sampling

The two primary sampling techniques used in pavement material analysis are disturbed and undisturbed. Each is descriptive of the amount of disruption of the soil matrix from its natural or in situ state.

- Disturbed

  Disturbed samples are frequently referred to as bulk samples. The materials are generally collected with a power auger with helical flights that raise the materials to the surface so they can be collected. This method is efficient, since a great amount of materials can be collected in a short amount of time.
- Undisturbed

  Undisturbed samples are not requested frequently. The advantage of having these samples is being able to test the material with (relatively) little disturbance, at the moisture content and density at which it was extracted.

10.4.3 Laboratory Evaluation

The laboratory testing program should be established by the geotechnical engineer based on conditions encountered in the borings. As warranted, the geotechnical testing procedures should typically include the tests listed in Table 10-2: Typical Laboratory Soil Test Procedures:

Table 10-2: Typical Laboratory Soil Test Procedures

Test Category	Test	Test Method*	Significance
Visual Identification	Soil Classification	Tex-142-E	Use as a check to verify assumed soil properties
Index Properties	Particle Size Analysis	Tex-110-E	A quantitative determination of the distribution of particle sizes
	Moisture Content	Tex-103-E	Determines natural subgrade moisture for use in drainage and soil suitability analyses
	Plasticity Index	Tex-106-E	Defines the amount of moisture a material can hold without turning into a liquid, gives an indication of the potential volume change of the material, assists with classification, potential construction/stabilization characteristics, and a measure that has been correlated to numerous engineering properties
	Potential Vertical Rise	Tex-124-E	Swell potential of subgrade soils
	Moisture Density Relationship	Tex-114-E	Compaction control purposes during construction can provide stronger, more durable materials
Strength Properties	California Bearing Ratio	ASTM D 1883	Strength of subgrade materials
Chemical Properties	Determining Sulfate Content in Soils	Tex-145-E	Soil analysis to determine the presence and the quantity of soluble sulfates that could have detrimental reactions with chemical (calcium-based) soil modifiers
	Soil Conductivity	Tex-146-E	Field detection of sulfate soils
	Soil pH	Tex-128-E	Determining the alkalinity or corrosivity of soils
	Soil Resistivity	Tex-129-E	Corrosivity of subgrade soils

* TxDOT Standard Text Method

10.4.4 Pavement Section Design

Pavements should be designed in accordance with the City of San Antonio Pavement Design Standards, Appendix 10A.

10.4.5 Geotechnical Summary Report for Pavement Design Development

Upon completion of the field investigation and laboratory testing program, the geotechnical engineer will compile, evaluate, and interpret the data and perform engineering analyses for the design of pavement foundation layers. In addition, the geotechnical engineer will be responsible for producing a report that both presents the subsurface information obtained from the site investigations and provides specific pavement section design and construction recommendations. The report must be signed by an engineer who is licensed in the State of Texas.

Since the scope, site conditions, and design/construction requirements of each project are unique, the specific contents of a geotechnical design report must be tailored for each project. The report should identify subsurface soil and rock conditions and provide recommended design parameters for each of these units. This requires a summary and analysis of all factual data to justify the recommended index and design properties. Groundwater conditions are particularly important for both design and construction; therefore, they need to be carefully assessed and described. For every project, the subsurface conditions encountered in the site investigation need to be compared with the geologic setting to better understand the nature of the deposits and to predict the degree of variability between borings.

10.5 Geotechnical Engineering Studies for Structures

10.5.1 Introduction

Conduct soils surveys for projects with the following features:

- bridges
- retaining walls
- slopes and embankments
- sign structures
- illumination
- sound walls
- radio towers

Minimum required testing for all structures includes Texas cone penetration (TCP) and/or standard penetration test (SPT) testing at 5-foot intervals, as well as rock quality designation (RQD) and percent recovery if rock coring is utilized.

10.5.2 Review of Existing Data

When available, existing data should be reviewed to estimate required boring frequency and depths. At a minimum, USGS maps should be reviewed to determine whether deep soil or shallow rock conditions are anticipated.

10.5.2.1 Boring Location

The complexity of geological conditions and the type, length, and width of a structure determine the number of borings required for foundation exploration.

Borings sites should be in accessible areas, where possible. When determining the location of test holes, exiting utilities and overhead power lines should be considered. If possible, avoid steep slopes and standing or flowing water. Deviations within a 20-foot radius of the staked location that do not include a greater than 5-foot deviation in elevation are not usually excessive, but note them on the logs and obtain the correct surface elevation.

When determining the location and depth of test holes, carefully consider these factors:

- test hole depth
- lowering of gradeline
- channel relocations and channel widening
- scour
- foundation loads
- foundation type

10.5.2.2 Bridges

Figure 10-1: Minimum Number of Test Holes for Common Types of Structures shows the minimum number of test holes for common types of bridge structures. Avoid spacing test holes more than 300 feet apart.

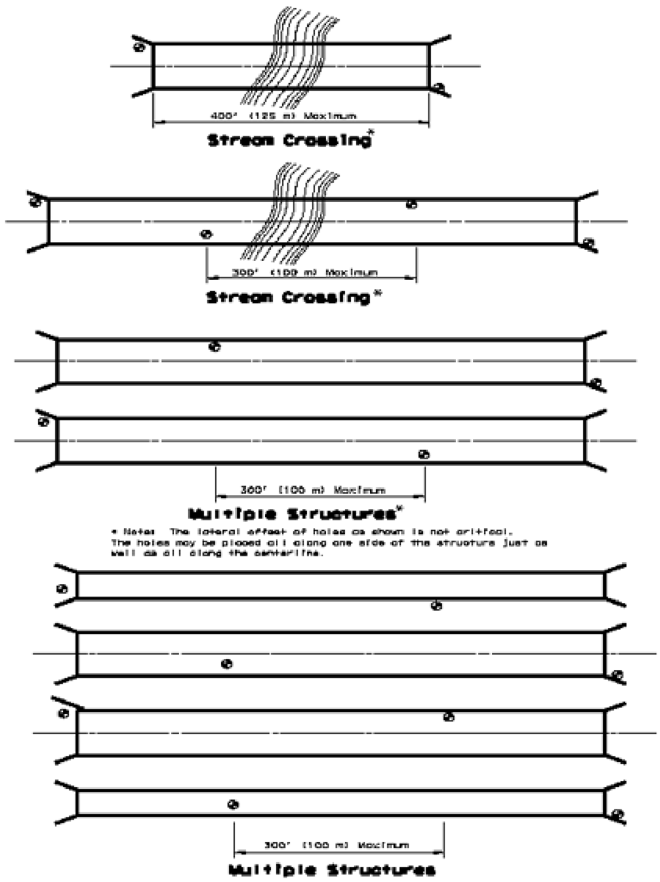

Figure 10-1: Minimum Number of Test Holes for Common Types of Structures

In general, drill test holes 15 to 20 feet deeper than the probable tip elevation of the foundation. Estimate the probable founding or tip elevation from the results of Texas cone penetration tests and correlation graphs, “Texas Cone Penetration Test,” and experience with foundation conditions in the area. Pay special attention to major structures where high foundation loads are expected. If the depth of the boring is questionable, consult the design structural engineer for a detailed analysis of projected foundation loads and foundation capacities.

10.5.2.3 Stream Crossings

Structures over channels less than 200-feet wide are classified as minor stream crossings. For these crossings, a boring on each bank as close to the water's edge as possible is sufficient. If boring information varies significantly from one side of the channel to the other, a boring in the channel may be necessary.

Major stream crossings require core borings in the channel if no existing data are available. A site inspection by the driller or logger is necessary to evaluate site accessibility and special equipment needs.

Grade Separations: If the structure borings indicate soft surface soils (fewer than 10 blows per foot), additional borings and testing may be required for the bridge approach embankments.

Bridge Field Exploration: The exploration should include the following:

- Test hole spacing

  Complete test holes near each abutment of the proposed structure plus a sufficient number of intermediate holes to determine the depth and location of all significant soil and rock strata. If there is no reasonable correlation between borings (for example, TCP and SPT data, stratigraphy), consult with the project engineer to determine the need for additional holes.

- Texas cone and standard penetration tests

  Conduct tests at 5-foot intervals beginning at a depth of 5 feet.

- Upper soil layer test

  Test as directed under the section titled "Slopes and Embankments," following.

- Soils and bedrock classification

  Completely fill out a classification and log record for each test hole on the standard log.

- Groundwater

  Include elevation measurements as part of the data acquisition. Site conditions may require installation of piezometers to establish a true groundwater surface elevation and method of monitoring water surface fluctuations.

10.5.2.4 Retaining Walls

Obtain soil core borings for walls taller than 10 feet. Evaluate walls shorter than 10 feet case-by-case. For most soils, TCP and SPT tests are adequate to design walls and evaluate wall stability.

Soil Borings: Obtain soil borings at 200-foot spacing unless site conditions or the wall designer requires tighter or coarser spacing.

Boring Depth for Fill Walls: For mechanically stabilized earth (MSE) walls, spread footing walls, temporary earth walls, and block walls, the depth of boring should be equal to the height of the wall, depending on the wall type and existing and proposed ground lines. The minimum boring depth is 15 feet below the bottom of the wall, unless rock is encountered. Extending borings 5 feet into rock for fill walls is usually adequate.

Boring Depth for Cut Walls: For drilled shaft walls, tied-back walls, and soil and rock nail walls, always base the depth of boring on the final grade lines. Cantilever drilled shaft walls require the depth of boring to extend the anticipated depth of the shaft below the cut, typically between one and two times the height of the wall. Borings for soil nail and rock nailed walls need to be advanced through the material that is to be nailed. Borings should extend a minimum of 20 feet below the bottom of the proposed wall. Borings for cut walls may need to penetrate rock significant distances depending on the depth of the cut and height of the wall.

Soil Samples and Testing: Provide additional testing for taller walls, walls on slopes, or walls on soft foundations, as necessary to completely evaluate wall stability. Additional testing includes, but is not limited to, obtaining samples for consolidation testing, triaxial testing, or in-place shear testing to determine soil strength. Consult with the wall designer for development of the complete soil exploration plan.

Groundwater: Include groundwater elevation measurements as part of the data acquisition for retaining walls. Site conditions may require the installation of piezometers to establish a true ground water surface elevation and method of monitoring water surface fluctuations.

10.5.2.5 Other Structures

Conduct foundation investigations for high-mast illumination, radio towers, and overhead sign structures when other borings are not located nearby. The typical depth of the boring ranges from 30 to 50 feet, but depends on existing and proposed ground lines, soil consistency, and structure loading.

10.5.2.6 Slopes and Embankments

Soil Core Borings: Obtain soil core borings for cuts greater than 10 feet or embankments taller than 15 feet in areas with suspect foundation soils (less than or equal to 10 blows/ft). For most soils, TCP and STP tests are adequate.

The exploration should include the following:

- The soil under future embankments

  Advance borings to a depth equal to the height of the embankment or 20 feet, whichever is greater. Conduct TCP and STP testing at 5-foot intervals.

- Soil in proposed cuts

  Advance borings to a depth of 15 feet below the bottom of the proposed cut. Conduct TCP and STP testing at 5-foot intervals.

- Groundwater elevation measurements

  Include groundwater elevation measurements as part of the data acquisition for slopes and embankments. Site conditions may require installation of piezometers to establish a true groundwater surface elevation and method of monitoring surface fluctuations.

Soil Testing: Perform the appropriate field and laboratory tests necessary to determine the soil shear strength for proper soil elevation. The designer must consider the short-term and long-term conditions:

- Short-term

  Use TCP and STP tests, in-place vane shear tests, triaxial tests (UU), and/or direct shear tests.

- Long-term

  Use consolidated undrained triaxial tests (r-bar) and/or drained direct shear tests.

Estimate long-term strengths of clay soils based on the index properties of the soil. Use Figure 10-2: TCP vs. Angle of Internal Friction for Cohesionless Soils to correlate TCP and STP test results to angle of internal friction for cohesionless soil.

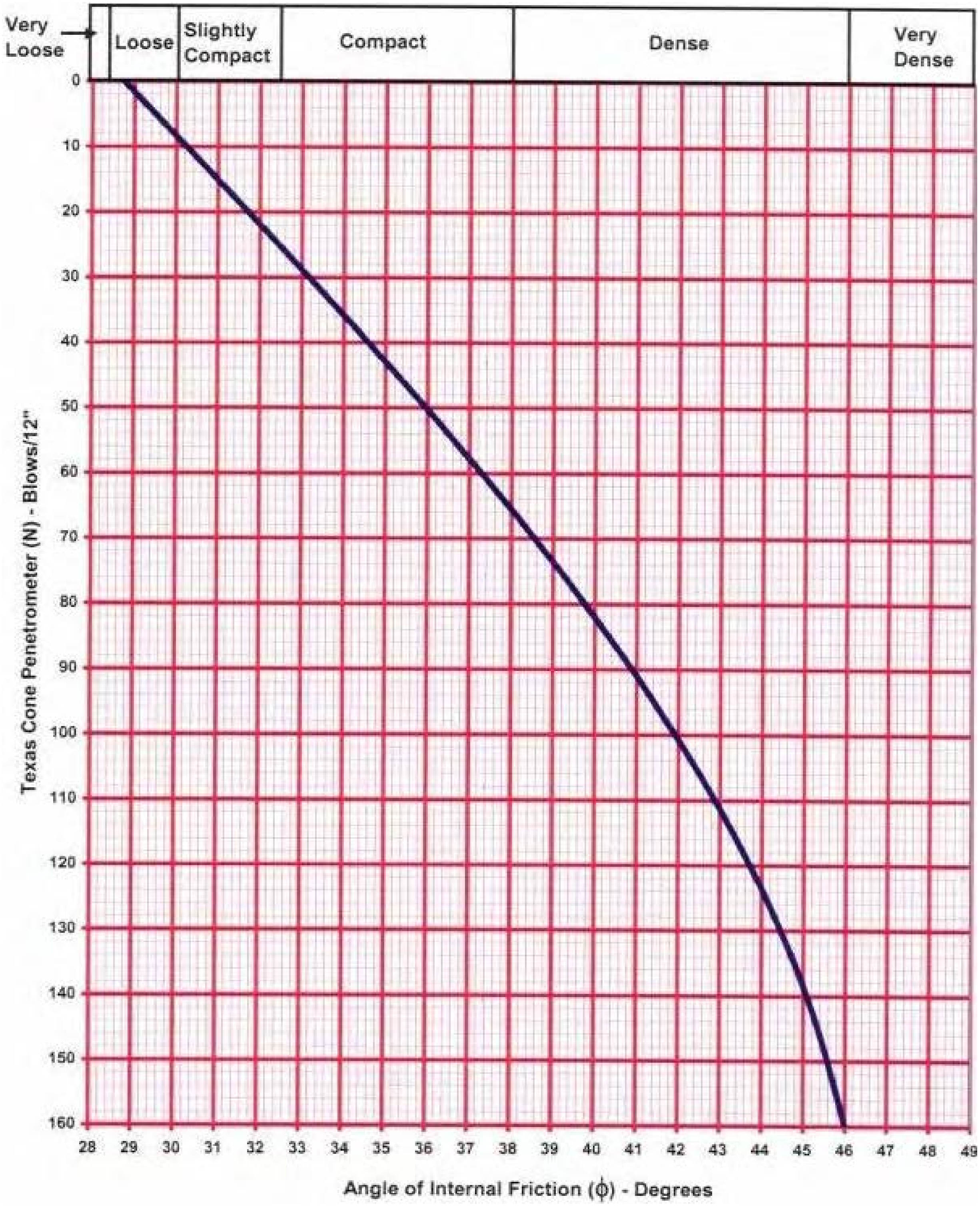

Figure 10-2: TCP vs. Angle of Internal Friction for Cohesionless Soils

10.6 Field Operations

10.6.1 Drilling

10.6.1.1 Introduction

Consider the following items before starting core drill operations:

- core drill equipment
- drill rig
- site preparation
- access
- utility clearance
- traffic control
- barge work
- drill hole filling

10.6.1.2 Access

Ensure that permission to enter private property has been secured before drilling.

10.6.1.3 Utility Clearance

All locations proposed for drilling must be cleared for utilities before the core drill team arrives. When utilities are present, their exact location should be clearly marked by the utility company. The number to phone for utility clearance is 1-800-545-6005. Calls to this number automatically rotate to the three notification centers. Obtain utility clearance at least 48 hours and no more than 14 days before starting core drilling. The three notification centers may be contacted directly as shown below. For SAWS facilities, please contact 704-SAWS.

- Texas Excavation Safety System (TESS) 1-800-344-8377
- Lone Star Notification Center 1-800-669-8344
- Texas One Call 1-800-245-4545

10.6.1.4 Traffic Control

Provide traffic control in general accordance with Texas Manual on Uniform Traffic Control Devices.

10.6.1.5 Drill Hole Filling

Drill holes must be filled or plugged to prevent injury to livestock or people in the area and to minimize the entry of surface water into the bore hole. If surface contamination of lower aquifers or cross contamination is a concern, backfill the hole with bentonite pellets or grout. This is especially important in urban areas where ground contamination from leaking underground storage tanks is common.

10.7 Sampling Methods

10.7.1 Overview

Use appropriate sampling methods as dictated by the structural engineer, field conditions, and laboratory tests. When allowed, provide continuous sampling and testing for all field drilling methods shown below for visual classification.

10.7.2 Field Testing

Texas cone penetration (TCP) testing: Conduct testing in general accordance with TxDOT's standard test procedure Tex-132-E "Texas Cone Penetration Test." Ensure that the drill rig mobilized to the drill site is equipped with test equipment that conforms to the test procedure. Use a hammer with an automated trip mechanism to regulate the fall of the hammer to 24 inches ± ½ inch.

TCP values described in this manual are either the total number of blows necessary to drive the cone 12 inches or the distance the cone advances in inches in 100 blows.

Standard penetration test (SPT): Conduct testing in general accordance with ASTM D1586 Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.

Rock core drilling and sampling: Conduct drilling and sampling in general accordance with ASTM D2113 Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation.

Thin-walled tube sampling of soils: Conduct undisturbed sampling of soils in general accordance with ASTM D1587 Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes.

In-place vane shear test: Use this test to determine the in-place shearing strength of fine-grained soil which does not lend itself to undisturbed sampling and triaxial testing and when encountering organic silty clay (muck) or very soft clay. These materials, however, must be free of gravel or large shell particles, because pushing the vanes through these obstructions would disturb the sample and probably cause physical damage to the vanes. Use the test with extreme caution in soil that has Texas cone penetration values harder than 15 blows/12 inches.

Torvane and pocket penetrometer: These devices are useful for index and classification purposes. They yield only approximate information and are not suitable for foundation design.

10.8 Soil and Bedrock Logging

10.8.1 Logging

10.8.1.1 Material Order of Description

Keep core descriptions as simple as possible by generally following ASTM D5434 Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock as the guide for field logging of subsurface exploration of soils and rock. The order of description is as follows:

1. material
2. density or consistency, hardness
3. moisture
4. color
5. cementation
6. description adjectives
7. unified soil classification system
8. rock quality designation (RQD), percent recovery

10.8.1.2 Material

Keep the number of strata to a minimum. Remember that not every small variation in a soil — such as a change in clay from “slightly sandy” to “sandy” —warrants a change in strata. The logger must define strata that have significance to designers who will use the boring log information.

10.8.1.3 Density or Consistency, Hardness

Use Table 10-3: Soil Density or Consistency and Table 10-4: Bedrock Hardness to determine the density or consistency and hardness of material encountered:

Table 10-3: Soil Density or Consistency

Density (Cohesionless)	Consistency (Cohesive)	TCP Values	Field Identification
Very loose	Very soft	0 to 8	Core (height twice diameter) sags under own weight
Loose	Soft	8 to 20	Core can be pinched or imprinted easily with finger
Slightly compact	Stiff	20 to 40	Core can be imprinted with considerable pressure
Compact	Very stiff	40 to 80	Core can be imprinted only slightly with fingers
Dense	Hard	50 to 5 inches/100	Core cannot be imprinted with fingers, but can be penetrated with a pencil
Very dense	Very hard	0 inch to 5 inches/100	Core cannot be penetrated with pencil

Table 10-4: Bedrock Hardness

Mohs' Hardness Scale	Characteristics	Examples	Hardness	Approximate TCP Values
5.5 to 10	Rock will scratch knife	Sandstone, chert, schist, granite, gneiss, some limestone	Very hard	0 inch to 2 inches/100
3 to 5.5	Rock can be scratched with knife blade	Siltstone, shale, iron deposits, most limestone	Hard	1 inch to 5 inches/100
1 to 3	Rock can be scratched with fingernail	Gypsum, calcite, evaporites, chalk, some shale	Soft	4 inches to 6 inches/100

10.8.1.4 Moisture

If any moisture exists, note the extent present. The samples will be assumed dry if the degree of moisture is not indicated. If free water is present, describe the soil as wet or water-bearing.

10.8.1.5 Color

Describe the primary color and restrict description to one color. If one main color does not exist in a sample, call it multicolored.

10.8.1.6 Cementation

Identify the degree of cementation, if any is present.

10.8.1.7 Description Adjectives

Use ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

10.8.1.8 Unified Soil Classification System

This soil system is based on the recognition of the type and predominance of the constituents, considering grain size, gradation, plasticity index, and liquid limit. It includes three major divisions of soil: coarse-grained, fine-grained, and highly organic. See ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) for the procedure for determining soil classification.

10.8.1.9 Rock Quality Designation (RQD)

Determine the RQD for rock core samples following ASTM D6032 Standard Test Method for Determining Rock Quality Designation (RQD) of Rock Core. Always note the RQD and percent recovery on logs of borings where rock is encountered.

10.8.1.10 Log Form

For uniformity, use ASTM D5434 Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock as minimum standard guide for field logging of subsurface exploration of soils and rock.

10.9 Retaining Walls

10.9.1 Retaining Wall Selection

The geotechnical engineer should provide geotechnical design and construction recommendations with regard to retaining wall structures.

10.9.2 Design Considerations

Design and analyze walls following accepted geotechnical engineering industry standards. In analyses, use earth pressures that follow governing sections of the 17th edition of the AASHTO Standard Specifications for Highway Bridges (2002). For load conditions or walls that are not specifically covered by AASHTO, refer to the TxDOT web page for recommendations.

Check walls to ensure minimum factors of safety are met for all potential modes of failure, including sliding, overturning, bearing pressure, and stability. Consult governing wall standards for assumptions and minimum factors of safety for various modes of failure: the minimum factor of safety is set at 1.3.

Avoid perching walls on slopes. When walls must be placed on slopes, conduct both short- and long-term stability analyses using appropriate soil strengths, geometry, and loading conditions (live load surcharge, hydrostatic, etc.).

10.10 Slope Stability

10.10.1 Overview

All slopes, whether a cut or a fill and whether in soil or in rock, must be evaluated for stability for both short-term (undrained) and long-term (drained) conditions. Specific site conditions may require evaluation for additional types of failure, such as bearing capacity, settlement, and undercutting (for rock cuts).

10.10.2 Stability Analysis

Use the following data to analyze stability of a slope:

- geometry (cross section and loading conditions)
- location of the water table
- soil/rock stratigraphy
- soil/rock properties

  (unit, weight, Atterberg Limits, undrained and drained shear strength)

Stability of a slope requires a minimum factor of safety (FS) ≥ 1.3.

Section 11 Public Involvement Guidelines

11.1 Introduction

This section is a guide to planning and implementing public involvement during the design and construction phases of projects undertaken by the Transportation & Capital Improvement (TCI) Department of the city. This section is not intended to be exhaustive, rather, the checklist format functions as a reminder of elements to consider.

In a broad sense, the design phase is when the project team begins and completes the engineering plans and specifications that will guide project construction. TCI divides the design phase into:

- 40-percent (40%)
- 70-percent (70%)
- 95-percent (95%)
- bid documents (100%)

The 40-percent design phase is interactive, involving many different interests and perspectives to clarify the needs of the project, analyze alternatives, and recommend the best alternative. The latter stages are focused on plan preparation and assume that all public issues will be resolved with the proposed design. In certain areas where Complete Streets have been determined to be a priority due to project location and context, public involvement may be required earlier than 40% design. Projects in such areas shall be identified in the preliminary design conference and included in the Design Summary Report.

Once the preferred alternative has been selected and the team receives approval to move forward, the project moves towards 95-percent and bid documents, when the details of the selected alternative are more fully developed. The project team also conducts environmental review, applies for permits, and prepares the contract bid documents.

Community affairs issues will typically be managed through the TCI Department. If there is sufficient public interest in the project, the TCI capital projects officer (CPO) will be engaged to manage public communication. During design, this includes helping the project team identify and understand the community's perspectives and concerns. This should be a two-way, iterative exchange in which the CPO works with the project team to provide information to the community, then receives public comments and suggestions, and then disseminates them to the team. It is also important to follow up and provide feedback to the community to convey how their comments were incorporated. Community involvement can result in better design decisions and increase the likelihood of community support for a project. It’s important to note that this work is typically done within the department and is not performed by outside consultants.

11.2 Overview of Design Phase

There are three principal elements of responsibility for the CPO during design:

- Conduct community needs assessment and develop or update a public involvement plan

  Conduct research on the affected community to ensure responsiveness.

- Implement the public involvement plan

  Plan and arrange all public meetings and other outreach activities.

- Manage the community relations task

  Develop the community relations scope of work, provide input on the scope and budget for consultants, and provide information regarding the type of public involvement support needed.

11.2.1 Objectives of Public Involvement during 40-percent and 70-percent Design

- Provide information to assist the public in understanding the project, alternatives, and solutions.
- Provide opportunities for public feedback on potential facility locations (e.g., routes, problem areas, etc.), as appropriate.
- Provide opportunities for public feedback on facility design elements, such as site layout, aesthetics, architecture, and landscape design.

11.2.2 Objectives of Public Involvement during 95-percent and 100-percent Design

- Communicate project decisions to the community via fliers.

  Discuss and demonstrate how their feedback was or was not incorporated and why.

- Provide public information (e.g., fact sheets, graphics) to support the property acquisition and permitting processes, if necessary.
- Explain project details, possible construction impacts, and ways to minimize them, and establish communications channels, typically through a pre-construction meeting.

11.3 Project Stages during Design

11.3.1 Preliminary Engineering Report

Pre-design lasts through the 70-percent engineering design phase. During pre-design, the project need and purpose are identified. Examples of alternatives to be evaluated could include whether to repair a facility or replace it. It could also include where to site a new facility or how to manage storm water through the facility. During the pre-design process, a facility concept is selected. This includes the rough sizes and functional arrangement of roadway lanes and intersections.

During pre-design, soil and groundwater investigations, utility locations, and other fieldwork often occurs. This information is used during detailed design to determine roadway cross section requirements and construction methods.

The CPO should plan to conduct a meeting with the public during this phase of work to explain the project and what the city intends to do, including the project need and purpose, information about the configuration of the project, and a schedule of activities.

11.3.2 Role of the Community Relations Planner in Pre-design

During the pre-design phase, it is important to determine the need for public involvement. Some projects may be small in scope, and their impact on public activities is minor. For these, the need to have a public involvement task is low and may not be required. Other projects, however, may have significant impact and may require extensive public outreach to inform and solicit support for the proposed work. Public involvement for small non-controversial projects may be satisfied by contact with affected owners.

On significant projects, the CPO can refine information developed by the design consultant about the purpose and need for the project and can prepare the public to provide input and feedback on the design. Many basic design decisions are made during pre-design, particularly those related to route and basic site layout. Opportunities for input later in the design process are more limited.

At the end of the 40-percent design, the CPO should include a section in the resulting report that summarizes the information in the needs assessment and public involvement plan. Full copies of the needs assessment and public involvement plan should also be provided as appendices to the pre-design report.

As the project moves toward 70-percent, the concept developed during the 40-percent design is expanded. The scope of the project becomes fixed, as major construction elements are defined and the number of construction contracts and phasing are determined. Major drawings are drafted, and master specifications are determined.

Plans and specifications define the scope of the construction work. The environmental review is often conducted during this phase, after which the team can begin to apply for permits.

At this stage, the CPO can obtain feedback on exterior design elements, such as architectural details and landscaping plans. The planner should also work with the project team to develop responses to likely questions from the community about construction and potential operational impacts. Some type of community meeting is usually held early in this phase to get feedback from the public before final design.

Other tasks that occur during this phase typically include the following:

- obtain any necessary properties, permits, and easements;
- identify and address operations and maintenance, constructability, and risks;
- complete construction contract packaging (the number of contracts and phasing);
- develop construction cost estimates and schedule for budgeting and staffing; and
- hold community and neighborhood meetings and discussions with the city and permitting agencies.

The goals are to inform the public about the project, identify concerns, and develop ways to resolve them before the 70-percent design begins.

11.3.3 95- percent to 100-percent Design

At the 95-percent stage, drawings and specifications are essentially complete. Final permits and final easements are obtained, and final comments are incorporated. At 100 percent design, they are compiled into the bid document.

11.3.3.1 Role of the CPO in 100 Percent Design

During this stage, the CPO typically provides information to the public on the project status, how public input was incorporated, and the project's next steps: bid and award construction contracts and preparing for transition to construction. Once the design is complete, the bid package is advertised and a contractor is selected. The process of bid solicitation, bid evaluation, and contract awards typically takes about four months.

11.3.3.2 Role of the CPO in Transition to Construction

During this time, the CPO will develop a detailed plan for construction community relations and should provide a public information update to the community. As the project moves toward construction, the CPO will need to develop tools to rapidly communicate project construction information to directly impacted residents and businesses. Contact lists with phone numbers, e-mail lists, and door-to-door delivery maps are examples of such tools. An emergency communications plan and after hours contact list for project team members is also helpful.

11.4 Planning for Public Involvement

The first step in preparing to involve the public during the design phase is to become educated about the purpose and need for the project. CPOs should meet with the project team and review whatever relevant materials are available, including programmatic plans that may initially have defined the need for a project.

The next crucial step is to conduct an initial needs assessment (INA), followed by a full needs assessment (FNA), if needed. These and the draft public involvement plan (PIP) should be written during pre-design and should be prepared by the CPO. These are tools to determine and document the objectives and level of public involvement required for a project. The whole team should agree on the objectives before planning public involvement activities. Will the public have an opportunity to provide feedback on the roadway plan? Be involved in development of the design? How will the project team incorporate feedback? Answers to such questions will help define the role of the public in design, as well as the public involvement activities required.

11.4.1 Role of the CPO in the Environmental Review Process

The Environmental Management Division (EMD) is responsible for ensuring that the city meets the requirements of state and federal environmental policy. The CPO should work with the EMD to determine how public involvement can support that process.

The basic regulations require legal notice to agencies and property owners within 500 feet of the project. This notice is typically prepared by the design consultant. To support this, the CPO may prepare a flier explaining the permit review process or help compile a mailing list of interested groups and other appropriate parties who should receive notice. Official notices of public meetings and hearings must be advertised in local newspapers as part of the NEPA process. Public meetings and hearings require completion of a findings report. These official notices and reports are typically prepared by the EMD and its representatives.

11.4.2 Role of the CPO in Property Owner Interactions

Many projects require the city to obtain a construction or permanent easement or right-of- way from a property owner. The city may also have to obtain a right-of-entry permit to conduct surveying, geotechnical work, or other field investigations. The city's real property agents are responsible for this work. CPOs are sometimes asked to help with public contacts or to review written materials that explain the project in detail.

11.4.3 Role of the CPO in the Permitting Processes

The design consultant in conjunction with EMD is responsible for obtaining permits for projects. During permitting, the CPO's role is limited. In some cases, planners may be asked to help a real property agent prepare fact sheets or graphics to respond to a request from a permitting agency. Permitting can involve a number of local, state, and federal jurisdictions and covers such things as water quality, land use, erosion control, street use, noise, hours of operation, and traffic planning. Permits also specify conditions that must be met to minimize community impacts.

11.4.4 Role of the CPO in the Interface with Public Art

If the project is an aboveground capital improvement, 1 percent of the budget may be allocated for public art. The city coordinates the inclusion of public art by publishing a prospectus describing the project, the scope of the artist's involvement, and the schedule and budget.

The public art program also issues a call for artists and helps the artists work with the community. The CPO should stay in communication with selected artists to ensure the goals of the community are understood.

Working with an artist, the project team may decide to hold a public meeting to discuss the objectives of the public art program and how public art funding might be used. Such a meeting could be held in conjunction with other project goals, such as presenting 70-percent design plans, although the timing of these events may vary.

11.5 Implementing Public Involvement

A checklist for public involvement planning and implementation is provided in Table 11-1 below. The CPO should clarify the level of public involvement appropriate for the project to manage public expectations.

Table 11-1: Design Phase Public Involvement Checklist (			
Phase	**Description**	**Specific**	**Yes / No**
Pre-Design Phase	Review Existing Materials	Project description and plan	
		Plans or summaries from programmatic or public meetings	
		Initial needs assessment and full needs assessment	
	Meet with Project Team	Determine project knowns and unknowns	
		Identify when public input will be most helpful?	
		Identify any previous commitments made to the public regarding this project	

Table 11-1: Design Phase Public Involvement Checklist (continued)			
Phase	**Description**	**Specific**	**Yes / No**
		Identify who will answer technical questions	
	Develop a Public Involvement Plan	What are the topics for public input?	
		How will input be collected and used?	
		How will the team provide feedback to the public to let them know how their input was used?	
	40-Percent Design	Develop community relations section to report	
		Review environmental permit process to support public review	
		Support property owner interactions, if ROW to be acquired	
		Plan for interface regarding public art	
		Determine whether public meetings are needed	
	70-Percent Design	Document activities and community input	
		Support permitting and land owner interactions as needed	
	Transition to Construction	▪ Create a project design closeout folder and finalize the project file: • Public involvement plan • Newsletters, fliers, and other material distributed to the public • Correspondence • Public meetings hearings, and workshop summaries • Summary of community issues and responses ▪ Create a mailing list	
		Attend pre-construction conference with design team	
		Conduct pre-construction survey of residents	
		Hold preconstruction meeting with residents	

All communication about the project should be consistent and identifiable. For example, a project identity (such as a logo or nickname) could be developed for a project of long duration. For a shorter project with multiple public outreach tools, use a similar template across all pieces.

11.5.1 Newsletters and Fliers

Newsletters and/or fliers can be used to communicate information on the project's status to neighbors and other interested parties. Newsletters contain more detailed information, while fliers are useful for advance notice about specific impacts or brief updates that project milestones have been reached.

If there have been significant lulls or a long time has passed since previous interaction with the public, newsletters or fliers may be an appropriate way to update the community, as well as reach new members of the public not familiar with the project. One possible tool would be a "frequently asked questions" section in a newsletter.

It's important to be inclusive in the development of newsletters and fliers. Therefore, communications tools must be developed to automatically provide large-print and brailed formats. All public meetings must be held at ADA accessible sites, including the provision of sign language interpreters, if requested. All printed materials must inform of this availability.

11.5.2 Public Meetings

If the project team determines that a public meeting is necessary during the design phase, the timing should be carefully considered. The meeting should be held when design is far enough along to show structures, but not so far that input would be meaningless.

Frequently, meetings are held during development of 70-percent design plans, and public feedback is solicited on defined topics. It may be possible to hold the public meeting in conjunction with environmental review. Coordination with the relevant project team members will be necessary to determine overlap, schedule issues, and topics of the meeting. The design engineer should be prepared to attend these meetings to answer questions from the public and to support the meeting by providing exhibits for presentation.

11.5.3 Documentation

As the design activities conclude, it is crucial to document the status of the public involvement, especially the commitments the project team has made to the community or to individuals. Documentation should include the public involvement plan, summaries of public meetings, Advertisements for public meetings or hearings, and public meeting or hearing reports.

Concluding design phase public involvement includes preparation for construction phase public involvement and tailoring the public involvement plan to construction activities. The most important contribution to future public involvement efforts is to ensure that the commitments to the public are documented and that the bid documents include accurate descriptions of these commitments. The construction phase is governed by what is in the bid documents, so it is crucial for the CPO to have input into this process.

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Section 12 Cost Estimating

12.1 Purpose

The purpose of this section is to outline recommended procedures and establish minimum format standards for preparing engineer's estimates.

12.2 Introduction

The project cost estimate is an important component of the scope of work performed by the design consultant. Important decisions regarding scope and schedule are made based on the costs presented in the engineer's estimate, therefore, project costs should be developed and reviewed throughout the design phase so adjustments can be made to ensure the work will be delivered within financial expectations.

It's unreasonable to expect estimates made early in the design process to be precise, since these are made at a time when the least is known about the work. However, as the design continues and more becomes known, the accuracy of the estimate improves.

12.3 Preparing Engineer's Estimate

The critical review of a project's scope or a contractor's bid price depends on the purpose and reliability of the estimate. Therefore, the design consultant is strongly urged to employ the same level of detail in preparing estimates as does the contracting industry. The engineer's estimate should reflect the amount that the current contracting community considers fair and reasonable for performance of the work. Under-estimating causes project delay, while additional funding has to be arranged to meet the contract costs. On the other hand, over-estimating causes inefficient use of funds that could be directed to other projects.

There are two basic approaches to estimating project costs: stochastic methods and deterministic methods. In stochastic methods, the variables used in cost estimating are generally something other than a direct measure of the work. The cost estimating relationships are subjective, not exact. Deterministic methods, on the other hand, incorporate direct measurements of the work and are not subject to supposition. Generally, as the level of design increases, the estimating methodology moves from stochastic to deterministic.

Most estimates prepared for TCI will be deterministic, so stochastic methodologies will not be presented here.

12.4 Deterministic Estimating Method

Deterministic cost estimating is based on direct measurement of the work that is to be accomplished. Therefore, this method can be employed for preparing engineer's estimates when sufficient design has occurred to allow definition of the work. To this end, engineer estimates are required upon completion of the 40-percent design, 70-percent design, and 95-percent design. These estimates will comprise the following:

- descriptions of work elements to be accomplished (tasks)
- a quantity of work required for each task
- a cost for each task quantity

A unit cost for each task is developed to increase the accuracy of the estimating procedure and should provide a reference comparison to historic experience. For this reason, the descriptions of work elements used in the estimate must closely parallel those used in the bid items presented in the city's standard specifications. Non-standard work descriptions must be documented, so the work referenced is fully understood. The documentation must address not only material requirements, but must also quantify labor in terms of crew type, size, equipment, and production rates. Lump sum estimating, when used at the task level, must also be documented.

Estimate preparation is dependent upon the design consultant thoroughly understanding the project scope of work, the bid-ability, constructability, operability, and all other aspects of the project being estimated. The engineer must also know the drawings, specifications, and other references to formulate a construction sequence and duration. The construction sequence must be developed as soon as possible and should be used to provide a checklist of construction requirements throughout the cost estimating process.

The quantity "take-off" is an important part of the cost estimate. It must be as accurate as possible and should be based on available engineering and design data. After the scope has been analyzed and broken down into construction tasks, each task must be quantified prior to pricing. Equal emphasis should be placed on both accurate quantity calculation and accurate pricing. Quantities should be shown in standard units of measure and should be consistent with design units typically used in the city's standard specifications. In addition, quantities should be calculated by sheet, and quantity tables that identify the work on each plan and profile drawing.

The detail to which the quantities are prepared for each task is dependent on the level of design detail. Quantity calculations beyond design details are often necessary to determine a reasonable price to complete the overall scope of work for the cost estimate. Project notes will be added at the appropriate level in the estimate to explain the basis for the quantity calculations, to clearly show contingencies, and to note quantities determined by cost engineering judgment that will be reconciled upon design refinement.

In addition, see the following table for a list of contingencies expected during each design phase.

Table 12-1: Project Phase Contingency Ta	
Project Phase	**% Contingency**
PER/Scoping	20 – 30
40% Design	15 – 20
70% Design	10 – 15
95% Design	5 – 10
100% Design	0

12.4.1 Types of Costs

Various types of cost elements must be evaluated in detail. Direct costs are those which can be attributed to a single task of construction work. These are usually associated with a construction labor crew performing a task using specific materials. Labor foreman costs should normally be considered as direct costs. Subcontracted costs should be considered as direct costs to the prime contractor in estimates. Indirect costs are those which cannot be attributed to a single task of construction work. These include overhead, profit, and bond. Indirect costs are also referred to as distributed costs.

Estimates based on detailed design will be developed from separate direct cost pricing of labor, material, construction equipment, and supplies. Applicable indirect costs will be added later to reflect the total construction cost. Other costs, including lands and damages, escalation, design contingencies, and construction contingencies, construction supervision and administration, and engineering during construction, will be added to the construction cost to determine the total project cost according to program-specific requirements.

12.4.2 Price Sources

Various pricing sources should be obtained and be available to the design engineer. In using pricing from any source, experience and ability to relate data in hand to a specific circumstance is important. The following discussion is provided on commonly used cost sources and source development.

City Bid Tabulations (CBT): These are available from the TCI Department or the Department of Public Works. They contain repetitive construction tasks with direct cost pricing (labor, equipment, material) based on standard city bid items. The data are taken directly from bid openings for a variety of city projects. These data are historical and can be an excellent pricing source when adequate details have been saved. Before applying these costs to new work, the design engineer must understand the context in which the prices were determined and be satisfied that the conditions in the new project are similar, otherwise, adjustments must be made.

Development of specific tasks: When standard tasks do not meet project needs, specific new tasks need to be developed. Such development requires experience. Descriptions developed for new tasks must adequately define the scope and material requirement. Unit cost for each task is developed as a direct cost with separate costing for the labor, equipment, and material components. Notes which explain key factors in the pricing and methodology should accompany the task development. Comparison with existing pricing guides, such as RSMeans® data by Gordian, is recommended.

- *Labor unit cost*: This cost is based on a defined crew which performs the tasks at an assigned production rate. Hourly rates for each craft are applied to the crew labor to arrive at the hourly crew labor cost. The total crew labor cost/hour is divided by the expected production rate (units/hour) to derive the labor cost/unit.
- *Equipment unit cost*: This cost is derived similar to labor unit cost. Hourly equipment rates are obtained from an appropriate regional manual such as the United States Army Corps of Engineers manual entitled, "Construction Equipment Ownership and Operating Expense Schedule" (herein referenced as, Equipment Ownership Schedule), Engineer Pamphlet (EP) 1110-1-8.
- *Material unit cost*: This cost is developed using vendor quotes, historical costs, commercial pricing sources, or component calculations. The price should include delivery to the project site.

Commercial unit cost books: These common sources are typically available through subscription or purchase. Basis of costs shown are typically explained along with adjustment methodology. Such publications are valuable "second-opinion" verification and appropriate for minor commercial type work item pricing.

12.4.3 Costs and Pricing

The cost for each task should be developed by summing the direct cost elements for labor, equipment, and materials. Indirect costs and other markups associated with each task or work item should be identified and are considered separately for the specific project.

The direct cost of construction tasks of minor overall cost significance and of a repetitive nature can normally be priced from any of the sources discussed above. When using historical pricing, adjustments must be made for project location, work methodology, quantity of work, and other dissimilarities which affect prices.

Use of lump sum items is discouraged. If lump sum items are used in the estimate, they must have backup cost data relating to their tasks and source of the data. As a rule of thumb, when a task extended direct cost is $10,000 or more, or 5 percent of the total direct cost, whichever is less, detailed backup for the cost should be prepared or quotations obtained as pricing support to the cost estimate.

Applying the same rule of thumb, unit price bid items for city estimates may be based on suitable experienced bid prices or historical cost data, i.e., the predetermined bid item does not exceed $100,000, or 5 percent of the estimated total cost, whichever is less.

For cost estimates prepared during preliminary or planning phases, where design is limited or not available, predetermined unit prices, adjusted to current pricing level, may be used by the design engineer. Use of experienced prices should consider any necessary adjustments in prime contractor's profit or distributed costs appropriate to the contract requirements.

The design engineer must use extreme care and sound judgment when using predetermined or historical unit costs. The basis for the unit costs should be well documented and included in the supporting data for the estimate. Where a bid item consists primarily of equipment and labor costs, with very little materials and supplies, it is advisable to develop the cost as indicated above, even though the item may fall under this rule of thumb.

Inflation will be accounted for by the city manager. The design engineer will not include inflation factors in his or her estimates.

12.5 Composition of City Estimates

The city estimate prepared at 40-percent, 70-percent, and 95-percent should include the following primary elements: narrative of contract cost, estimate backup data, and miscellaneous support data.

12.5.1 Narrative of Contract Costs

This part of the estimate of construction cost describes the scope tasks and costing. It contains discussions, considerations, and the developed construction plan. The types of items normally included are:

- *Table of contents*: This page denotes the backup content.

- *Project narrative*: Providing general details of the project, the narrative defines the assumptions made during the preparation of the cost estimate. It describes the project requirements that must be performed in sufficient detail to give a clear understanding of the scope of work, and it describes project details including length, width, height, and shape of primary features; special problems that will be encountered in performing the work; site conditions affecting the work; reasons for the selection of equipment (if appropriate); method and time for mobilization and demobilization of all equipment; and the reasons for unusually high or low unit prices.

  Each estimate will include a statement that relates both the development of design, as appropriate, and date of effective pricing. Other factors to be considered in the project narrative include:

  - Construction schedule, use of overtime, construction windows, phasing, right- of-way acquisition plan, and subcontracting.
  - Project-related details include site access; borrow areas; construction methodology; unusual conditions (soil, water or weather); unique techniques of construction; equipment/labor availability and distance traveled; environmental concerns; contingencies by feature or sub-feature, if appropriate; and effective dates and sources for labor, equipment, and material pricing.

- *Construction Schedule*: The design engineer will prepare a construction schedule to support the cost estimate that is consistent with the schedule for completion of the project. It may be in the form of a bar chart or network analysis system and must identify the sequence and duration of the tasks upon which the cost estimate is developed. The schedule must be prepared in sufficient detail to adequately develop the required labor, equipment, crew sizes, and production rates required for each of the identified construction tasks.

- *Equipment and materials utilization*: On those projects involving considerable heavy construction equipment, it is necessary to sufficiently plan the equipment usage against the work schedule to identify the actual number of cranes and bulldozers and allow for proper mobilization, to assure that demand for the equipment is not over or understated. Materials which require long lead-time and can become critical to the construction schedule should be noted, planned, and adequately considered.

- *Labor discussion and utilization*: The estimate should clearly state the sources for the various labor classifications and rates and include tabulation by crafts of the various composite wage rates used. When extensive overtime beyond the normal workday is used in the estimate, an explanation should be included.

12.5.2 Estimate Backup Data

This part of the estimate comprises all the support and backup documentation. The various categories of support documentation are as follows:

- *Cost analysis summary sheets*: The summary sheets for direct, indirect, and owner costs are used to summarize cost components for each bid item and by the appropriate work breakdown structure. Distribution of overhead and profit is also shown on these sheets.
- *Mobilization, preparatory work, and demobilization*: These costs should be itemized and priced separately. These costs may be combined at summary level with overhead, if these costs are not paid as a separate bid item. This item may be shown as a lump sum on the bid schedule.
- *Profit computation sheet*: When profit is included, the weighted guidelines will be used to compute the profit and will be part of the cost estimate backup.
- *Overhead costs*: The itemization and calculations of overhead costs, both job site and home office, should be estimated and presented.
- *Bond costs*: Bond costs should be based on costs provided by bonding companies at the time the project estimate is made.
- *Production rates*: The details that are used to express production rate analysis of crews.
- *Crew, labor, equipment rates*: These details express the crew composition, and associated rates for labor and equipment costs. The information contained on these sheets provides the backup support for the task unit labor and equipment costs shown.
- *Quantity computations*: The quantity take-off computations should be organized by task for the bid items and kept as backup. The take-off should reference the drawing and clearly explain the computation.
- *Quotations*: Quotations should be collected and compiled by task or bid item into an organized reference. When quotations were not obtained for significant material and supply items, the basis for the cost used should be fully described. Quotations should be considered proprietary information and should be kept confidential to protect the information entrusted to the design engineer.

12.5.3 Miscellaneous Support Data

Include all other information pertinent to the estimate, such as drawings and sketches which were used as the basis of the cost estimate. Drawings may include a project map showing the location of the work with respect to principal cities and roads; a site map showing the location of the work; borrow, quarry, and spoil areas; and existing work access roads; any existing facilities usable by the contractor; a general plan and elevation or profile of the work with typical sections; and a construction layout.

12.5.4 Complete Streets

Project cost estimates shall include Complete Street components as determined appropriate and feasible. In instances where enhanced components (e.g. wider sidewalks, pedestrian refuge medians, or right-of-way acquisition solely for non-vehicular travel) are included, the costs shall be incorporated into the overall project costs. Such costs that can be directly attributed to implementation of Complete Streets shall also be tracked separately to allow for long-term assessment of cost factors associated with Complete Streets.

Section 13 Quality Assurance / Quality Control

13.1 Purpose

The objective of the QA/QC process is to provide successful projects that meet the project goals and budget through good planning and quality design. The plans should be clear, concise, understandable, constructible, and relatively error free. The QA/QC process also provides or sets out a mechanism by which all design documents will be subjected to a systematic and consistent review process resulting in a set of quality project plans that meet these criteria.

A secondary objective of the QA/QC process will be the creation of a documented audit trail of the design process.

This section of the Design Guidance Manual establishes processes to ensure that:

- the city's project requirements and goals are incorporated into the design documents
- projects are proceeding on schedule and within budget
- designs and design documents are being developed and prepared in conformance with the project work plan and the manual and that they are consistent with accepted industry standards
- consistency is provided with all plans developed for the city by use of the standards and guidelines set forth in the manual
- errors are detected and corrected through the implementation of quality controls, which include checking during all phases of the work
- all design decisions, instructions, issues, correspondence, and calculations are documented and preserved
- all parties or stakeholders are involved throughout the design process
- plans accurately and thoroughly present the existing project site and terrain features
- plans accurately and thoroughly present the proposed project features and details to be constructed

13.2 Definitions

Quality: The design and construction of a project that meets or exceeds the project goals and standards established for the project and is delivered within budget.

Quality Control (QC): Activities and tools required to control the design quality of a project. These activities include providing clear decisions and directions, constant supervision by experienced individuals, immediate review of completed work or tasks for accuracy, and completeness and accurate documentation of all decisions, assumptions, and recommendations.

Quality Assurance (QA): Activities and tools required to ensure an acceptable level of quality is provided by the design engineer. QA involves items such as constructability, function, and maintainability.

Quality Control Plan: A comprehensive written set of procedures and activities aimed at delivering projects that meet or exceed the city's expectations.

13.3 Requirements for Quality Control

The quality control process includes quality planning, training, constant supervision, and immediate review of completed work. Additionally, the quality control process should ensure that all plans are accurate, that they have properly prepared and coordinated, and that they have been reviewed and checked.

Quality control does not consist of a review after a project is completed, rather it is an ongoing process that is planned and must be carried out throughout the design process. Quality control is based on the belief that:

- quality control should ensure that the work is done correctly
- quality is achieved by focusing on preventing problems or errors
- quality is achieved by qualified individuals performing and supervising all work functions
- quality is achieved by providing proper training of personnel and ensuring that all personnel remain current on the knowledge and skills needed for their position
- quality is achieved through proper planning, coordination, supervision, technical direction, and clear understanding of the project's requirements and goals
- quality is verified through review of completed activities for accuracy and completeness
- the quality review process documents all decisions, directions, assumptions, and recommendations

The design engineer is ultimately responsible for the project designs and preparation of all construction documents and must ensure quality and adhere to established design policies, good engineering practice procedures, and standards and guidelines in the preparation and review of all design projects.

The city will review plans for compliance with policies and adherence to project goals, city and industry standards, procedures, and good engineering practice. This review by the city will not absolve the design engineer from his or her design responsibilities or limit professional liability.

13.3.1 Quality Assurance/Quality Control Plan

The QA/QC activities presented below represent the minimum requirements that should be included in a quality control plan. The design engineer is to develop a QC plan specifically tailored to his or her organization. The QC plans will be submitted to the city in conjunction with the fee proposal during contract negotiations. When the contract is executed the design engineer shall also post the QC plan to the COSA PRIMELink.

The Design Engineer's QA/QC plan should include, as a minimum, the following:

- project description, location, limits and minimum design criteria
- project deliverables and schedules
- organization chart showing responsibilities for design services and for quality control checks, which shall be conducted by an independent person qualified in the specific area of review
- communications plan outlining the protocol for all communications related to the project
- format and schedule for checking design reports, calculations, plans, and specifications for accuracy and completeness. The QA/QC plan should make provisions for review of reports, plans, specifications, and estimates provided by sub-consultants. The design engineer will be totally responsible for all sub-consultant's work as if it were the design engineer's own work.
- format and procedure for documenting all issues, design directions, design decisions, review comments, and review comment responses
- format and procedures for certifying that all requirements of the QA/QC plan have been met and that all comments and issues have been resolved to the satisfaction of the reviewer

13.3.2 Plan Submittals

All submittals will be checked prior to submission to the city for review. This review shall include, as a minimum, the following activities:

- compliance with project requirements
- compliance with design engineer's QA/QC plan
- technical accuracy and adequacy
- compatibility with other associated project documents
- compliance with previous review comments

The design engineer will be required to provide submittal requirement checklists with all submittals. The checklists are to be signed and dated by the design engineer and are for the purpose of documenting what items are included in the submitted. The checklists for each project phase are included in each of the various sections of the Design Guidance Manual. Submittals not accompanied by the checklists or with missing items will not be accepted and will be returned to the design engineer.

The checklists should not be considered as including all items necessary for review, but should be considered as guides to be expanded or reduced as necessary for each individual project. These checklists establish the minimum submittal requirements which must be met to satisfy the documentation requirements for each phase of the project.

13.3.3 QA/QC Certification

All design deliverables shall be accompanied by a QA/QC certification, which is the design engineer's confirmation to the city that the attached submittal:

- has been prepared and reviewed in accordance with the design firm's quality control policies, standards, and guidelines;
- has gone through a quality control checking process;
- conforms to the design requirement outlined in the project work plan; and
- was prepared in accordance with the criteria outlined in the manual.

A copy of this certification is included as Appendix 13A.

13.4 Quality Assurance

Quality assurance is used to ensure continued high standards of quality for all design projects. It provides tools and methods with which design engineers can manage and measure the quality and work product. Timely reviews are one method used to manage quality. These reviews will, in effect, be an audit of a design engineer's quality control. While quality control and quality assurance should be ongoing internal processes throughout the development of a project, the city will also be performing its own quality assurance on the design engineer's design submittals.

All projects will be reviewed at the 40-percent, 70-percent, 95-percent, and bid documents phases. If a project requires a preliminary engineering report phase, it will also require a review.

At each submittal stage, the city will review the submittals for the degree of completeness required by that phase, conformance with project goals, technical adequacy, schedule, and budget. The design engineer's submittals will be distributed by the city to all reviewers. The city will provide a date by which all comments are to be received from reviewers. It will be the responsibility of each reviewer to review the submittals in accordance with their area of expertise and return their comments to the project manager by the specified date. The city review shall be completing within 30 days of the date the design engineer's submittal is received.

Design submittals prepared for the project will be reviewed for conformance with the requirements, design criteria, and standards and guidelines required by COSA. At a minimum, the city will check:

- for conformance with the design criteria and project requirements outlined in the project work plan, including graphic standards (CAD standards), compatibility standards, and good plans preparation practice
- for completeness and clarity
- previous review comments to ensure they have been addressed and incorporated into the current submittal
- for coordination with other aspects of the project, i.e., structural, utilities, civil, traffic, right-of-way, etc., and with other associated project documents
- for coordination with project elements being developed or planned for development on adjacent projects

The design engineer will not rely on reviews by the COSA or its program manager as a part of the QC plan either formally or informally. The design engineer is expected to follow his or her own QC plans and accepted engineering practices.

13.4.1 Review Meetings

All QA/QC review comments provided to the design engineers will be on the review comment and resolution form, included as Appendix 13B. Comments from reviewers may include marked-up plans. It will be the responsibility of each reviewer to ensure that their comments are concise, clear, and to the point.

The city's project manager will be responsible to compile the comments on the review comment and resolution form. The city will provide the design engineer both an electronic copy on PRIMELink and a hardcopy of the review comment and resolution form and any marked-up plans. The city's review comments will also be posted on the COSA PRIMELink.

After the city's review comments have been compiled and transmitted to the design engineer, a design phase workshop (design review meeting) will be scheduled to be held within five days. The purpose of this workshop will be to discuss the review comments and address any project related concerns or issues. The proceedings of these workshops will be documented by the design engineer in the form of meeting minutes. In the event that review comments are received at the workshops, the design engineer will note these new review comments in the meeting minutes.

Within five days of the design phase workshop the design engineer is required to submit both meeting minutes and responses due prior to the next submittal. The design engineer's response to review comments shall be on the review comment and resolution form provided by the city. The design engineer will submit one hardcopy of his formal response along with all marked-up plans to the city. The design engineer shall also upload these items to the COSA PRIMELink.

The city's project manager will forward the design engineer's responses to the appropriate reviewer and will ensure that all comments and responses have been documented in the project files. It is the design engineer's responsibility to ensure that all comments are incorporated into the design plans.

13.4.2 Environmental Review

An environmental review will occur in all design phases. The purpose of this review is to identify environmental challenges that could potentially affect the project. Further assessments may be conducted to identify the environmental impact and its extent.

Both the design consultant and the EMD will work closely in the early stages of the design to avoid or minimize the environmental impact to the project. Plans may need to be modified to address these environmental issues and/or permits. The design consultant needs to coordinate and confirm with the EMD that all environmental issues have been addressed in accordance with federal, state and local regulations and requirements.

13.4.3 Right-of-Way Review

A right-of-way review will occur at the 40-percent phase. The purpose of this review is to allow input to assist the Real Estate Section in commencing process for acquiring easements or right-of-way necessary to construct the project.

13.4.4 Constructability Review

If required, a constructability review will occur at the 70-percent phase. The constructability review is intended to save on project costs, anticipate and mitigate field problems, minimize potential change orders, improve the overall project design and timeline, and still achieve the design engineer's intent. Some of the items to be considered include scheduling requirements, construction sequencing, phase conflicts, completeness and clarity, errors, omissions, inconsistencies, construction methods, and construction materials fabrication requirements. The constructability reviews comments will be discussed at the 70-percent design workshop.

13.4.5 Construction Phase QA/QC

The QA/QC will ensure that the project is constructed in accordance with the construction documents, that the construction budget is monitored and controlled, and that construction inspection and observation is preformed to monitor construction quality.

The activities to be performed by the design engineer during the construction phase will be outlined in the project work plan. The design engineer shall respond to all inquiries and reviews in a timely fashion or within the time frames spelled out in the contract documents.

13.4.6 Construction Phase Documentation

All construction phase project documentation shall be provided to the appropriate parties in hardcopy and posted on the COSA PRIMELink.

Written correspondence: All written correspondence to the contractor shall be signed by the city's project manager and transmitted to the contractor by the city construction representative.

Submittals logs: All required project submittals and submittal logs shall be posted on the COSA PRIMELink. Appropriate parties responsible for reviewing these submittals shall be notified that a submittal has been posted and is available for review. Submittal logs for shop drawings, requests for information, change order requests, and change orders should be maintained. These logs shall document the submittal number, submittal date, submittal description, response date, disposition of submittal, and whether the submittal has been closed or further action is pending.

Meeting minutes: All meeting shall be documented and meeting minutes prepared and distributed to all attendees for review. If there are any discrepancies in the meeting minutes, the preparer of the meeting minutes shall be notified and appropriate revisions made or exceptions noted in revised meeting minutes.

Telephone conversations records: All telephone conversations related to the construction of the project shall be documented. These telephone records will serve to document items or issues discussed, dates of telephone conversations, and parties involved.

Periodic construction observation report: The design engineer shall prepare construction observation reports of all visits. These reports shall as a minimum have the following information:

- project name
- contractor name
- report date
- site conditions (i.e., wet, dry, etc.)
- summary of work observed a location of work
- summary of traffic control and phasing
- description of work compliance with construction plans
- general comments
  - noted deviations from plans and specifications
  - summary of conservations with city's construction representative, contractor, subcontractors, suppliers, property owners, or any other parties associated with the project
- consultant name, signature, and date

The construction observation report is included as Appendix 13C.

13.4.7 Project Closeout

If required by the project work plan, a post-construction workshop will be held with the design engineer, construction field inspector, and city staff. This workshop will document the quality and accuracy of the construction plans and any construction issues. This feedback will then be provided to the city's project manager to serve as lessons learned. These memos will be compiled, categorized, and distributed to the various departments to serve as a knowledge data base from which to update the Design Guidance Manual and improve the quality of future construction plans.

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Appendix 1A Introduction

1A.1 Appendix Numbering Convention

The appendices in this manual are numbered according to the section to which they apply.

For example, an appendix displaying information regarding constraints in design is named *Appendix 15C: Design Constraints*.

- *Appendix 15* tells you that the information in this appendix directly effects the information in Section 15: Design.

  Not all sections have an appendix. Section 22, for example, does not require appendices. Therefore, you would see ***–no–*** appendix labeled *Appendix 22A*.

- *C* indicates this is the third appendix to reference Section 15.

  Some sections have numerous appendices. Section 15, for example, requires four appendices. Therefore, you would see the following listings:

  - Appendix 15A: Design Requirements
  - Appendix 15B: Design Form
  - *Appendix 15C: Design Constraints*
  - Appendix 15D: Design Report

- *Design Constraints* tells you the title of the appendix, as well as the topic (how it applies to Section 15).

1A.2 Appendix List

Table 13-1: Appendices - Sections, Numbers, and Titles (c		
Section	**No.**	**Title**
Section 2: Project Management and Administration		
2	A	Civil Engineering Contract Template
2	B	City of San Antonio Design Summary Report
2	C	City of San Antonio Capital Improvement Projects Generalized Scope of Services
2	D	Project Work Plan
2	E	Construction Contract
2	F	Bidding Process
2	G	Variance Letter
2	H	Plan of Record (As-Builts) Submittal Requirements
Section 3: Surveying and Mapping		
3	A	Survey Example
3	B	Standard Feature Codes
3	C	Control Sheet Example
Section 5: Utility Coordination		
5	A	Utility Points of Contact
5	B	Utility Conflict Matrix
5	C	CPS – Things to Consider

Table 13-1: Appendices - Sections, Numbers, and Titles (continued)		
Section	No.	Title
Section 7: Roadway, Bicycle, and Pedestrian Design		
7	A	Preliminary Design Conference
7	B	Preliminary Engineering Report Checklist
7	C	City of San Antonio TCI 40% Design Checklist
7	D	City of San Antonio TCI 70% Design Checklist
7	E	City of San Antonio TCI 95% Design Checklist
7	F	City of San Antonio TCI Bid Phase Checklist
7	G	Complete Streets Assessment & Field Analysis Checklist
Section 8: Environmental Coordination & Permitting		
8	A	Permitting Contacts
Section 10: Geotechnical Services		
10	A	City of San Antonio Pavement Design Standards
Section 13: Quality Assurance / Quality Control		
13	A	City of San Antonio QA / QC Certification Form
13	B	City of San Antonio Review Comment & Resolution Form
13	C	Periodic Construction Observation Report

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Appendix 2A Civil Engineering Contract Template

2A.1 Introduction

The Civil Engineering Design Services Contract document can be located at:

http://www.sanantonio.gov/TCI/Contract-Opportunities/Contract-Documents

The static document displayed below is dated May 2017. For the most up-to-date version of the document, please download the PDF file from the TCI Contract Documents site.

2A.2 Civil Engineering Design Services Contract

EXHIBIT A

PROFESSIONAL SERVICES AGREEMENT

STATE OF TEXAS

COUNTY OF BEXAR

OF SAN ANTONIO

CIVIL ENGINEERING DESIGN SERVICES

FOR THE _______________________________ PROJECT

(PROJECT NUMBER XX-XXXXX)

This Agreement is made and entered into in San Antonio, Bexar County, Texas, between City of San Antonio, a Municipal Corporation in the State of Texas (hereafter referred to as "City") and

____

____

____

an Engineer duly licensed and practicing under the laws of the State of Texas **(**hereafter referred to as "Consultant") (City and Consultant hereafter individually referred to as "a Party" and collectively referred to as "the Parties"), said Agreement being executed by City pursuant to City Charter, Ordinances and Resolutions of the San Antonio City Council, and by Consultant for **CIVIL ENGINEERING DESIGN SERVICES** set forth herein in connection with the above designated Project for City.

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ARTICLE I. DEFINITIONS

As used in this Agreement, the following terms shall have meanings as set out below:

I.1 **"AGREEMENT"** is this written document signed by City and Consultant, including any other document itemized and expressly referenced in, or attached to, and expressly made part of this Agreement, to include Consultant's proposal, to the extent accepted by City and not in conflict with the **ARTICLES** of this Agreement: Scope of Services **– EXHIBIT A;** Schedule of Project Services - **EXHIBIT B;** Additional Services - **EXHIBIT C;** SBEDA Subconsultant/Supplier Utilization Plan and SBEDA Ordinance Compliance and Provision - **EXHIBIT D**; General Conditions for City of San Antonio Construction Projects **– EXHIBIT E**; Form 1295 **– EXHIBIT F**; and any issued Addenda **– EXHIBIT G**.

I.2 **"APPLICATION FOR COMPENSATION"** means written form for a request from Consultant to be paid for completed work.

I.3 **"AMENDMENT"** is a written modification of the Contract prepared by City or Consultant and signed by City and Consultant (and approved by the San Antonio City Council, if required) which authorizes an addition, deletion or revision in the Scope of Services or an adjustment in the Contract Sum or the Contract Times and is issued on or after the Effective Date of the Agreement.

I.4 **"CCMS"** means City's Contract Management System whereby payments made by Consultants to, and confirmed by, Sub-Consultants, pursuant to this Project, are entered by Consultants and Sub-Consultants and which are monitored by City for compliance.

I.5 **"CITY"** means City of San Antonio, Texas.

I.6 **"CLAIM"** is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of this Agreement terms, payment of money and/or extension of time or other relief, with respect to the terms of this Agreement. The term "Claim" also includes other disputes and matters in question between City and Consultant arising out of, or relating to, this Agreement.

I.7 **"COMPENSATION"** means amounts paid for services under this Agreement.

I.8 **"CONSULTANT"** means_________________and its officers, partners, employees, agents and representatives, and all Sub-Consultants, if any, as well as all other persons or entities for which Consultant legally is responsible.

I.9 **"DIRECTOR"** means the Director of City's Transportation and Capital Improvements Department (hereafter referred to as "TCI") or his/her designee.

I.10 **"OWNER DESIGNATED REPRESENTATIVE (ODR)"** means a person designated by City to act for City.

I.11 **"PLANS AND SPECIFICATIONS"** means the construction documents.

I.12 **"PRIME*LINK*"** means City's internet-based, project management software for approving Task Orders and Applications for Compensation.

I.13 **"PROJECT"** means the capital improvement/construction development undertaking of City.

I.14 **"PROPOSAL"** means Consultant's Proposal to provide services for this Project.

I. 15 **"PROPOSED TASK ORDER REQUEST"** means a request to Consultant to submit a Proposal for a specific Project as further defined herein.

I.16 **"SAMSA"** means the San Antonio Metropolitan Statistical Area or Relevant Marketplace, which collectively is comprised of Bexar County and the seven (7) surrounding counties of Atascosa, Bandera, Comal, Guadalupe, Kendall, Medina and Wilson.

I.17 **"PROJECT MANAGEMENT TEAM"** means the assigned City staff overseeing the management of the Project. The Project Management Team typically includes a Project Manager and his or her staff.

I.18 **"DESIGN GUIDANCE MANUAL (DGM)"** means the document that instructs design engineers on the procedures and formats to be followed in the design of capital improvement projects for the City of San Antonio. The DGM provides minimum standards for the project development process and deliverables.

END OF ARTICLE I

ARTICLE II. COMPENSATION

II.1 The Compensation for all services included in this Agreement and in the Scope of Services for this Agreement shall not exceed______________________________**DOLLARS, ($XXX,XXX.XX).** The amount to be paid to Consultant, including authorized adjustments, is the total amount payable by City to Consultant for performance of the Services under this Agreement. It is agreed and understood such amount shall constitute full compensation to Consultant for Services included in the Scope of Services and shall meet all applicable requirements of City's Design Guidelines. Unless and until City makes further appropriations for any additional services not included in the Scope of Services of this Agreement, the obligation of City to Consultant for Compensation in connection with this Agreement cannot and shall not exceed such sum of _________________________________ **DOLLARS, ($XXX,XXX.XX)** without further amendment to this Agreement.

II.2 REIMBURSABLE EXPENSES

When authorized by City in writing, the Consultant shall be entitled to reimbursement at actual incurred cost for services and related expenses for the following items:

II.2.1 Travel outside SAMSA only if approved in writing by City prior to such travel. Reimbursement for travel costs shall be limited to costs directly associated with Consultant's performance of Service under the Agreement. Travel costs are limited to the per diem rates set annually by the Federal Government's General Services Administration. Consultant shall provide detailed receipts for all reimbursable charges. Travel expenses, if any, shall be negotiated with each Task Order issued. City does not pay for Consultant's travel within SAMSA.

II.2.2 Mailing, courier services and copies of documents requested by City in writing in excess of the copies to be provided under **ARTICLE IV** of this Agreement. These costs, if any, shall not exceed the amount noted in Article IV herein, without further approval of City. Consultant shall bear these costs unless agreed to, in writing, by City.

II.2.3 Graphics, physical models, and presentation boards requested by City in writing in excess of the copies to be provided under **ARTICLE IV** of this Agreement. These costs shall not exceed the amount noted in **ARTICLE IV** without further approval of City. Consultant shall bear these costs unless agreed to, in writing, by City.

II.2.4 City does not allow a markup on any of the above reimbursable items and only shall reimburse approved hard costs incurred.

II.2.5 SUB-CONSULTANT WORK

City shall not pay a markup to Consultant for Sub-Consultant work. However, for additional services performed by Sub-Consultants as a direct pass through, Consultants are permitted up to a 5% markup for Sub-Consultant management costs subject to approval by the City.

END OF ARTICLE II

ARTICLE III. METHOD OF PAYMENT

III.1 Payments to Consultant shall be in the amount shown on the invoices and its supporting documentation submitted, and shall be subject to City's approval. All services shall be performed in accordance with the professional standard of care set forth in **ARTICLE XX.1** and to City's satisfaction, which satisfaction shall be judged by the Director in his/her sole discretion, and City shall not be liable for any payment under this Agreement for services which are unsatisfactory and which previously have not been approved by the Director. The final payment due hereunder shall not be paid until all reports, data and documents have been submitted, received, accepted and approved by City.

III.1.1 Payment may be made based solely on the units of services completed and approved by City and the associated unit price for such service, as may be described in Compensation for Additional Professional Services (attached hereto, incorporated by reference herein and labeled as "**EXHIBIT A"**).

III.1.2 Monthly payments for services performed in the various additional services shall be reviewed by Director upon Consultant entering itemized invoices, with all required back-up, within **PRIME*Link***. The invoice shall indicate the value of the additional services performed to date.

III.2 Consultant shall, within ten (10) calendar days following receipt of Compensation from City, pay all bills for services performed and furnished by Sub-Consultants, in connection with the Project and the performance of the work, and shall provide City with evidence of such payment through City's electronic Contract Management System ("CCMS"). Consultant's failure to make payments within such time shall constitute a material breach of this Agreement, unless Consultant is able to demonstrate to City bona fide disputes associated with the unpaid Sub-Consultant and its services. Consultant shall include a provision in each of its sub-agreements imposing the same payment obligations on the Sub-Consultants as are applicable to Consultant hereunder, and shall require Sub-Consultants to provide confirmation to City of receipt of payments through CCMS. If Consultant has failed to make payment promptly to the Sub-Consultant for the Services for which City has made payment to Consultant, City shall be entitled to withhold payment to Consultant to the extent necessary to protect City except in the event of a valid dispute between Consultant and that Sub-Consultant.

III.3 Consultant warrants title to all Services covered by an Application for Payment shall pass to City no later than the time of payment. Consultant further warrants, upon submittal of an Application for Compensation, all Services for which Applications for Compensation have been previously issued and payments received from City shall, to the best of Consultant's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrance in favor of Consultant or other persons or entities making a claim by reason of having provided labor or services relating to this Agreement. **CONSULTANT SHALL INDEMNIFY AND HOLD CITY HARMLESS FROM ANY LIENS, CLAIMS, SECURITY INTEREST OR ENCUMBRANCES FILED BY ANYONE CLAIMING BY, THROUGH OR UNDER THE ITEMS COVERED**

BY PAYMENTS MADE BY CITY TO CONSULTANT.

III.4 Consultant may submit a request for Partial Compensation prior to the completion of services. A request for Partial Compensation must be accompanied by a progress report detailing the Services performed. Any partial payment made shall be in proportion to the Services performed, as reflected in the progress report and approved by the City. Partial payments are subject to the following:

III.4.1 Prior to submittal of the current design phase, partial payments cannot exceed 70% of the allocated fee for the current design phase.

III.4.2 Upon submittal of the current design phase, partial payment may be requested up to 90% of the allocated fee for the current design phase.

III.4.3 100% of the allocated fee for the current design phase may be requested upon approval of that design phase.

Compensation also may be made based solely on the tasks and services completed and approved by City and the associated unit price for each Service/Project, as may be described in fee schedule and/or hourly rates included in **"EXHIBIT A"** hereto.

III.5 Project Close Out and Final Payment:

III.5.1 Final billing shall indicate "Final Bill - no additional compensation is due to Consultant".

III.5.2 City may withhold compensation to such extent as may be necessary, in City's opinion, to protect City from damage or loss for which Consultant is responsible, because of:

a. Delays in the performance of Consultant's work;

b. Third-party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to City is provided by Consultant;

c. Failure of Consultant to make payments properly to Sub-Consultants or vendors for labor, materials or equipment;

d. Reasonable evidence Consultant's work cannot be completed for the amount unpaid under this Agreement;

e. Damage to City; or

f. Persistent failure by Consultant to carry out the performance of its services in accordance with this Agreement.

III.5.3 When the above reasons for withholding are removed or remedied by Consultant, compensation of the amount withheld shall be made within a reasonable time. City shall not be deemed in default by reason of withholding compensation as provided for in this **ARTICLE III**.

a. In the event of any dispute(s) between the Parties, regarding the amount properly compensable for any Phase or as final compensation, or regarding any amount that may be withheld by City, Consultant shall be required to make a claim pursuant to and in accordance with the terms of this Agreement and follow the procedures provided herein for the resolution of such dispute. In the event Consultant does not initiate and follow the claims procedures provided in this Agreement in a timely manner and as required by the terms thereof, any such claim shall be waived.

b. City shall make final compensation of all sums due Consultant not more than thirty (30) calendar days after Consultant's execution and delivery of a final Pay Application.

c. Request of final compensation by Consultant shall constitute a waiver of claims except those previously made in writing and identified by Consultant as unsettled at the time of final application for compensation.

d. Consultant agrees to maintain adequate books, payrolls and records satisfactory to City in connection with any and all Services performed hereunder. Consultant agrees to retain all such books, payrolls and records (including data stored in computer) for a period of not less than four (4) years after completion of Services or the termination of this Agreement, unless there is an ongoing dispute under the contract; then, such retention period shall extend until final resolution of the dispute. At all reasonable times, City and its duly authorized representatives shall have access to all personnel of Consultant and all such books, payrolls and records, and shall have the right to audit same.

III.5.4 INTERNET-BASED PROJECT MANAGEMENT SYSTEM

City shall administer its services through an Internet-Based Project Management System (hereafter referred to as "PRIMELink"). In such case, Consultant shall conduct communication through PRIMELink and perform all Project-related functions utilizing PRIMELink, with the exception of Sub-Consultant payment monitoring activities through CCMS. This includes correspondence, submittals, requests for information, vouchers, compensation requests and processing, amendment, change orders and other administrative activities. City shall administer the PRIMELink software, shall provide PRIMELink training to Project

Team Members and shall make the software accessible via the Internet to all necessary Project Team Members. All invoices shall be submitted through PRIMELink.

END IF ARTICLE III

ARTICLE IV. SCOPE OF SERVICES

[SUBJECT TO REVISION AS APPLICABLE]

IV.1 Consultant shall provide Engineering Services and include in its Scope of Services all associated services required for Consultant to provide such Services pursuant to this Agreement, along with all Services which normally would be required by law or common due diligent practice.

IV.2 Consultant shall comply with the standards of City’s Design Guidance Manual throughout the duration of the subject Project and this Agreement, unless specifically and explicitly excluded from doing so in the approved Scope of Services attached hereto, incorporated by reference herein and labeled as “**EXHIBIT C”** and as described in this **ARTICLE IV**.

IV.3 Consultant shall adhere to the requirements of the design phases described in City’s Design Guidance Manual, to include performing the tasks and submitting deliverables as described therein, unless specifically and explicitly excluded in the approved Scope of Service in **“EXHIBIT C”** hereto and as described in this **ARTICLE IV.**

IV.4 Consultant acknowledges and accepts its responsibilities, as defined and described in City’s General Conditions for City of San Antonio Construction Contracts, attached hereto, incorporated by reference herein and labeled as “**EXHIBIT D”**.

IV.5 Consultant shall provide all labor, equipment and transportation necessary to complete all services agreed to hereunder in a timely manner throughout the term of the Contract. Additionally, Consultant shall provide staff for regular, overtime, night, weekend and holiday service, as requested by City. Persons retained by Consultant to perform work pursuant to this Agreement shall be employees or subcontractors of Consultant.

IV.6 Consultant shall not commence service on any Task Order authorized under this Agreement until being thoroughly briefed on the scope of the project and being notified in writing to proceed. Should the scope subsequently change, either Consultant or City may request a review of the anticipated services, with an appropriate adjustment in compensation.

IV.7 Consultant, in consideration for the compensation herein described, shall render the professional services described in this **ARTICLE IV** necessary for the advancement of the Project through Substantial Completion to Final Completion.

IV.8 Consultant shall perform its obligations under this Agreement in accordance with the Scope of Services outlined herein and in accordance with the Compensation for Additional Professional Services, attached and incorporated herein and labeled as **“EXHIBIT C"**. The Scope of Services fully shall be described in Consultant's Proposal, as revised in accordance with negotiations with and approval by City for each authorized service task and as provided in this Agreement.

IV.9 Compensation for Additional Professional Services, which includes pre-priced tasks and/or hourly rates, is described in **"EXHIBIT A"** hereto. Consultant may submit a request for Partial Compensation prior to the completion of Additional Professional Services. A request for Partial Compensation must be accompanied by a progress report detailing the Additional Professional Services performed. Any partial payment made shall be in proportion to the Additional Professional Services performed, as reflected in the progress report and approved by the City.

IV.10 For each design phase submittal, Consultant shall submit the required number and type of deliverables as defined in the Design Guidance Manual, addressed to the City's Project Management Team, for use by City.

IV.11 Prior to the actual printing of the final Construction Documents (the Project Plans and Specifications), one (1) advance copy shall be submitted to City. Upon review and approval of said Construction Documents (hereafter referred to as "CDs"), Consultant shall provide and submit same to City as follows:

IV.11.1 Consultant shall submit the required number and type of Construction Documents as defined in the Design Guidance Manual and the General Conditions for City of San Antonio Construction Contracts, addressed to the City's Project Management Team, for use by City. In addition, Consultant shall submit the required number and type of Construction Documents to the Contractor for use by the Contractor as defined in the General Conditions for City of San Antonio Construction Contracts.

IV.11.2 Consultant further shall deliver digital and/or print copies of the final City-accepted CDs to plan rooms during the bidding process. A listing of plan rooms will be provided by the City.

IV.11.3 Consultant accepts and agrees at Project closeout that Consultant is responsible for and shall post the Project's As-Built final Plans and Specifications to City's Internet-Based Project Management System.

END OF ARTICLE IV

ARTICLE V. TIME AND PERIOD OF SERVICE

V.1 The term of this Agreement shall commence upon its approval by the San Antonio City Council and its execution by both Parties.

V.2 Time is of the essence for this Agreement. Consultant shall perform and complete its obligations for the services under **ARTICLE IV** in a prompt and continuous manner, so as to not delay the development of services and so as to not delay the construction of the work for the Project, in accordance with the schedules approved by City. City shall perform its obligations of review and approval in a prompt and continuous manner so as to not delay the Project.

V.3 Consultant shall not be liable or responsible for any delays due to strikes, riots, acts of God, national emergency, acts of the public enemy, governmental restrictions, laws or regulations, or any other causes beyond Consultant's reasonable control. Within twenty one (21) calendar days from the occurrence of any event, for which time for performance by Consultant shall be significantly extended under this provision, Consultant shall give written notice thereof to City stating the reason for such extension and the actual or estimated time thereof. If City determines Consultant is responsible for the need for extended time, City shall have the right to make a Claim as provided in this Agreement.

V.IV This Agreement shall remain in force for a period which may reasonably be required for the design, award of the contract and the completion of the Project, including any extra work and any required extensions thereto, unless terminated, as provided for elsewhere in this Agreement.

END OF ARTICLE V

ARTICLE VI. (RESERVED)

END OF ARTICLE VI

ARTICLE VII COORDINATION WITH CITY

VII.1 Consultant shall hold periodic conferences with City through the end of the Project. The Project shall have the full benefit of City's experience and knowledge of existing needs and facilities and be consistent with City's current policies and standards. To assist Consultant in this coordination, City shall make available, for Consultant's use in planning and designing the Project, all existing plans, maps, statistics, computations and other data in City's possession, relative to existing facilities and to this particular Project, at no cost to Consultant. However, any and all such information shall remain the property of City and shall be returned by Consultant to City upon termination or the completion of the Project or if instructed to do so by the Director.

VII.2 The Director or his/her representative shall act on behalf of City, with respect to the services to be performed under this Agreement. The Director shall have complete authority to transmit instructions, receive information and interpret and define City's policies and decisions, with respect to materials, equipment, elements and systems pertinent to Consultant's services.

VII.3 City promptly shall give written notice to Consultant whenever City observes, discovers or otherwise becomes aware of any defect in Consultant's services, or any development affecting the scope or timing of Consultant's services.

VII.4 Unless otherwise required by City, City shall furnish approvals and permits from all governmental authorities having jurisdiction over the Project and other such approvals and consents from others, as may be necessary, for the completion of the Project. Consultant shall provide City reasonable assistance in connection with such approvals and permits, such as the furnishing of data compiled by Consultant pursuant to other provisions of the Agreement, but Consultant shall not be obligated to develop additional data, prepare extensive reports or appear at hearings or the like unless compensated therefore under other provisions of this Agreement.

END OF ARTICLE VII

ARTICLE VIII. REVISIONS TO DOCUMENTS

VIII.1 Consultant shall make, without expense to City, such revisions to the drawings, reports or other documents, as may be required to meet the needs of City and which are within its Scope of Services. After the written approval by City of drawings, reports or other documents at the end of each phase of Services, any revisions, additions or other modifications made at City's request, which involve extra services and expenses to Consultant, shall require an Amendment to incorporate such services and associated compensation into this Agreement.

VIII.2 Any Amendments must be approved in writing by City prior to commencing work.

VIII.3 Revisions to the drawings, reports, or other documents, including additional submittals, that result from the Consultant not complying with the requirements of the Design Guidance Manual or not adhering to a level of quality consistent with the degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances shall be made at no additional expense to the City.

END OF ARTICLE VIII

ARTICLE IX. OWNERSHIP OF DOCUMENTS

IX.1 All documents, including the original drawings, estimates, specifications and all other documents and data, previously owned by Consultant, shall remain the property of Consultant as instruments of service. However, it is to be understood City shall have free access to all such information and hold the right to make and retain copies of drawings, estimates, specifications and all other documents and data. Any reuse, without specific written verification or adaptation by Consultant, shall be at City's sole risk and without liability or legal exposure to Consultant.

IX.2 Consultant acknowledges and agrees, upon payment, City exclusively shall own any and all information in whatsoever form and character produced and/or maintained in accordance with, pursuant to or as a result of this Agreement and said information shall be used as City desires. Any and all documents, including the original drawings, estimates, specifications and all other documents and data, shall be delivered to City at no additional cost to City, upon request, termination or completion of this Agreement without restriction on future use.

IX.3 Consultant agrees and covenants to protect any and all proprietary rights of City in any materials provided to Consultant. Such protection of proprietary rights by Consultant shall include, but not be limited to, the inclusion in any copy intended for publication of copyright mark reserving all rights to City. Additionally, any materials provided to Consultant by City shall not be released to any third party without the consent of City and shall be returned intact to City upon termination or completion of this Agreement or if instructed to do so by the Director.

IX.4 Consultant hereby assigns all statutory and common law copyrights to any copyrightable work that, in part or in whole, was produced from this Agreement is the property of City, including all equitable rights. No reports, maps, documents or other copyrightable works, produced in whole or in part by this Agreement, shall be subject of an application for copyright by Consultant. All reports, maps, project logos, drawings or other copyrightable work produced under this Agreement shall become the property of City (excluding any instrument of services, unless otherwise specified herein). Consultant shall, at its own expense, defend all suits or proceedings instituted against City and pay any award of damages or loss resulting from an injunction against City, insofar as the same are based on any claim materials or work provided under this Agreement constitute an infringement of any patent, trade secret, trademark, copyright or other intellectual property rights.

IX.5 Consultant may make copies of any and all documents and items for its files. Consultant shall have no liability for changes made to or use of the drawings, specifications and other documents by City, other Consultants and/or engineers and/or other persons, subsequent to the completion of the Project. City requires Consultant appropriately mark all changes or modifications on all drawings, specifications and other documents by other Engineers or other persons, including electronic copies, subsequent to the Final Completion of the

Project. Following Final Completion of the Project, if City requests Consultant perform additional scope beyond that listed in "**EXHIBIT C"** hereto, City appropriately shall compensate Consultant for such additional scope work performed by Consultant.

IX.6 Copies of documents, which may be relied upon by City, are limited to the printed copies (also known as hard copies) and PDF electronic versions sealed and signed by Consultant. Files in editable electronic media format of text, data, graphics or other types, (such as DWG or DGN) furnished by Consultant to City or utility only are for convenience of City or utility. Any conclusion or information obtained or derived from such electronic files shall be at the user's sole risk.

IX.7 Notwithstanding anything to the contrary contained herein, all previously owned intellectual property of Consultant, including but not limited to, any computer software (object code and source code), tools, systems, equipment or other information used by Consultant or its suppliers in the course of delivering the Services hereunder, and any know-how, methodologies or processes used by Consultant, to provide the services or protect deliverables to City, including without limitation, all copyrights, trademarks, patents, trade secrets and any other proprietary rights inherent therein and appurtenant thereto, shall remain the sole and exclusive property of Consultant or its suppliers.

END OF ARTICLE IX

ARTICLE X. TERMINATION AND/OR SUSPENSION OF SERVICES

X.1 RIGHT OF EITHER PARTY TO TERMINATE FOR DEFAULT

X.1.1 This Agreement may be terminated by either Party for substantial failure by the other Party to perform, through no fault of the terminating Party, in accordance with the terms of this Agreement and a failure to cure as provided in this **ARTICLE X**.

X.1.2 The Party not in default must issue a written and signed Notice of Termination, citing this **ARTICLE X.1.2**, to the other Party declaring the other Party to be in default and stating the reason(s) why it is in default. Upon receipt of such written Notice of Default, the Party in receipt shall have a period of ten (10) calendar days to cure any failure to perform under this Agreement. Upon the completion of said ten-day period, commencing upon receipt of Notice of Termination, if such Party has not cured any failure to perform, such termination shall become effective without further written notice.

X.2 RIGHT OF CITY TO TERMINATE

City reserves the right to terminate this Agreement, for reasons other than substantial failure by Consultant to perform, by issuing a signed Notice of Termination, citing this **ARTICLE X.2**, which shall take effect on the twentieth (20^{th}) calendar day following receipt of said notice or upon the scheduled completion date of the performance phase in which Consultant then currently is working, whichever effective termination date occurs first.

X.3 RIGHT OF CITY TO SUSPEND GIVING RISE TO RIGHT OF CONSULTANT TO TERMINATE

X.3.1 City reserves the right to suspend this Agreement at the end of any phase for the convenience of City by issuing a written and signed Notice of Suspension, citing this **ARTICLE X.3.1**, which shall outline the reasons for the suspension and the expected duration of the suspension, but such expected duration shall, in no way, guarantee what the total number of calendar days of suspension shall occur. Such suspension shall take effect immediately upon receipt of said Notice of Suspension by the Consultant.

X.3.2 Consultant hereby is given the right to terminate this Agreement in the event such suspension extends for a period in excess of one hundred twenty (120) calendar days. Consultant may exercise this right to terminate by issuing a signed, written Notice of Termination, citing this **ARTICLE X.3.2**, to City after the expiration of one hundred twenty (120) calendar days from the effective date of the suspension. Termination, pursuant to this **ARTICLE X.3.2**, shall become effective immediately upon receipt of said written notice by City.

X.4 PROCEDURES CONSULTANT SHALL TO FOLLOW UPON RECEIPT OF NOTICE OF TERMINATION

X.4.1 Upon receipt of a Notice of Termination and prior to the effective date of termination, unless the notice otherwise directs or Consultant immediately takes action to cure a failure to perform under the cure period set out hereinabove, Consultant immediately shall begin the phase-out and the discontinuance of all services, in connection with the performance of this Agreement, and shall proceed promptly to cancel all existing orders and contracts insofar as such orders and contracts are chargeable to this Agreement. Within thirty (30) calendar days after receipt of such Notice of Termination, unless Consultant successfully has cured a failure to perform, Consultant shall submit a statement showing in detail the services performed under this Agreement prior to the effective date of termination. City retains the option to grant an extension to the time period for submittal of such statement.

X.4.2 Copies of all completed or partially completed specifications and all reproductions of all completed or partially completed designs, plans and exhibits prepared under this Agreement, prior to the effective date of termination, shall be delivered to City, in the form requested by City, as a pre-condition to final payment. These documents shall be subject to the restrictions and conditions set forth in **ARTICLE IX**.

X.4.3 Upon the above conditions being met, absent any reason why City may be compelled to withhold fees, City promptly shall pay Consultant that proportion of the prescribed fee which the services actually performed under this Agreement bear to the total services called for under this Agreement, less any previous payments of the fee.

X.4.4 City, as a public entity, has a duty to document the expenditure of public funds. Consultant acknowledges this duty imposed upon City. Consultant further acknowledges the failure of Consultant to comply with the submittal of the statement and documents, as required above, shall constitute a waiver by Consultant of any and all rights or claims to payment for services performed under this Agreement by Consultant.

X.4.5 Failure of Consultant to comply with the submittal of the statement and documents, as required above, shall constitute a waiver by Consultant of any and all rights or claims to collect monies Consultant otherwise may be entitled to for services performed under this Agreement.

X.5 PROCEDURES CONSULTANT TO FOLLOW UPON RECEIPT OF NOTICE OF SUSPENSION

X.5.1 Upon receipt of written Notice of Suspension, which date also shall be the effective date of the suspension, Consultant shall, unless the Notice otherwise directs, immediately begin to phase-out and discontinue all services in connection with the performance of this Agreement and promptly shall proceed to suspend all existing orders and contracts, insofar as such orders and contracts are chargeable to this Agreement.

X.5.2 Consultant shall prepare a statement showing, in detail, the services performed under this Agreement prior to the effective date of suspension.

X.5.3 Copies of all completed or partially completed designs, plans and specifications, prepared under this Agreement prior to the effective date of suspension, shall be prepared for possible delivery to City but shall be retained by Consultant until such time as Consultant may exercise the right to terminate.

X.5.4 In the event Consultant exercises the right to terminate one hundred twenty (120) calendar days after the effective suspension date, within thirty (30) calendar days after receipt by City of Consultant's Notice of Termination, Consultant promptly shall cancel all existing orders and contracts, insofar as such orders and contracts are chargeable to this Agreement, and shall submit the above referenced statement showing, in detail, the services performed under this Agreement prior to the effective date of suspension.

X.5.5 Any documents prepared in association with this Agreement shall be delivered to City as a pre-condition to final payment.

X.5.6 Upon the above conditions being met, absent any reason why City may be compelled to withhold fees, City promptly shall pay Consultant that proportion of the prescribed fee which the services actually performed under this Agreement bear to the total services called for under this Agreement, less any previous payments of the fee.

X.5.7 City, as a public entity, has a duty to document the expenditure of public funds.

X.5.8 Consultant acknowledges this duty imposed upon City. Consultant further acknowledges the failure of Consultant substantially to comply with the submittal of the statements and documents, as required herein, shall constitute a waiver by Consultant of any portion of the fee for which Consultant did not supply such necessary statements and/or documents.

END OF ARTICLE IX

ARTICLE XI. CONSULTANT'S WARRANTY

Consultant warrants the services required under this Agreement shall be performed with the same degree of professional skill and care typically exercised by similar consulting professionals performing similar services in Bexar County, Texas. Consultant further warrants it has not employed or retained any company or person other than a bona fide employee, working solely for Consultant, to solicit or secure this Agreement, and it has not, for the purpose of soliciting or securing this Agreement, paid or agreed to pay any company or person a commission, percentage, brokerage fee, gift or any other consideration, contingent upon or resulting from the award or making of this Agreement. For breach of this warranty, City shall have the right to terminate this Agreement under the provisions of **ARTICLE X**.

ARTICLE XII. NON-DISCRIMINATION POLICY

XII.1 NON-DISCRIMINATION

As a Party to a contract with City, Consultant understands and agrees to comply with the *Non-Discrimination Policy* of the City of San Antonio contained in Chapter 2, Article X of the City Code and further, shall not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, veteran status, age or disability, unless exempted by state or federal law, or as otherwise established herein. Consultant represents and warrants it has complied with City's *Non-Discrimination Policy* throughout the course of this solicitation and Agreement award process and shall continue to comply with said *Non-Discrimination Policy*. As part of said compliance, Consultant shall adhere to City's *Non-Discrimination Policy* in the solicitation, selection, hiring or commercial treatment of Sub-Consultants, vendors, suppliers or commercial customers, nor shall Consultant retaliate against any person for reporting instances of such discrimination. Consultant shall provide equal opportunity for Sub-Consultants, vendors and suppliers to participate in all of its public sector and private sector sub-consulting and supply opportunities, provided nothing contained in this clause shall prohibit or limit otherwise lawful efforts to remedy the effects of marketplace discrimination which have occurred or are occurring in City's Relevant Marketplace. Consultant acknowledges it understands and agrees a material violation of this clause shall be considered a material breach of this Agreement and may result in termination of this Agreement, disqualification of Consultant from participating in City contracts, or other sanctions. This **ARTICLE XII.1** is not enforceable by or for the benefit of, nor creates any obligation to, any third party. Consultant's certification of its compliance with City's *Non- Discrimination Policy*, as submitted to City pursuant to the solicitation for this Agreement, is hereby incorporated into the material terms of this Agreement. Consultant shall incorporate this clause into each of its Sub-Consultant and supplier agreements entered into, pursuant to City agreements/contracts.

XII.2 SUB-CONSULTANTS

Upon execution of this Agreement by Consultant, Consultant shall provide to City a detailed outreach and diversity plan for approval by City, including a list of Sub- Consultants and shall require all of its Sub-Consultants to register in City's Centralized Vendor Registry (hereafter referred to as "CVR") through City's Internet-Based Project Management System. Consultant shall obtain approval in writing from City prior to adding, substituting or deleting any Sub-Consultant from this Project.

END OF ARTICLE XII

ARTICLE XIII. ASSIGNMENT OR TRANSFER OF INTEREST

Consultant shall not assign or transfer Consultant's interest in this Agreement without the written consent of City.

END OF ARTICLE XIII

ARTICLE XIV. INSURANCE REQUIREMENTS

XIV.1 Prior to the commencement of any work under this Agreement, Consultant shall furnish copies of all required endorsements and completed Certificate(s) of Insurance to City's TCI/Contract Services Department, which clearly shall be labeled "*insert name of project/contract*" **Project** in the Description of Operations block of the Certificate. The Certificate(s) shall be completed and signed by an Agent. If City so requests, said Certificates also shall be accompanied by an affidavit signed by Consultant, attesting the furnished Certificate(s) represent Consultant's current coverages. City shall not accept a Memorandum of Insurance or Binder as proof of insurance. The Certificate(s) must be signed by the Authorized Representative of the carrier and list the agent's signature and telephone number. The Certificate(s) shall be mailed, with copies of all applicable endorsements, directly from the insurer's authorized representative to City. City shall have no duty to pay or perform under this Agreement until such certificate and endorsements have been received and approved by City's TCI Department – Contract Services Division. No officer or employee, other than City's Risk Manager, shall have authority to waive this requirement.

XIV.2 City reserves the right to review the insurance requirements of this **ARTICLE XIV** during the effective period of this Agreement and any extension or renewal hereof and to request the modification of insurance coverage and limits when deemed necessary and prudent by City's Risk Manager, based upon changes in statutory law, court decisions or circumstances surrounding this Agreement. In no instance shall City allow modification whereby City may incur increased risk.

XIV.3 Consultant's financial integrity is of interest to City; therefore, subject to Consultant's obligation to maintain reasonable deductibles in such amounts as are approved by Consultant's insurance companies, Consultant shall obtain and maintain in full force and effect for the duration of this Agreement and any extension hereof at Consultant's sole expense, insurance coverage written on an occurrence basis, unless otherwise indicated, by companies authorized to do business in the State of Texas and with an A.M Best's rating of no less than A- (VII), in the following types and for an amount not less than the amount listed below. These listed insurance limits are standard limits for all City projects. If a project does not justify these standard limits of insurance coverages, Consultant may request a review of the City's insurance requirements, to be considered on a project-by-project basis:

TABLE TO FOLLOW

TYPE	AMOUNTS
1. Workers' Compensation **2.** Employers' Liability	***Statutory*** $1,000,000.00/$1,000,000.00/ $1,000,000.00
3. Commercial General Liability Insurance to include coverage for the following: **a.** Premises/Operations **b.** Products/Completed Operations **c.** Personal/Advertising Injury ***d.** Environmental Impairment/ Impact – sufficiently broad to cover disposal liability. ***e.** Explosion, Collapse, Underground	For Bodily Injury and Property Damage of: **$1,000,000.00** per occurrence; **$2,000,000.00** General Aggregate, or its equivalent in Umbrella or Excess Liability Coverage
4. Business Automobile Liability: **a.** Owned/leased vehicles **b.** Non-owned vehicles **c.** Hired Vehicles	Combined Single Limit for Bodily Injury and Property Damage of **$1,000,000.00** per occurrence
5. *Professional Liability (Claims-made basis) To be maintained and in effect for no less than two years subsequent to the completion of the professional service.	**$1,000,000.00** per claim, to pay on behalf of the insured all sums which the insured shall become legally obligated to pay as damages by reason of any act, malpractice, error, or omission in professional services.
6. Umbrella or Excess Liability Coverage	**$5,000,000.00** per occurrence combined limit Bodily Injury (including death) and Property Damage.
7. *Builder's Risk	All Risk Policy written on an occurrence basis for 100% replacement cost during construction phase of any new or existing structure.
*if applicable	

City may request, and without expense to City, to inspect copies of Consultant's policies and endorsements as they apply to the limits and forms required by City.

XIV.4 Consultant agrees to require, by written contract, all Sub-Consultants and/or Subcontractors providing goods or services hereunder obtain the same categories of insurance coverage required of Consultant herein, and provide to Consultant a Certificate of Insurance and endorsement naming Consultant and City as additional insureds. Policy limits of the coverages carried by Sub-Consultants and Subcontractors shall be determined as a business decision of Consultant. Consultant shall provide City with said Certificate(s) and endorsement prior to the commencement of any work by any Sub-Consultant and/or Subcontractor and through the period referenced in **ARTICLE XIV.3.5**. This provision may be modified by City's Risk Manager, without subsequent City Council approval, when deemed necessary and prudent, based upon changes in statutory law, court decisions or circumstances surrounding this Agreement. Such modification may be enacted by letter signed by City's Risk Manager, which shall become a part of the contract for all purposes.

XIV.5 As they apply to the limits required by City, City shall be entitled, upon request and without expense, to receive copies of the policies, declaration page and all required endorsements. Consultant shall be required to comply with any such requests by City and shall submit all requested documents to City at the address provided below within ten (10) days. Consultant shall pay any costs incurred resulting from the provision of said documents to City.

XIV.6 Consultant shall mark those portions of the policy, if any, Consultant regards as confidential. In the event a third party makes and Open Records Request, under the Texas Freedom of Information Act or other public information law asking to view or copy Consultant's policy, City shall submit the received request, along with Consultant's information, to the Texas Attorney General (hereafter referred to as "AG") for an opinion regarding the release of Consultant's policy information. Consultant and City agree City shall be bound by the AG opinion/decision. Similarly, Consultant agrees and accepts City shall provide all Consultant information pursuant to a court order or a litigation discovery rule requiring or directing City to disclose any of Consultant's information.

XIV.7 Consultant agrees, with respect to the above required insurance, all insurance policies are to contain or be endorsed to contain the following provisions, to the extent permitted by policy provisions, terms and conditions:

XIV.7.1 Name City, its officers, officials, employees, volunteers, and elected representatives as additional insureds by endorsement, with respect to operations and activities of, or on behalf of, the named insured performed under contract with City, with the exception of the workers' compensation and professional liability policies;

XIV.7.2 Provide for an endorsement that the "other insurance" clause shall not apply to the City of San Antonio where City is an additional insured shown on the policy, as allowed by respective policy provisions, terms and conditions;

XIV.7.3 Workers' compensation, employers' liability, general liability and automobile liability policies shall provide a waiver of subrogation in favor of City; and

XIV.7.4 Where allowed by respective policy provisions, terms and conditions, provide thirty (30) calendar days advance written notice to City of any cancellation or non-renewal or material change in coverage, any change in policy limits by endorsement and not less than ten (10) calendar days advance notice for nonpayment of premium.

XIV.7.5 All correspondences sent by Consultant to City, with regard to Consultant's insurance coverages and requests shall be sent to:

City of San Antonio Attn: TCI Contract Services
P.O. Box 839966
San Antonio, Texas 78283-3966

XIV.8 Within five (5) calendar days of a suspension, cancellation or non-renewal of coverage, Consultant shall provide a replacement Certificate of Insurance and applicable endorsements to City. City shall have the option to suspend Consultant's performance, should there be a lapse in coverage at any time during this contract. Failure to provide and to maintain the required insurance shall constitute a material breach of this Agreement.

XIV.9 In addition to any other remedies City may have upon Consultant's failure to provide and maintain any insurance or policy endorsements, to the extent and within the time herein required, City shall have the right to order Consultant to stop work hereunder until Consultant demonstrates compliance with the requirements hereof.

XIV.10 Nothing herein contained shall be construed as limiting in any way the extent to which Consultant may be held responsible for payments of damages to persons or property resulting from Consultant's or its Sub-Consultants' and/or Subcontractors' performance of the work covered under this Agreement.

XIV.11 It is agreed Consultant's insurance shall be deemed primary and non-contributory, with respect to any insurance or self-insurance carried by the City of San Antonio, for liability arising out of operations under this Agreement.

XIV.12 It is understood and agreed the insurance required is in addition to and separate from any other obligation contained in this Agreement and no claim or action by or on behalf of City shall be limited to insurance coverage provided.

XIV.13 Consultant and any Sub-Consultants and/or Subcontractors are responsible for all damage to their own equipment and/or property.

ARTICLE XV. INDEMNIFICATION

XV.1 CONSULTANT FULLY SHALL INDEMNIFY AND HOLD HARMLESS CITY AND ITS OFFICIALS, OFFICERS, AGENTS, EMPLOYEES, VOLUNTEERS, DIRECTORS AND REPRESENTATIVES (HEREAFTER INDIVIDUALLY AND COLLECTIVELY REFERRED TO AS "INDEMNITEE") FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LIABILITIES OR COSTS, INCLUDING REASONABLE ATTORNEY FEES AND DEFENSE COSTS, MADE UPON INDEMNITEE CAUSED BY OR RESULTING FROM AN ACT OF NEGLIGENCE, INTENTIONAL TORT, INTELLECTUAL PROPERTY INFRINGEMENT, OR FAILURE TO PAY A SUBCONTRACTOR OR SUPPLIER COMMITTED BY CONSULTANT OR ITS AGENT, CONSULTANT UNDER CONTRACT OR ANOTHER ENTITY OVER WHICH CONSULTANT EXERCISES CONTROL WHILE IN THE EXERCISE OF RIGHTS OR PERFORMANCE OF THE DUTIES UNDER THIS AGREEMENT. THIS INDEMNIFICATION SHALL NOT APPLY TO ANY LIABILITY RESULTING FROM INDEMNITEE'S NEGLIGENCE OR WILLFUL MISCONDUCT IN INSTANCES WHERE THE NEGLIGENCE OR WILLFUL MISCONDUCT CAUSES PERSONAL INJURY, BODILY INJURY, DEATH OR PROPERTY DAMAGE. IF A COURT OF COMPETENT JURISDICTION FINDS CONSULTANT AND CITY JOINTLY LIABLE, LIABILITY SHALL BE APPORTIONED COMPARATIVELY IN ACCORDANCE WITH THE LAWS FOR THE STATE WITHOUT, HOWEVER, WAIVING ANY GOVERNMENTAL IMMUNITY AVAILABLE TO CITY UNDER TEXAS LAW AND WITHOUT WAIVING ANY DEFENSES OF THE PARTIES UNDER TEXAS LAW.

XV.1 The provisions of this **ARTICLE XV** solely are for the benefit of the Parties hereto and not intended to create or grant any rights, contractual or otherwise, to any other person or entity. Consultant shall advise City in writing within twenty four (24) hours of any claim or demand against City or Consultant known to Consultant related to or arising out of Consultant's activities under this Agreement.

END OF ARTICLE XV

ARTICLE XVI. CLAIMS AND DISPUTES

XVI.1 Every Claim of Consultant, whether for additional compensation, additional time or other relief, shall be signed and sworn to by an authorized corporate officer (if Consultant is not a corporation, then an official of the company authorized to bind Consultant by his/her signature) of Consultant, verifying the truth and accuracy of the Claim. The responsibility to substantiate Claims shall rest with the party making the Claim.

XVI.2 TIME LIMIT ON CLAIMS

Claims by Consultant must be initiated in writing to City within twenty-one (21) calendar days after the occurrence of the event giving rise to such Claim.

XVI.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing, Consultant shall proceed diligently with performance of the Agreement and City shall continue to make payments in accordance with this Agreement.

XVI.4 CLAIMS FOR ADDITIONAL TIME

If Consultant wishes to make a Claim for an increase in the time for performance, written notice, as stated in this **ARTICLE XVI**, must be given. Consultant's Claim shall include an estimate of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

XVI.5 CLAIMS FOR CONSEQUENTIAL DAMAGES

Except as otherwise provided in this Agreement, in calculating the amount of any Claim or any measure of damages for breach of contract (such provision to survive any termination following such breach), the following standards shall apply both to claims by Consultant and to claims by City:

XVI.5.1 No consequential damages shall be allowed; and

XVI.5.2 Damages are limited to extra costs specifically shown to have been directly caused by a proven wrong for which the other Party is claimed to be responsible; and

XVI.5.3 No profit shall be allowed on any damage claim.

XVI.6 NO WAIVER OF GOVERNMENTAL IMMUNITY

NOTHING IN THIS SECTION XVI SHALL BE CONSTRUED TO WAIVE CITY'S GOVERNMENTAL IMMUNITY FROM LAWSUIT, WHICH IMMUNITY IS

EXPRESSLY RETAINED TO THE EXTENT IT IS NOT CLEARLY AND UNAMBIGUOUSLY WAIVED BY STATE LAW.

XVI.7 ALTERNATIVE DISPUTE RESOLUTION

XVI.7.1 CONTINUATION OF SERVICES PENDING DISPUTE RESOLUTION

Each Party is required to continue to perform its obligations under this Agreement, pending a final resolution of any dispute arising out of or relating to this Agreement, unless it would be impossible or impracticable under the circumstances.

XVI.7.2 REQUIREMENT FOR SENIOR LEVEL NEGOTIATIONS

Before invoking mediation or any other alternative dispute process set forth herein, the Parties agree they first shall try to resolve any dispute arising out of or related to this Agreement through discussions directly between those senior management representatives within their respective organizations who have overall managerial responsibility for similar projects. This step shall be a condition precedent to use of any other alternative dispute resolution process. If the Parties' senior management representatives cannot resolve the dispute within thirty (30) calendar days, after a Party delivers a written notice of such dispute, then the Parties shall proceed with the mediation alternative dispute resolution process contained herein. All negotiations pursuant to this clause are confidential and shall be treated as compromise and settlement negotiations for purposes of applicable rules of evidence.

XVI.7.3 MEDIATION

a. In the event City or Consultant shall contend the other has committed a material breach of this Agreement, the Party alleging such breach shall, as a condition precedent to filing any lawsuit, request mediation of the dispute.

b. Request for mediation shall be in writing, and shall request mediation commence not less than thirty (30) or more than ninety (90) calendar days following the date of the request, except upon agreement of both Parties.

c. In the event City and Consultant are unable to agree to a date for the mediation or to the identity of the mediator or mediators within thirty (30) calendar days following the date of the request for mediation, all conditions precedent in this **ARTICLE XVI** shall be deemed to have occurred.

d. The Parties shall share the mediator's fee and any filing fees equally. Venue for any mediation or lawsuit arising under this Agreement shall be in Bexar County, Texas. Any agreement reached in mediation shall be enforceable as a settlement agreement in any court having jurisdictionthereof. No provision of this Agreement shall waive any immunity or defense. No provision of this Agreement shall be deemed consent to suit.

END OF ARTICLE XVI

ARTICLE XVII. SEVERABILITY

If, for any reason, any one or more **ARTICLE(s)** and/or paragraphs of this Agreement are held invalid or unenforceable, such invalidity or unenforceability shall not affect, impair or invalidate the remaining **ARTICLE(S)** and/or paragraphs of this Agreement but shall be confined in its effect to the specific **ARTICLE**, sentences, clauses or parts of this Agreement held invalid or unenforceable, and the invalidity or unenforceability of any **ARTICLE**, sentence, clause or parts of this Agreement, in any one or more instance, shall not affect or prejudice in any way the validity of this Agreement in any other instance.

END OF ARTICLE XVII

ARTICLE XVIII. INTEREST IN CITY CONTRACTS PROHIBITED

XVIII.1 No officer or employee of City shall have a financial interest, directly or indirectly, in any contract with City or shall be financially interested, directly or indirectly, in the sale to City of any land, materials, supplies or service, except on behalf of City as an officer or employee. This prohibition extends to City's Public Service Board, SAWS and other City boards and commissions, which are more than purely advisory. The prohibition also applies to Sub-Contracts on City projects.

XVIII.2 Consultant acknowledges it is informed the Charter of the City of San Antonio and its Ethics Code prohibit a City officer or employee, as those terms are defined in the Ethics Code, from having a financial interest in any contract with City or any City agency, such as City-owned utilities. Consultant's officer or employee has a "prohibited financial interest" in a contract with City or in the sale to City of land, materials, supplies or service, if any of the following individual(s) or entities is a party to the contract or sale:

XVIII.2.1 A City officer or employee;

XVIII.2.2 A City officer or employee's parent, child or spouse;

XVIII.2.3 A business entity in which City officer or employee, or the officer or employee's parent, child or spouse, owns ten percent (10%) or more of the voting stock or shares of the business entity, or ten percent (10)%) or more of the fair market value of the business entity; or

XVIII.2.4 A business entity in which any individual or entity above listed is a subcontractor on a City contract, a partner or a parent or subsidiary business entity.

XVIII.3 Consultant warrants and certifies, and this Agreement is made in reliance thereon, Consultant, its officers, employees and agents are neither officers nor employees of City. Consultant further warrants and certifies it has tendered to City a Discretionary Contracts Disclosure Statement in compliance with City's Ethics Code.

END OF ARTICLE XVIII

ARTICLE XIX. CONFLICTS OF INTEREST DISCLOSURE

Consultant must disclose if it is associated in any manner with a City officer or employee in a business venture or business dealings. Failure to do so shall constitute a violation of City's Ethics Code. To be "associated" in a business venture or business dealings includes: a) being in a partnership or joint venture with a City officer or employee; b) having a contract with a City officer or employee; c) being joint owners of a business with a City officer or employee; d) owning at least ten percent (10%) of the stock in a corporation in which a City officer or employee also owns at least ten percent (10%); or
e) having an established business relationship with a City Officer or employee as a client or customer.

END OF ARTICLE XIX

ARTICLE XX. STANDARD OF CARE/LICENSING

XX.1 Services provided by Consultant under this Agreement shall be performed in a manner consistent with the degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances.

XX.2 Consultant shall be represented by personnel with appropriate licensure, registration and/or certification(s) at meetings of any official nature concerning the Project, including but not limited to scope meetings, review meetings, pre-bid meetings and preconstruction meetings.

XX.3 Consultant acknowledges the Texas Board of Professional Engineers, 1917 IH-35 South, Austin, Texas 78741, (512) 440-7723 and/or the Texas Board of Architectural Examiners, Hobby Building, 333 Guadalupe, Suite 2-350, Austin, Texas 78701, (512) 305-9000 has licensing jurisdiction over individuals licensed under Title 22 of the Texas Administrative Code.

END OF ARTICLE XX

ARTICLE XXI. RIGHT OF REVIEW AND AUDIT

XXI.1 Consultant grants City, or its designees, the right to audit, examine or inspect, at City's election, all of Consultant's records relating to the performance of the Work under this Agreement, during the term of this Agreement and retention period herein. The audit, examination or inspection may be performed by a City designee, which may include its internal auditors or an outside representative engaged by City. Consultant agrees to retain its records for a minimum of four (4) years following termination of the Agreement, unless there is an ongoing dispute under the contract, then, such retention period shall extend until final resolution of the dispute. "Consultant's records" include any and all information, materials and data of every kind and character generated as a result of the work under this Agreement. Example of Consultant records include, but are not limited to, billings, books, general ledger, cost ledgers, invoices, production sheets, documents, correspondence, meeting notes, subscriptions, agreements, purchase orders, leases, contracts, commitments, arrangements, notes, daily diaries, reports, drawings, receipts, vouchers, memoranda, time sheets, payroll records, policies, procedures, federal and state tax filings for issue in question and any and all other agreements, sources of information and matters that may, in City's judgment, have any bearing on or pertain to any matters, rights, duties or obligations under or covered by any Agreement Documents.

XXI.2 City agrees it shall exercise the right to audit, examine or inspect Consultant's records only during City's regular business hours. Consultant agrees to allow City's designee access to all of Consultant's Records, Consultant's facilities and current or former employees of Consultant, deemed necessary by City or its designee(s), to perform such audit, inspection or examination. Consultant also agrees to provide adequate and appropriate work space necessary to City or its designees to conduct such audits, inspections or examinations.

XXI.3 Consultant shall include this audit clause in any subcontractor, supplier or vendor contract.

END OF ARTICLE XXI

ARTICLE XXII. ENTIRE AGREEMENT

This Agreement represents the entire and integrated Agreement between City and Consultant and supersedes all prior negotiations, representations or agreements, either oral or written. This Agreement may be amended only by written instrument signed by both City and Consultant.

END OF ARTICLE XXII

ARTICLE XXIII. VENUE

The obligations of the Parties to this Agreement shall be performable in San Antonio, Bexar County, Texas. If legal action, such as civil litigation, is necessary in connection therewith, exclusive venue shall lie in Bexar County, Texas.

END OF ARTICLE XXIII

ARTICLE XXIV. NOTICES

Except as may be provided elsewhere herein, all notices, communications, and reports required or permitted under this Agreement shall personally be delivered or mailed to the respective Party by depositing the same in the United States Postal Service, addressed to the applicable address shown below, unless and until either Party otherwise is notified in writing by the other Party of a change of such address. Mailed notices shall be deemed communicated as of five (5) calendar days of mailing.

If intended for City, to:	If intended for Consultant, to:
City of San Antonio	______________________
TCI	
Attention: Contract Services 114	_______________________
West Commerce, 9th Floor	
San Antonio, Texas 78205	________________________

END OF ARTICLE XXIV

ARTICLE XXV. INDEPENDENT CONTRACTOR

In performing services under this Agreement, the relationship between City and Consultant is Consultant is and shall remain an independent contractor. By the execution of this Agreement, Consultant and City do not change the independent contractor status of Consultant. Consultant shall exercise independent judgment in performing its duties and obligations under this Agreement and solely is responsible for setting working hours, scheduling or prioritizing the work flow and determining how the work is to be performed. No term or provision of this Agreement or act of Consultant, in the performance of this Agreement, shall be construed as making Consultant the agent, servant or employee of City, or as making Consultant or any of its agents or employees eligible for any fringe benefits, such as retirement, insurance and worker's compensation, which City provides to or for its employees.

END OF ARTICLE XXV

ARTICLE XXVI. CAPTIONS

The captions for the individual provisions of this Agreement are for informational purposes only and shall not be construed to effect or modify the substance of the terms and conditions of this Agreement to which any caption relates.

END OF ARTICLE XXVI

ARTICLE XXVII. ATTORNEY FEES

The Parties hereto expressly agree neither Party shall be responsible for payment of attorney's fees pursuant to Texas Civil Practice and Remedies Code Chapter 38, Texas Local Government Code §271.153, common law or any other provision for payment of attorney's fees. Both Parties hereto expressly waive any claim to attorney's fees, should litigation result from any dispute in this Agreement.

END OF ARTICLE XXVII

ARTICLE XXVIII. CONFLICT RESOLUTION BETWEEN DOCUMENTS

Consultant hereby agrees and acknowledges if anything contained in Consultant's prepared Scope of Services, attached hereto and labeled as **EXHIBIT C**, or contained in any other document prepared by Consultant and included herein is in conflict with this Agreement and/or with City's General Conditions for City of San Antonio Construction Contracts, attached hereto and labeled as **EXHIBIT D**, this Agreement and/or City's General Conditions for City of San Antonio Construction Contracts shall take precedence and control to resolve said conflict(s).

IN WITNESS WHEREOF, the City of San Antonio lawfully has caused these present to execute this Agreement by the hand of City Manager, or his/her designee; Consultant, acting by the hand of______________________________, thereunto authorized ____________________ does now sign, execute and deliver this document.

Executed by City and effective on this _____day of ______________________, 20________.

CITY OF SAN ANTONIO ______________________**(FIRM)**

____
PETER ZANONI
DEPUTY CITY MANAGER

By: ____________________________

____
Title

APPROVED AS TO FORM:

____
CITY ATTORNEY

EXHIBIT A PROJECT FEE SUMMARY

(TO INCLUDE REIMBURSEABLES, IF ANY) AND TIMELINE FOR DESIGN PHASE SERVICES

EXHIBIT B UTILIZATION PLAN AND SBEDA ORDINANCE COMPLIANCE AND PROVISIONS

EXHIBIT C SCOPE OF SERVICES

(Shall include the role and responsibilities of Consultant, as detailed in City's General Conditions attached hereto)

Consultant hereby agrees and acknowledges if anything contained in this Consultant prepared Exhibit 3, Consultant's Scope of Services, or contained in any other document prepared by Consultant and included herein is in conflict with this Agreement and/or City's General Conditions for City of San Antonio Construction Contracts, attached hereto and labeled as Exhibit 4, this Agreement and/or City's General Conditions for City of San Antonio Construction Contracts shall take precedence and control to resolve said conflict.

EXHIBIT D GENERAL CONDITIONS

FOR CITY OF SAN ANTONIO CONSTRUCTION CONTRACTS

EXHIBIT E CERTIFICATE OF INTERESTED PARTIES (Form 1295)

The Texas Government Code §2252.908, and the rules issued by the Texas Ethics Commission found in Title 1, Sections 46.1, 46.3 and 46.5 of the Texas Administrative Code, require a business entity to submit a completed Form 1295 to the City before the City may enter into a contract with that business entity.

Form 1295 must be completed online. It is available from the Texas Ethics Commission by accessing the following web address:
https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm.

Print your completed Form 1295 and the certification of filing. Sign Form 1295 in front of a notary and submit it, along with the certification of filing, with your response to this solicitation. In Box 3 of Form 1295, provide the solicitation number shown on the cover page of this solicitation (e.g. IFB 6100001234, RFO 6100001234 or RFCSP 6100001234).

The following definitions found in the statute and Texas Ethics Commission rules may be helpful in completing Form 1295.

“Business entity” includes an entity through which business is conducted with a governmental entity or state agency, regardless of whether the entity is a for-profit or nonprofit entity. The term does not include a governmental entity or state agency.

“Controlling interest” means: (1) an ownership interest or participating interest in a business entity by virtue of units, percentage, shares, stock, or otherwise that exceeds 10 percent; (2) membership on the board of directors or other governing body of a business entity of which the board or other governing body is composed of not more than 10 members; or (3) service as an officer of a business entity that has four or fewer officers, or service as one of the four officers most highly compensated by a business entity that has more than four officers. Subsection (3) of this section does not apply to an officer of a publicly held business entity or its wholly owned subsidiaries.

“Interested party” means: (1) a person who has a controlling interest in a business entity with whom a governmental entity or state agency contracts; or (2) an intermediary.

“Intermediary,” for purposes of this rule, means a person who actively participates in the facilitation of the contract or negotiating the contract, including a broker, adviser, attorney, or representative of or agent for the business entity who:

(1) receives compensation from the business entity for the person’s participation;
(2) communicates directly with the governmental entity or state agency on behalf of the business entity regarding the contract; and
(3) is not an employee of the business entity or of an entity with a controlling interest in the business entity.

EXHIBIT F CONTRACT ADDENDA

(if any)

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Appendix 2B City of San Antonio Design Summary Report

2B.1 Introduction

The City of San Antonio Design Summary Report document can be located by visiting:

http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Design-Guidance-Manual-and-Forms

and selecting Design Summary Report, found under the Design Guidance Manual Forms heading.

The static document displayed below is dated October 2017. For the most up-to-date version of the document, please download the PDF file from the TCI Contract Documents site.

2B.2 Overview

The DSR is intended to be a tool that can be used by the Project Delivery team to anticipate and memorialize basic project information, with the objective being to minimize or eliminate rework, last minute surprises, and their associated costs and delays.

Although the DSR addresses a wide range of issues that can affect the design and delivery of a project, every project is unique and, as such, every project warrants thoughtful consideration about how its design and construction will be accomplished. Not all factors identified in the DSR will apply to each project and factors will arise on some projects that are not addressed in the standard DSR. Those individuals contributing the DSR are encouraged to think comprehensively and tailor their use of the DSR form to meet the unique needs of the project.

It is likely that the DSR will be partially completed prior to the Initial Scope Meeting (ISM) and updated from time to time as the project progresses. As information is added or revised, it is strongly recommended that they be associated with a date and the author of the change. Information that is outdated should not be deleted, but stricken, so as to preserve a more complete record of the progression of the project design. The ISM should be stored on PRIMELink and available for all parties to review. The City PM and the Consultant PM should be the only parties that can modify the ISM.

2B.3 Design Summary Report

I. SCHEDULING, FUNDING, AND DELIVERY

Project: Project Name

Type of Project: Project Type

Project Background, History, Goals and Objectives: Goals and Objectives

City Council District: District

Other Projects affected by this project: Other Projects

Preliminary Engineering Report Required (COSA PM Decision) yes/no

Project Schedule	Start	Completion	Duration
Design	M/D/YYYY	M/D/YYYY	___ days
Environmental/Permitting	M/D/YYYY	M/D/YYYY	___ days
ROW Acquisition	M/D/YYYY	M/D/YYYY	___ days
Construction	M/D/YYYY	M/D/YYYY	___ days

Programmed Funding and Date Available (Excluding Utility Costs):

Design	$0.00	Date	M/D/YYYY
ROW	$0.00	Date	M/D/YYYY
Construction	$0.00	Date	M/D/YYYY

Project Construction Cost Estimate History (Excluding Utility Relocation Costs):

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

Project Funding Partners and Description of Work, etc.

☐ SAWS - Description of Work, Etc.

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

☐ CPS - Description of Work, Etc.

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

☐ TxDOT - Description of Work, Etc.

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY

70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

☐ ROW Costs - Description of Work, Etc.

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

☐ Environmental Costs - Description of Work, Etc.

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

☐ Capital Administration Costs - Description of Work, Etc.

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

Project Delivery

Anticipated method of project delivery

- ☐ Design-bid-build
- ☐ Competitive Sealed Proposals (list factors influencing awards)
  - ☐ Cost (000%)
  - ☐ Schedule (000%)
  - ☐ Prior Experience (000%)
  - ☐ Other (000%)
- ☐ Construction Manager at Risk
- ☐ Design-Build

II. EXISTING CONDITIONS

A1. Existing typical roadway conditions for Name of Roadway (complete for each major roadway in project)

1. Number of traffic lanes Yes
2. Approximate lane width Yes
3. Approximate shoulder/parkway width Yes
4. Sidewalks Describe
5. Median width Yes
6. Curbs Yes
7. Underground Storm Drainage System Yes

A2. Existing typical roadway conditions for Name of Roadway (complete for each major roadway in project)

1. Number of traffic lanes Yes
2. Approximate lane width Yes
3. Approximate shoulder/parkway width Yes
4. Sidewalks Describe
5. Median width Yes
6. Curbs Yes
7. Underground Storm Drainage System Yes

B. Existing bridge and bridge class structure data

1. Name of stream, tributary, etc Name
2. Structure type Type
3. Structure length Length
4. Date of construction M/YYYY
5. Is structure adequate for:
   - a. Roadway Yes
   - b. Sidewalk and pedestrian Yes
   - c. Hydraulic capacity Yes

C. Underground and cross drainage facilities:

Location ##/Alpha Description: Describe
Location ##/Alpha Description: Describe
Location ##/Alpha Description: Describe
Location ##/Alpha Description: Describe
Location ##/Alpha Description: Describe
Location ##/Alpha Description: Describe
Location ##/Alpha Description: Describe

D. ROW

Existing ROW width Length
Is ROW adequate? Yes
Existing Sidewalks (Condition 0-3) Yes
Existing Curb Ramps (Condition 0-3) Yes
Estimated number of adjacent parcels ##
Estimated number of parcels required ##
Will “corner clips” be acquired? Yes
Characterize adjacent land use: Description

E. Environmental

Potential environmental concerns (i.e., gas stations, industrial sites, auto shops, landfills, etc.:
Description: Describe
Existing Creeks and/or Tributaries: Description: Describe
Potential Historical Area (50 years or older) Description: Describe
Potential Archeological Sites: Description: Describe
Potential Endangered Species Habitat Area: Description: Describe
Project over Edwards Aquifer Recharge or Transition Zone: Description: Describe

F. Constraints

Schools: Description
Parks: Description
Businesses: _Description
Cemeteries: Description
Trees: Description
Other: Description

G. Railroads: ☐ crossing ☐ adjoining ☐ grade separation

Railroad owner: Owner's Name
Type of warning device:

- ☐ Passive
- ☐ Flashing lights only
- ☐ Lights and gates
- ☐ Other (pre-emption, crossing consolidation, etc.): Explain

H. Airport Clearance Zone issues: Description

I. Preliminary Utility Inventory (Briefly describe facilities, locations, age, adequacy (if known), condition (if known), anticipated or potential conflict, conceptual approach, and any especially critical issues related to the utility.)

Sanitary Sewer:	Description
Water:	Description
Natural Gas:	Description
Underground Electric:	Description
Overhead Electric:	Description
Cable Television:	Description
Telephone:	Description
Other:	Description

Will the Utility Owner or Design Consultant perform conflict assessment and design?

	Utility	Consultant
Sanitary Sewer	☐	☐
Water	☐	☐
Natural Gas	☐	☐
Underground Electric	☐	☐
Overhead Electric	☐	☐
Cable Television	☐	☐
Telephone	☐	☐
Other	☐	☐

Will utility owner joint bid or perform work ahead of City project?

	Joint bid	Prior to Project
Sanitary Sewer	☐	☐
Water	☐	☐
Natural Gas	☐	☐

Underground Electric	☐	☐
Overhead Electric	☐	☐
Cable Television	☐	☐
Telephone	☐	☐
Other	☐	☐

Owner of poles supporting overhead lines Utility Co
Are there locations of multiple contacts? Yes
Any AC water or sewer lines? Yes

K. Are there any existing traffic signals, crosswalks, school zones, fire stations, emergency medical facilities, etc. that warrant special design consideration? Description

L. Any other relevant information about the project that should be considered, such as existing historic structures or aesthetic design enhancement? Description

III. BASE MAPPING, GEOTECHNICAL & ENVIRONMENTAL, PERMITTING, & COMMUNITY RELATIONS ISSUES

Surveying and Mapping

Is aerial topo and mapping desired? ? Scale: 1”=##

☐ planimetric
☐ orthophoto
☐ contours

Coordinate system to be used: Type of system
Vertical control system to be used: Type of system (See Survey Section of DGM)

ROW and/easements required? ☐ Yes ☐ Unknown ☐ No
Conceptual ROW Expansion approach (e.g., corner clips only, equal amounts both sides, all on one side, variable, etc.) Description

Locate apparent ROW only ☐ Locate and resolve ROW and side lot lines ☐
Tree mitigation survey requirements (e.g., tie clusters, all trees over certain diameter, trunk size only, canopy) Description

Geotechnical and Environmental Investigations

Soil types in project area per Bexar County Soil Survey: Narrative

Are geotechnical reports for other projects in or near the area available and adequate for use on this project? ☐ Yes ☐ No (list)

Drilling and/or testing required for

☐ Pavement design
☐ Bridge class structures
☐ Scour Analysis
☐ Trench Excavation Protection
☐ Subsurface Investigation (rock, groundwater, etc)

Pavement Design(s) ☐ Provided by geotech
☐ Provided by City
Scour analysis required? ☐ Yes ☐ No

Permitting Issues

Cultural resource survey required?	☐ Yes ☐ No
Historic Preservation Permit likely?	☐ Yes ☐ No
NEPA Permit likely required?	☐ Yes ☐ No
Hazardous Waste Contamination assessment	☐ Yes ☐ No
Endangered species assessment needed?	☐ Yes ☐ No
USACE401 permit likely?	☐ Yes ☐ No
USACE404 permit likely?	☐ Yes ☐ No
☐ Nationwide	
☐ Individual	
Wetlands delineation survey required?	☐ Yes ☐ No
Environmental Waste Management Plan, Spec's, Quantities, & Details	☐ Yes ☐ No
WPAP (TCEQ Permit likely required)?	☐ Yes ☐ No
Tree Permit required?	☐ Yes ☐ No
TxDOT ROW permit required?	☐ Yes ☐ No
Railroad permit required?	☐ Yes ☐ No

TDLR Review
- ☐ Submitted by City
- ☐ Submitted by Design Consultant

TDLR Inspection
- ☐ Coordinated by City
- ☐ Coordinated by Design Consultant

San Antonio River Authority
Sand and Gravel Permit
- ☐ Submitted by City
- ☐ Submitted by Design Consultant

Community relations issues

Is a formal public relations plan required?	☐ Yes ☐ No
Project info website required?	☐ Yes ☐ No
Stakeholder list required?	☐ Yes ☐ No
Project PowerPoint required?	☐ Yes ☐ No
Is coordination of historic district or enhancements required	☐ Yes ☐ No

Public meetings (Check all that apply)
- ☐ None
- ☐ Pre-design
- ☐ Preliminary design concept
- ☐ Interim meeting(s) – estimated # 00
- ☐ Present final design
- ☐ Pre-construction
- ☐ Construction – estimated # 00

Special requirements
- ☐ Mailed notifications
  - ☐ English only
  - ☐ Spanish and English
- ☐ Other: Description

IV. DESIGN ISSUES

Governing Specifications: Description

Roadways

Functional Classification for each roadway: Narrative

Design Speed: ## mph

Preliminary Lane configuration

- ## Number of lanes
- ## Width of lanes
- ☐ Dual Left Turn Lane Width: ##
- Type Curbed Median/surface treatment (concrete, grass, landscape, etc.)

Bike Facilities (check all that apply)

- ☐ Bike Lanes How many: ##
- ☐ Bike Accommodation Lanes
- ☐ Bike Paths

Sidewalk locations: Description

Bus stop pads: ☐ Yes ☐ No

Clear Zone width: ##

Conceptual parkway restoration approach: Description

Controlling geometric design criteria

- ☐ UDC
- ☐ AASHTO
- ☐ Other: Describe

Are any design waivers anticipated? ☐ Yes ☐ No
If so, what are they? Describe

Roadway Illumination

- ☐ Intersections only
- ☐ Continuous lighting

Photometric Design by:

- ☐ CPS
- ☐ Design Consultant

Traffic

Are additional traffic studies/counts required? ☐ Yes ☐ No
Describe if yes: Describe

Are there major generators in the project area? ☐ Yes ☐ No
Describe if yes: Describe

Minimum Design Level of Service desired: A

Traffic signals

Signal head orientation ☐ Horizontal ☐ Vertical
☐ Mast arm ☐ Span wire/strain poles

Controller Type

☐ Type 2070 (City maintained)
☐ NEMA (TxDOT maintained)
Will controller maintenance be transferred to City? Yes
Are signal coordination communications facilities desired? Yes

School Zone Flashers
☐ None (school zone signs only)
☐ Roadside
☐ Overhead

Intelligent traffic systems issues

Storm Drainage

Design/Analysis Frequency (in years):

## -year rainfall event	Streets (may depend on functional classification)
## -year rainfall event	Inlets
## -year rainfall event	Underground storm drains
## -year rainfall event	Open channels
## -year rainfall event	Cross drainage facilities
## -year rainfall event	Creeks, rivers, etc delineated as Zone A on FIRM

Hydrology analyzed for: (Choose one of the following)
☐ existing conditions only
☐ ultimate conditions

Runoff methodology: (Choose one of the following)
☐ Rational method
☐ TR55
☐ TxDOT
☐ Other

Minimum number of un-flooded lanes to be provided for design storm: ##

On-grade/Sump inlet preferences: Description

Grate inlet preferences: Description

Open channel preferences
☐ Earth lined (max side slope ##:1)
☐ Geotextile armored (max side slope ##:1)
☐ Concrete armored (max side slope ##:1)
☐ Gabion armored

☐ Full channel
☐ Pilot channel only
☐ Vertical wall concrete channel

Outfall preferences
☐ Concrete chutes/scuppers
☐ Pipe/box culvert to toe of slope

Preliminary Maintenance Access Ramp locations: Description

Construction Phasing

Preliminary construction phasing preferences:

☐ Half at a time
☐ Section by Section
☐ Other: Describe

Temporary illumination to be provided?______

Design Enhancements

Describe preliminary design enhancements desired (concept, location, budget, etc): Description

Overhead Utility Conversion? _____

V. PROJECT JOURNAL

Date Initially Created: MM/DD/YYYY

Date Modified/Updated: MM/DD/YYYY
Description: Describe
Date Modified/Updated: MM/DD/YYYY
Description: Describe
Date Modified/Updated: MM/DD/YYYY
Description: Describe
Project Closed: MM/DD/YYYY

Appendix 2C City of San Antonio Capital Improvement Projects Generalized Scope of Services

2C.1 Generalized Scope of Services

Table 2C- 1:Generalized Scope of Services (			
No.	**Description**		
1.	**Initial Scope Meeting**		
	1.1.	Complete DSM, Meeting and Meeting minutes	
	1.2.	Prepare Preliminary Engineering Report (if required)	
2.	**Right of Way Surveying**		
	2.1.	Acquire Ownership information	
	2.2.	Secure Right of Entry	
	2.3.	Survey ROW	
		2.3.1.	Boundary
		2.3.2.	Apparent ROW only
	2.4.	Monument ROW	
	2.5.	Prepare ROW Map	
	2.6.	Prepare plats and field notes of parcels to be acquired	
	2.7.	Flag existing corners, set new corners, etc.	
3.	**Topographic Surveying / Base Mapping**		
	3.1.	Establish Primary Project Control	
	3.2.	Establish Secondary Project Control	
	3.3.	Set Project centerline or baseline	
		3.3.1.	Interval ______________________________________
	3.4.	Survey topographic features	
	3.5.	Survey Cross sections / spot elevations to develop DTM/cross sections	
		3.5.1.	To ROW only
		3.5.2.	feet into adjacent property [everywhere] [where required] [only where ROE can be secured]

Table 2C- 1:Generalized Scope of Services (continued)					
No.	**Description**				
	3.6.	Secure utility maps			
		3.6.1.	Water		
		3.6.2.	Sanitary Sewer		
		3.6.3.	Natural Gas		
		3.6.4.	Underground Electric		
		3.6.5.	Overhead Electric		
		3.6.6.	Underground Telephone		
		3.6.7.	Overhead Telephone		
		3.6.8.	Underground Cable Television		
		3.6.9.	Overhead Cable Television		
	3.7.	Survey Quality Level C locates			
		3.7.1.	Water		
			3.7.1.1.	Valve Box elevation	
			3.7.1.2.	Valve Stem elevations	
		3.7.2.	Sanitary Sewer		
			3.7.2.1.	Manhole Rings and Covers elevations	
			3.7.2.2.	Invert elevations and details (sizes, configurations, flow directions, north arrow)	
		3.7.3.	Natural Gas		
			3.7.3.1.	Valve Box elevations	
			3.7.3.2.	Valve Stem elevations	
			3.7.3.3.	Test box elevations	
		3.7.4.	Storm Drainage		
			3.7.4.1.	Manhole rings and covers elevations	
			3.7.4.2.	Invert elevations and details	
			3.7.4.3.	Curb inlets	
				3.7.4.3.1.	Top elevations
				3.7.4.3.2.	Floor and invert elevations
				3.7.4.3.3.	Lateral details (sizes, configurations, flow directions, north arrow)
			3.7.4.4.	Outfall elevations	
			3.7.4.5.	Culvert and headwall dimensions and elevations	

Table 2C- 1:Generalized Scope of Services (continued)				
No.	**Description**			
		3.7.5.	Underground Electric	
			3.7.5.1.	Manhole rings and covers elevations
			3.7.5.2.	Vault elevations and dimensions
			3.7.5.3.	Conduit elevations at Vaults
		3.7.6.	Underground Telephone	
			3.7.6.1.	Manhole rings and covers elevations
			3.7.6.2.	Vault elevations and dimensions
			3.7.6.3.	Conduit elevations at Vaults
		3.7.7.	Underground Cable Television	
			3.7.7.1.	Manhole rings and covers elevations
			3.7.7.2.	Vault elevations and dimensions
			3.7.7.3.	Conduit elevations at Vaults
		3.7.8.	Develop Utility Basemap	
		3.7.9.	Mains only	
		3.7.10.	Mains and services	
	3.8.	Survey Trees		
		3.8.1.	All trees	
		3.8.2.	All trees with trunk diameter > 4”	
		3.8.3.	Show	
			3.8.3.1.	Species
			3.8.3.2.	Trunk diameter
			3.8.3.3.	Spread
	3.9.	Survey Bridges and Structures		
		3.9.1.	Full measure up (secure all relevant measurements needed)	
		3.9.2.	Locate Columns, abutments, and bridge deck only	
		3.9.3.	Profile grade lines	
			3.9.3.1.	Centerline
			3.9.3.2.	Break back line(s)
			3.9.3.3.	Curbline

Table 2C- 1:Generalized Scope of Services (continued)				
No.	**Description**			
4.	**Roadway and Drainage Design**			
	4.1.	Establish Typical Roadway Cross sections showing lane, sidewalk, and clear zone widths, etc. for various roadways in project area		
	4.2.	Develop Plan and Profile sheets for 1" =_' plans; Existing ground profiles at		
		4.2.1.	Centerline	
		4.2.2.	_____feet left of centerline	
		4.2.3.	_____feet right of centerline	
	4.3.	Establish Horizontal Roadway alignments showing		
		4.3.1.	Centerline geometry (centerline bearings, PI, PC, and PT stations, centerline curve data, curb return radii, etc.)	
		4.3.2.	Curb locations and geometry	
		4.3.3.	Lane widths	
		4.3.4.	Sidewalk widths and locations	
		4.3.5.	Transitions and extent of construction of intersecting streets (coordinate with SAWS)	
		4.3.6.	Prepare Retaining wall plans for all retaining walls in excess of 3'	
	4.4.	Establish Horizontal Channel alignments showing		
		4.4.1.	Centerline geometry (centerline bearings, PI, PC, and PT stations, centerline curve data, etc.)	
		4.4.2.	Bottom width, horizontal distance to top of design section slope, etc.	
	4.5.	Establish Roadway profiles		
		4.5.1.	Estimate storm drainage velocities	
		4.5.2.	Establish maximum flow capacity	
	4.6.	Establish Design Discharges		
		4.6.1.	Delineate drainage areas and establish flow patterns	
		4.6.2.	Develop runoff coefficients	
		4.6.3.	Develop times of concentration and related intensities	
		4.6.4.	Calculate preliminary design discharges	
	4.7.	Design storm drainage facilities		
		4.7.1.	Roadways	
			4.7.1.1.	Establish inlet locations and design discharges
			4.7.1.2.	Develop storm drainage facility sizes, incremental

Table 2C- 1:Generalized Scope of Services (continued)				
No.	**Description**			
				times of concentration, effective drainage areas, design discharges, friction and junction losses, etc.
			4.7.1.3.	Establish preliminary horizontal and vertical alignments of storm drainage facilities (Max EGL is 1.3 feet below top of curb)
			4.7.1.4.	Identify potential utility conflicts and locations for SUE
			4.7.1.5.	Establish lateral sizes
			4.7.1.6.	Lateral details [with] [without] underground utilities
		4.7.2.	Channels	
			4.7.2.1.	Model existing drainage channel
			4.7.2.2.	Establish analysis nodes
			4.7.2.3.	Develop channel sizes, slopes, velocities, incremental times of concentration, effective drainage areas, design discharges, friction and structure losses, etc.
			4.7.2.4.	Develop pre-project and post-project water surface profiles
			4.7.2.5.	Identify and design energy dissipation facilities
			4.7.2.6.	Establish channel armoring and erosion control areas
		4.7.3.	Bridges	
			4.7.3.1.	Model bridges and bridge class structures pre-project and post project
		4.7.4.	Regulatory Coordination	
			4.7.4.1.	Tie to FEMA models
			4.7.4.2.	Secure CLOMR
			4.7.4.3.	Secure LOMR
5.	**Pavement Design**			
	5.1.	Design pavement sections using COSA Pavement Design Standards – Appendix 10A		
6.	**Prepare Cross sections**			
	6.1.	Roadway cross sections		
	6.2.	Channel cross sections		
	6.3.	Box culvert excavation cross sections		

Table 2C- 1:Generalized Scope of Services (continued)			
No.	**Description**		
7.	**Proposed Utility Plans**		
	7.1.	Prepare Sanitary Sewer plan and profiles	
		7.1.1.	Coordinate with SAWS on service history, video results, adequacy, etc.
		7.1.2.	Establish extent of sanitary sewer construction (to nearest manhole) (coordinate with roadway design)
	7.2.	Prepare Water line plans	
		7.2.1.	Coordinate with SAWS on service history, adequacy, etc.
		7.2.2.	Establish extent of water construction (coordinate with roadway design
	7.3.	Prepare Gas line plans	
		7.3.1.	Probe main
		7.3.2.	Probe services
		7.3.3.	Establish extent of gas line construction
8.	**Other Plans**		
	8.1.	Prepare Pavement Marking and Signing Plan	
	8.2.	Prepare Traffic Signal Plans	
	8.3.	Prepare Construction Sequencing Plan	
	8.4.	Prepare Traffic Control Plan	
	8.5.	Prepare SW3P	
	8.6.	Prepare Driveway Plats	
9.	**Meetings and Coordination (including meeting minutes)**		
	9.1.	Public meetings	
	9.2.	Utility coordination meetings	
	9.3.	Initial scope meeting	
	9.4.	Complete Streets Public Meeting and Field Analysis Checklist	
	9.5.	Preliminary Engineering Report Review	
	9.6.	40% Plans Review Meeting	
	9.7.	70% Plans Review Meeting	
	9.8.	95% Plans Review Meeting	

Table 2C- 1:Generalized Scope of Services (continued)		
No.	**Description**	
	9.9.	100% Plan Review Meeting
	9.10.	Pre-bid Meeting
	9.11.	Pre-Construction meeting
10.	**Cost Estimating**	
	10.1.	Preliminary Engineering Report Cost Estimate (if required)
	10.2.	40% Plans Cost Estimate
	10.3.	70% Plans Cost Estimate
	10.4.	95% Plans Cost Estimate
	10.5.	Evaluate bids and recommend award, etc.
11.	**Construction Phase**	
	11.1.	Stake center line (or ROW) of roadway and/or channel for utility adjustment prior to the project bid
	11.2.	Reestablish project control points for contractor’s use before construction
	11.3.	Attend citizen meeting(s) and prepare exhibits at the start of construction
	11.4.	Assist in preparation and review of the monthly pay estimates
	11.5.	Assist in preparation and review of change orders
	11.6.	Provide list of required shop drawings and Review/Approve shop drawings
	11.7.	Respond to request for information
	11.8.	Perform a minimum of two (2) project site visits per month and prepare a report for each visit to the City regarding progress of construction
	11.9.	Attend a minimum of two (2) construction progress meetings per month and prepare meeting minutes.
	11.10	Participate in final inspection of project and provide assessment of findings.
	11.11	Prepare project record drawings and update quarterly.
	11.12	Participate in one-year warranty inspection of project

2C.2 Plan Production Information

☐	[full size] [half size] sets of 40% review plans
☐	[full size] [half size] sets of 70% review plans
☐	[full size] [half size] sets of 95% review plans
☐	[full size] [half size] sets of 100% review plans
☐	[full size] [half size] sets of bid documents

2C.3 Composition of Plan Sets at Designated Milestones: 40%, 70%, 95%, Bid Documents (100%)

Table 2C- 2: Composition of Plan Sets at Designated Milestones (c				
40%	**70%**	**95%**	**100%**	**Milestone**
General Sheets				
☐	☐	☐	☐	City Title Block
☐	☐	☐	☐	Summary of Estimated Quantities Sheet
☐	☐	☐	☐	Index sheet
☐	☐	☐	☐	Project Layout Sheet(s)
☐	☐	☐	☐	Typical Sections (existing and proposed for all conditions / locations)
☐	☐	☐	☐	General Notes and Specifications
Traffic Control Sheets				
☐	☐	☐	☐	Sequence of Construction Layouts
☐	☐	☐	☐	Detour Plan / Profile / Typical Sections
☐	☐	☐	☐	Traffic Control Plan
Environmental Sheets				
☐	☐	☐	☐	SW3P Narrative
☐	☐	☐	☐	SW3P Layouts
☐	☐	☐	☐	EPIC sheet

Table 2C- 2: Composition of Plan Sets at Designated Milestones (continued)				
40%	**70%**	**95%**	**100%**	**Milestone**
☐	☐	☐	☐	Environmental Waste Management Plan, Specifications, Quantities and Plan Details
☐	☐	☐	☐	Transite Pipes Removal Plan, Specifications, Quantities and Plan Details
Roadway Sheets				
☐	☐	☐	☐	Roadway plan and profile sheets
☐	☐	☐	☐	Intersection grading sheets
☐	☐	☐	☐	Roadway detail sheets
☐	☐	☐	☐	Retaining Wall Layouts
Drainage Sheets				
☐	☐	☐	☐	Drainage Overall
☐	☐	☐	☐	Drainage Area Map and Table
☐	☐	☐	☐	Hydraulic Calculations
☐	☐	☐	☐	Storm Drainage plan and profile sheets
☐	☐	☐	☐	Lateral details and cross sections
☐	☐	☐	☐	Drainage details
☐	☐	☐	☐	Channel Plan and Profile
Bridge Sheets				
☐	☐	☐	☐	Bridge layouts
☐	☐	☐	☐	Bridge details
Pavement Markings and Signing Sheets				
☐	☐	☐	☐	Pavement markings and signing details
☐	☐	☐	☐	Traffic signal layouts
☐	☐	☐	☐	Traffic signal details
Illumination Sheets				
☐	☐	☐	☐	Illumination plans and conduit layouts
☐	☐	☐	☐	Illumination details

Table 2C- 2: Composition of Plan Sets at Designated Milestones (continued)				
40%	**70%**	**95%**	**100%**	**Milestone**
Landscaping and Design Enhancement Sheets				
☐	☐	☐	☐	Landscaping plans and details
☐	☐	☐	☐	Enhancement plans and details
Cross Sections				
☐	☐	☐	☐	Street Cross Sections
☐	☐	☐	☐	Drainage Cross sections
Utility Sheets				
☐	☐	☐	☐	[*Joint bid utility*] plans and details
☐	☐	☐	☐	[*Joint bid utility*] plans and details
☐	☐	☐	☐	[*Joint bid utility*] plans and details
Miscellaneous Stand Detail Sheets				
☐	☐	☐	☐	
☐	☐	☐	☐	
☐	☐	☐	☐	
☐	☐	☐	☐	
☐	☐	☐	☐	

Appendix 2D Project Work Plan

2D.1 Introduction

The Project Work Plan (.xls) file can be located by visiting:

http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Design-Guidance-Manual-and-Forms

and selecting Project Work Plan, found under the Design Guidance Manual Forms heading.

The static document displayed below is dated October 2017. For the most up-to-date version of the document, please download the file from the site listed above.

2D.2 Project Work Plan Example

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City of San Antonio - Transportation & Capital Improvements Department

Design Guidance Manual

Project: Sample Project
Prime Consultant: ABC
Subconsultant: XYZ
Proposal Date: 3/1/2013

Insert Positions As Required ----->	Principal	Project Manager	Project Engineer	EIT III	Eng TechIII		
Insert Approved Hourly Rate for Each Position ----->							
	HOURS	HOURS	HOURS	HOURS	HOURS	TASK HOURS	TASK / PHASE FEE
40% Design	0	30	20	20	20	**90**	**$9,000.00**
01. Project Management and General Items							
01.010. DSR Preparation / Scoping Meeting		10			10	20	$2,000.00
01.020. Complete Streets Assessment						0	$0.00
01.030. General Sheets - Index, Summaries / Quantities, Notes				10	10	20	$2,000.00
01.040. Design Review Meeting		10	10			20	$2,000.00
01.050. Prepare Meeting Minutes						0	$0.00
01.060. Project Schedule (Includes Construction)		10	10	10		30	$3,000.00
02. Right-of-Way Surveying and Mapping							
02.010. Acquire Ownership Information							
02.020. Secure Right-of-Entry							
02.030. Survey ROW							
02.030.010. Apparent ROW							
02.030.020. Boundary Survey							
02.040. Monument ROW							
02.050. Prepare ROW Map							
02.060. Plats and Field Notes							
02.070. Flag or Set New Corners							
03. Topographic Surveying / Base Mapping							
03.010. Establish Primary Project Control							
03.020. Establish Secondary Project Control							
03.030. Set Project Centerline or Baseline (Interval _____)							
03.040. Survey Topographic Features							
03.050. Survey Cross Sections / Spot Elevations to Develop DTM / Cross Sections							
3.050.010. To ROW Only							
3.050.020. __ FT Into Adjacent Property [everywhere] [where required] [where ROE can be secured]							
03.060. Secure Utility Maps							
03.070. Survey Quality Level C Locates							
03.080. Tree Survey							
03.090. Survey Bridges and Structures							
03.100. Survey Ordinary High Water Mark (Coordinate with Environmental Division)							
03.110. Develop Project Layout Sheet With Control Points							

City of San Antonio - Transportation & Capital Improvements Department

Design Guidance Manual

Project: Sample Project
Prime Consultant: ABC
Subconsultant: XYZ
Proposal Date: 3/1/2013

Insert Positions As Required -----> / Insert Approved Hourly Rate for Each Position ----->	Principal	Project Manager	Project Engineer	EIT III	Eng TechIII		
	HOURS	HOURS	HOURS	HOURS	HOURS	TASK HOURS	TASK / PHASE FEE
03.120. Stake Storm Drain Outfall Alignment (Coordinate with Environmental Division)							
04. Roadway Design							
04.010. Typical Sections - Existing and Proposed							
04.020. Horizontal Roadway Alignments							
04.030. Roadway Profiles							
04.040. Street Cross Sections							
04.050. Plan and Profile Sheets							
04.070. Driveway Summary Sheet							
05. Drainage Design							
05.010. Establish Drainage Discharge							
05.010.010. Drainage Area Map							
05.010.020. Model Hydrology (Pre-Project and Post-Project)							
05.010.030. Calculate Design Discharges							
05.020. Design Storm Drain Facilities (Plan and Profile)							
05.020.010. Roadways and Storm Drain System							
05.020.020. Channels							
05.020.030. Bridges / Bridge Class Culverts							
05.020.040. Horizontal Channel Alignments							
05.020.050. Channel Cross Sections							
05.020.060. Culvert Excavation Cross Sections							
06. Pavement Design and Geotech Engineering							
06.010. Design Pavement Section(s) - DGM Appendix 10-A							
07. Utility Coordination / Management							
07.010. Utility Basemap							
07.020. Utility Coordination (Section 5.0 of the DGM)							
07.030. Incorporate Joint-Bid Utility Plans							
08. Traffic Control Plan							
08.010. Construction Phasing Typical Sections							
08.020. Construction Phasing and Sequence of Work							

City of San Antonio - Transportation & Capital Improvements Department

Design Guidance Manual

Project:	**Sample Project**
	ABC
Prime Consultant:	
Subconsultant:	**XYZ**
Proposal Date:	**3/1/2013**

Insert Positions As Required -----> **Insert Approved Hourly Rate for Each Position ----->**	**Principal**	**Project Manager**	**Project Engineer**	**EIT III**	**Eng TechIII**		
	HOURS	**HOURS**	**HOURS**	**HOURS**	**HOURS**	**TASK HOURS**	**TASK / PHASE FEE**
08.030. Conceptual Construction Phasing Layouts							
09. Other Plans							
09.010. Intersection Layouts							
09.020. Bridge Layouts							
09.030. Traffic Signal Plans							
09.040. Illumination Plans							
09.050. Pavement Marking and Signing Plan							
10. Environmental and Regulatory Coordination							
10.010. General Environmental Coordination							
11. Cost Estimating							
11.010. Prepare Cost Estimate							
15. Communications							
15.010. Scoping Public Meeting (Complete Streets) and Exhibits							
15.020. Public Meeting and Exhibits							
15.030. Stakeholder Meetings							
70% Design	0	0	0	0	0	**0**	**$0.00**
01. Project Management and General Items							
01.030. General Sheets - Index, Summaries / Quantities, Notes							
01.040. Design Review Meeting							
01.050. Prepare Meeting Minutes							
01.060. Project Schedule (Includes Construction)							
03. Topographic Surveying / Base Mapping							
03.130. Centerline / ROW Staking for Utility Relocation Prior to Project Bid							
04. Roadway Design							
04.010. Typical Sections - Existing and Proposed							
04.020. Horizontal Roadway Alignments							
04.030. Roadway Profiles							

City of San Antonio - Transportation & Capital Improvements Department

Design Guidance Manual

Project: Sample Project
Prime Consultant: ABC
Subconsultant: XYZ
Proposal Date: 3/1/2013

Insert Positions As Required -----> / Insert Approved Hourly Rate for Each Position ----->	Principal	Project Manager	Project Engineer	EIT III	Eng TechIII		
	HOURS	HOURS	HOURS	HOURS	HOURS	TASK HOURS	TASK / PHASE FEE
04.040. Street Cross Sections							
04.050. Plan and Profile Sheets							
04.060. Retaining Wall Plans (Greater Than 3 FT)							
04.070. Driveway Summary Sheet							
05. Drainage Design							
05.020. Design Storm Drain Facilities (Plan and Profile)							
05.020.010. Roadways and Storm Drain System							
05.020.020. Channels							
05.020.030. Bridges / Bridge Class Culverts							
05.020.040. Horizontal Channel Alignments							
05.020.050. Channel Cross Sections							
05.020.060. Culvert Excavation Cross Sections							
07. Utility Coordination / Management							
07.010. Utility Basemap							
07.020. Utility Coordination (Section 5.0 of the DGM)							
07.030. Incorporate Joint-Bid Utility Plans							
08. Traffic Control Plan							
08.010. Construction Phasing Typical Sections							
08.020. Construction Phasing and Sequence of Work							
08.040. Construction Phasing Layouts							
08.050. Detour and Barricade Plans							
08.060. Temporary Traffic Signal Plans							
09. Other Plans							
09.010. Intersection Layouts							
09.020. Bridge Layouts							
09.030. Traffic Signal Plans							
09.040. Illumination Plans							
09.050. Pavement Marking and Signing Plan							
09.060. SW3P Plan							
09.060.010. SW3P Narrative							

City of San Antonio - Transportation & Capital Improvements Department

Design Guidance Manual

Project:	**Sample Project**
	ABC
Prime Consultant:	
Subconsultant:	**XYZ**
Proposal Date:	**3/1/2013**

Insert Positions As Required ----->	Principal	Project Manager	Project Engineer	EIT III	Eng TechIII		
Insert Approved Hourly Rate for Each Position ----->							
	HOURS	HOURS	HOURS	HOURS	HOURS	TASK HOURS	TASK / PHASE FEE
09.060.020. SW3P Layouts							
09.070. Tree Preservation / Mitigation Plan							
09.080. Landscaping Plans							
09.090. Details and Specifications							
09.090.010. Special Details							
09.090.020. List of Governing Specifications							
09.090.030. Special Provisions							
09.090.040. Special Specifications							
10. Environmental and Regulatory Coordination							
10.010. General Environmental Coordination							
10.020. WPAP							
10.030. TXDOT Permits							
10.040. RR Permits							
11. Cost Estimating							
11.010. Prepare Cost Estimate							
15. Communications							
15.020. Public Meeting and Exhibits							
15.030. Stakeholder Meetings							
95% Design	0	0	0	0	0	**0**	**$0.00**
01. Project Management and General Items							
01.030. General Sheets - Index, Summaries / Quantities, Notes							
01.040. Design Review Meeting							
01.050. Prepare Meeting Minutes							
01.060. Project Schedule (Includes Construction)							
04. Roadway Design							
04.010. Typical Sections - Existing and Proposed							
04.020. Horizontal Roadway Alignments							
04.030. Roadway Profiles							
04.040. Street Cross Sections							

City of San Antonio - Transportation & Capital Improvements Department

Design Guidance Manual

Project: Sample Project
Prime Consultant: ABC
Subconsultant: XYZ
Proposal Date: 3/1/2013

		Project	Project				
Insert Positions As Required ----->	Principal	Manager	Engineer	EIT III	Eng TechIII		
Insert Approved Hourly Rate for Each Position ----->							
	HOURS	HOURS	HOURS	HOURS	HOURS	TASK HOURS	TASK / PHASE FEE
04.050. Plan and Profile Sheets							
04.060. Retaining Wall Plans (Greater Than 3 FT)							
04.070. Driveway Summary Sheet							
05. Drainage Design							
05.020. Design Storm Drain Facilities (Plan and Profile)							
05.020.010. Roadways and Storm Drain System							
05.020.020. Channels							
05.020.030. Bridges / Bridge Class Culverts							
05.020.040. Horizontal Channel Alignments							
05.020.050. Channel Cross Sections							
05.020.060. Culvert Excavation Cross Sections							
05.030. Regulatory Coordination							
05.030.010. Secure Floodplain Development Permit							
05.030.020. Secure CLOMR							
07. Utility Coordination / Management							
07.010. Utility Basemap							
07.020. Utility Coordination (Section 5.0 of the DGM)							
07.030. Incorporate Joint-Bid Utility Plans							
08. Traffic Control Plan							
08.010. Construction Phasing Typical Sections							
08.020. Construction Phasing and Sequence of Work							
08.040. Construction Phasing Layouts							
08.050. Detour and Barricade Plans							
08.060. Temporary Traffic Signal Plans							
09. Other Plans							
09.010. Intersection Layouts							
09.020. Bridge Layouts							
09.030. Traffic Signal Plans							
09.040. Illumination Plans							
09.050. Pavement Marking and Signing Plan							

City of San Antonio - Transportation & Capital Improvements Department

Design Guidance Manual

Project: Sample Project
Prime Consultant: ABC
Subconsultant: XYZ
Proposal Date: 3/1/2013

Insert Positions As Required -----> / Insert Approved Hourly Rate for Each Position ----->	Principal	Project Manager	Project Engineer	EIT III	Eng TechIII		
	HOURS	HOURS	HOURS	HOURS	HOURS	TASK HOURS	TASK / PHASE FEE
09.060. SW3P Plan							
09.060.010. SW3P Narrative							
09.060.020. SW3P Layouts							
09.070. Tree Preservation / Mitigation Plan							
09.080. Landscaping Plans							
09.090. Details and Specifications							
09.090.010. Special Details							
09.090.020. List of Governing Specifications							
09.090.030. Special Provisions							
09.090.040. Special Specifications							
10. Environmental and Regulatory Coordination							
10.010. General Environmental Coordination							
10.020. WPAP							
10.030. TXDOT Permits							
10.040. RR Permits							
10.050. TDLR Design Approval							
11. Cost Estimating							
11.010. Prepare Cost Estimate							
15. Communications							
15.030. Stakeholder Meetings							
Bid Phase	0	0	0	0	0	**0**	**$0.00**
12. Bid Phase							
12.010. Submit 100% Plans With All Joint-Bid Utilities							
12.020. Final Project Specifications Book							
12.030. Finalize Constructability Issues							
12.040. Review Utility Conflict Report and Address Pending Items							
12.050. Attend 100% Review Meeting							
12.060. Assist the City in Preparing Advertising Documents							
12.070. Distribute Plans and Specifications to Contractors and Plan Rooms							
12.080. Attend Pre-Bid Meeting							

City of San Antonio - Transportation & Capital Improvements Department

Design Guidance Manual

Project: Sample Project
ABC
Prime Consultant:
Subconsultant: XYZ
Proposal Date: 3/1/2013

	Principal	Project Manager	Project Engineer	EIT III	Eng TechIII		
Insert Positions As Required -----> Insert Approved Hourly Rate for Each Position ----->							
	HOURS	HOURS	HOURS	HOURS	HOURS	TASK HOURS	TASK / PHASE FEE
12.090. Respond to Contractor Questions							
12.100. Prepare and Distribute Necessary Addenda							
12.110. Prepare Bid Tabulation and Letter of Recommendation							
Construction Phase	0	0	0	0	0	**0**	**$0.00**
13. Construction Management							
13.010 Stake Center Line (or ROW) of Roadway and/or Channel for Utility Adjustment (prior to bid)							
13.020 Reestablish Project Control Points for Contractor Prior to Construction							
13.030 Attend Citizen Meeting(s) and Prepare Exhibits at Start of Construction							
13.040 Prepare and Review Monthly Pay App							
13.050 Review / Negotiate Change Orders							
13.060 Review / Approve Shop Drawings							
13.070 Respond to RFI's							
13.080 Project Site Visits and Reports (Minimum Two Per Month)							
13.0 Participate in Construction Progress Meetings and Prepare Meeting Minutes (Coincide With 13.6 When Possible)							
13.100 Final Walkthrough and Punchlist Review							
13.100 TDLR Inspection							
15. Communications							
15.020. Public Meeting and Exhibits							
15.030. Stakeholder Meetings							
Project Closeout	0	0	0	0	0	**0**	**$0.00**
05. Drainage Design							
05.030. Regulatory Coordination							
05.030.030. Secure LOMR							
14. Project Closeout							
14.010. Prepare Record Drawings							
14.020. Final Warranty Inspection							
TOTAL BASE FEE WITH HOUR BREAKDOWN	**0**	**30**	**20**	**20**	**20**	**90**	**$9,000.00**

City of San Antonio - Transportation & Capital Improvements Department

Design Guidance Manual

Project:	**Sample Project**
	ABC
Prime Consultant:	
Subconsultant:	**XYZ**
Proposal Date:	**3/1/2013**

Insert Positions As Required ----->	Principal	Project Manager	Project Engineer	EIT III	Eng TechIII		
Insert Approved Hourly Rate for Each Position ----->							
	HOURS	HOURS	HOURS	HOURS	HOURS	TASK HOURS	TASK / PHASE FEE
Additional Services							

List additional services as scoped. Examples include Geotech and SUE.

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Appendix 2E Construction Contract

Construction Contract documents shall consist of the successful respondent's bid proposal, all contract documents identified in Table "A" of the City's Form 010, "Formal Invitation for Bids (IFB) and Contract" released in connection with the project, and all Addenda to the IFB. The successful respondent or bidder, by submitting its bid in response to the City's IFB, and signing the City's Form 010, "Formal Invitation for Bids (IFB) and Contract," acknowledges that he/she has received and read the entire Bid and Contract Document and agrees to be bound by the terms therein, that he/she has received all Addenda, and agrees to the terms, conditions, and requirements of the respondent's bid proposal and all documents listed in TABLE "A" of the IFB.

The "Formal Invitation for Bids (IFB) and Contract" integrates the document that form the entire Contract upon approval by the City Council. A written award acceptance (manifested by a City Ordinance) and appropriation (evidence by a Purchase Order) mailed or otherwise furnished to the successful respondent shall result in a binding contract without further action by either party.

A binding contract between the City and the Contractor will be an integration of the following items: City Council approval of the award of the contract, the ordinance (written award accepting the Contractor's bid), and appropriation of funds. A Contractor enters into this contract by signing Form 010 – "Formal Invitation for Bids and Contract".

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Appendix 2F Bidding Process

The Bidding Process for the Transportation & Capital Improvements (TCI) Department involves the coordination of the TCI Contract Services Division (Contracts), the TCI Project Management Team (PM Team), the City Clerk's Office (City Clerk) and the Design Consultant (Consultant). It is the PM Team's responsibility to coordinate with the Consultant regarding the bid document preparation in advance of the anticipated advertisement date. But it is also important for the Consultant to understand the complexity involved with the City's bidding process; and how the Consultant can contribute by supporting the coordination between the PM Team and Contracts to ensure a successful advertisement.

For the City, the bid process begins after the Consultant provides the 95% design submittal. The PM Team will use information obtained from the 95% design submittal to create and submit a "contract request" on Prime Link to Contracts. The "contract request" submitted on Prime Link will provide Contracts with the information necessary to initiate the advertisement preparation process which consists of the following three items:

1. The development of the Small Business Economic Development Advocacy (SBEDA) program's subcontracting goal for the project.
2. The development of the Front End documents.
3. The preparation of the bid package for distribution.

The development of the subcontracting goal is the first item determined in the advertisement preparation process initiated by the "contract request". And while the Consultant is not be responsible for its determination, the construction estimate, consisting of both the City's estimate and the joint bidders' estimates, will be used by the PM Team to fill out the National Institute of Governmental Purchasing (NIPG) worksheet. The NIPG worksheet will be one of the items included in the "contract request" submitted to Contracts on Prime Link. Contracts will then forward the worksheet to the Small Business Division where the NIPG worksheet is used to search their database and determine a suitable subcontracting goal for the project. Contracts will then forward the Small Business Division's determination to the PM Team for review. If the PM Team approves of the goal determined by the Small Business Division, the process is complete. If the PM Team disapproves, a Goal Setting Committee meeting is requested to challenge the goal. Contracts will forward the request to the Small Business Division and the PM Team can present its case to lower the goal. Upon the conclusion of the meeting, the subcontracting goal can be finalized and is valid for at least 90 days. Contracts will use the goal determined to finalize the 050.01 Form (SBEDA Guidelines) and the Subcontractor/Supplier Utilization Plan Form.

The development of the Front End documents is the second item in the advertisement preparation process initiated by the “contract request” and mainly takes place during the Bid Phase. Once the Notice to Proceed (NTP) Letter has been issued by the PM Team to initiate Bid Phase services, the 025 Form (Unit Price Form) will be forwarded to the Consultant to fill out and return with the 100% design submittal. The remaining Front End documents such as the 010 Form (Invitation to Bids); 020 Form (Bid form); 025 Form (Unit Pricing Form) and 040 Form (Standard Instructions to Respondents) will be developed by Contracts with information provided by the PM Team via the “contract request” submitted on Prime Link. The information is used to develop the Front End documents and consists of the following:

- project funding source
- project scope
- advertisement schedule: consisting of the pre-bid meeting time, date and location
- deadline for contractor questions
- deadline for addendums
- plan cost
- number of bidders
- number of alternates
- number of project signs
- calculations used to determine the Liquidated Damages for Substantial and Final completions

Contracts will also be responsible for ensuring the remaining Front End documents such as the 041 Form (Certificate of Interested Parties), 075 Form (Performance Bond), 076 Form (Payment Bond), 081 Form (General Conditions) and the Wage Decision are current.

The preparation of the bid package for distribution is the third and final item in the advertisement preparation process initiated by the “contract request” and also takes place during the Bid Phase. The PM Team will be responsible for checking all documents to ensure that the correct forms are included in the specifications. The Consultant will post the 100% plans with the 100% design submittal on Prime Link. Contracts will use the plans from the 100% submittal to post on the City’s web-site on the date the project is first advertised. Any revisions made after the 100% review meeting, addressing 95% comments not captured, will be made via addendum.

Contracts will provide the PM Team with the latest Front End documents for review. The PM team will send the Front End documents to the Consultant upon final approval. And the Consultant will add the Front End documents to the Specification Book.

Contracts will post the Front End documents on the City's web-site, in the "Contract Opportunities" tab, on the date of the project is first advertised.

Finally, Contracts will provide the PM Team with the latest version of the Plan Room List. The PM Team will send the Plan Room List to the Consultant. The Consultant will distribute the completed bid package to the Plan Rooms utilized by the City and have the bid package completed, printed and ready for purchase on the date the project is first advertised. The Consultant shall be responsible for all printing costs and for the sale of the Plans and Specifications to prospective bidders.

During the advertisement, the Consultant will be the keeper of all questions submitted. The PM Team and Contracts will be responsible for answering any questions in their scope of knowledge and forward those answers to the Consultant to be added via addendum. The Pre-Bid Meeting or Pre-submission Conference is typically held one two weeks prior to the bid opening date. The Consultant is required to attend the conference along with the PM Team and the appropriate team members. Contracts will be responsible for facilitating the meeting, providing talking points related to the contract and a record of all attendees for the contract file. The PM Team will be responsible for providing a Project Information sheet and the Consultant will be responsible for providing meeting minutes and answering any plan related questions from contractors.

Should changes to the plans or specifications be required and/or contractor's questions require responses, an Addendum shall be prepared by the Consultant and forwarded to the PM Team. Following PM Team approval of the addendum, the addendum will be forwarded to Contracts for posting to the City's web-site. It shall be the Consultant's responsibility to ensure that all firms that have purchased plans and specifications are sent a copy of the addendum. All addenda shall include an acknowledgment form that shall require the prospective bidder's signature. The acknowledgment form or forms must be included with all bids submitted. Should an addendum be required to be released with less than 7 days remaining before the bid due date, the addendum shall also extend the time allowed to submit bids for at least one week.

Barring holidays, bids shall be received on Tuesdays at 2:00 P.M. All bids are submitted to the City Clerk's Office and opened and read aloud immediately after receipt. Contracts will conduct bid openings with the assistance of the City Clerk's Office. The Consultant and PM Team should attend all bid openings in connection with their respective projects.

Following the bid opening, the as-read bid tabulation is checked and posted to the City's web-site by Contracts. The City Clerk's Office maintains all bid bonds. The original bids are kept by Contracts, and a copy of all bids is delivered to the PM Team and the Consultant. Contracts shall also provide a copy of the as-read bid tabulation to the PM Team. The PM Team will provide a copy of the as-read bid tabulation to the Consultant.

It is the Consultant's responsibility to check the bids, and to prepare the final bid tabulation. The final bid tabulation shall be provided to the PM Team within 7 days of bid opening, along with a recommendation letter (recommending the lowest responsible bidder for contract award), notice of any items that exceeded the budget by 5% or more, and a scoping letter.

During the bid tabulation process, if the Consultant, PM Team or Contracts are concerned about the qualifications of the low bidder, the low bidder's ability to complete the work, or an irregularity in the bid, an Administrative Hearing may be required. The Consultant should notify the PM Team in writing about these concerns. When there are concerns about the qualifications or responsibility of a bidder, the PM Team should notify Contracts to determine if an Administrative Hearing is desired. If an Administrative Hearing is desired, the PM Team will ask the Contract Administrator to coordinate the Administrative Hearing. If an Administrative Hearing is requested, the low bidder may be asked to provide additional information as to their capacity to perform the work, to include financial statements, lists of equipment and personnel or other information deemed necessary to mitigate risk to the City. The Consultant is required to attend the Administrative Hearing which is not considered to be an outside stakeholder meeting.

The PM Team shall provide Contracts with a copy of the final bid tabulation and notice of which alternates (if any) are being accepted. Contracts is responsible for contacting recommended low bidder to request payment & performance bonds and insurance certificates prior to award of contract.

Contract Services will provide the Economic Development Department with a copy of the lowest qualified bidder's Good Faith Effort Plan for review and approval. Should the Economic Development Department not approve the contractor's Good Faith Effort Plan, they will notify Contracts and/or the PM Team and will work with the contractor regarding their good faith efforts. Contracts will notify the PM Team when approval of the Good Faith Effort Plan or the revised Good Faith Effort Plan (if required) is received.

The PM Team shall begin drafting the Request for Council Action item as soon as the Consultant's recommendation is accepted. The PM Team will notify the Consultant when City Council has approved the construction contract and invite the Consultant to the pre-construction meeting, which typically occurs 10 days after council approval.

The Consultant will attend the pre-construction meeting and bring a final copy of the plans and specifications to give to the Contractor. If plan rooms have returned copies of plans and specifications, Consultant will provide those to the selected contractor as well. Copies of the plans and fully completed specification book with addendum shall be provided for the following individuals:

1. PM Team (3 2 hard copies and 1 PDF copy)
2. Inspections (2 copies and 1 PDF copy)
3. Contracts (2 1 PDF copies)
4. Contractor (3 copies and 1 PDF copy)

5. If Joint Design, at least one hard copy set and one PDF copy for each utility.

Please see Appendix 7F for the City of San Antonio TCI Bid Phase Checklist.

Appendix 2G Variance Letter

The Variance Letter document can be located at:

http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Design-Guidance-Manual-and-Forms

The static document displayed below is dated May 2017. For the most up-to-date version of the document, please download the PDF file from the TCI Design Guidance Manual & Forms site.

CONSULTANT LETTERHEAD

Date

Administrative Exception/Variance Request Review
c/o Assistant City Engineer
Transportation &Capital Improvements Department
City of San Antonio
114 W. Commerce
San Antonio, TX 78205

Re: Project name
City's Project Manager:
Administrative Exception/Variance

Dear Assistant City Engineer:

At a minimum, provide the following information in your Administrative Exception/Variance Request letter:

- *Introduction: Identify the project and state that you are requesting consideration for an administrative exception.*

- *Code Issue: Identify the specific Unified Development Code (UDC) section for which the exception is proposed.*

- *Discussion/Justification: Provide rationale and supporting information, such as technical data, engineering calculations, results of actual field tests, requirements or allowances in other standard engineering references, etc. that provide the basis for the City to accept the request. Proposed design documents (e.g., architectural or engineering plans, photos, etc) and supporting information listed above should be attached to the request as needed to clarify proposed request. Specifically, provide:*

    - *Rationale as to why the Administrative Exception/Variance will not be contrary to the spirit and intent of the UDC and the specific regulations from which an exception is requested;*
    - *Assertion that the applicant has taken all practicable measure to minimize any adverse impacts on the public health, safety and public welfare;*
    - *Justification stating that under the circumstances, the public interest underlying the proposed exception outweighs the public interest underlying the particular regulation for which the exception /variance is granted;*
    - *Identify the alternatives or consequences of the City not approving this request.*

- *Conclusion: Provide a summary statement such as "In my/our professional opinion, the proposed administrative exception/variance remains in harmony with the spirit and intent of the UDC as it will not adversely affect the health, safety, or welfare of the public".*

Sincerely,

____

Title
P.E. License # ____________________

Attachment(s)

( ) Approved

( ) Rejected

Reason for rejection
____
____
____
____
____

_____________________________________ ___________________
Assistant City Engineer Date

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Appendix 2H Plan of Record (As-Builts) Submittal Requirements

- Submit all the requirements below to the City's Project Manager (PM)
- Submit one set of Plan of Record plans for review
- Add the following to the Title Sheet

PLAN OF RECORD

CONTRACTOR:__________________________ (Name of General/Prime Contractor)

PROJECT NUMBER: ______________________________(Project No, i.e., 40-00022)

CONSTRUCTION COMPLETION: ___________________ (Date of Final Acceptance)

TDLR No.____ (TDLR Inspection Number)

- Plan of Record must show ALL modifications made to the original design. These changes include, but are not limited to pavement section, project limits, types of driveways, storm sewer/culvert alignment and elevations, signage/pavement markings, traffic signals and bridge drill shaft locations, etc… If needed, these changes must be accompanied by documentation, i.e., change orders.
- When there is a change in street reconstruction limits, or a change of location of manholes or inlets, the Plan of Record must reflect these station changes as per Contractor's redline plans.
- When there is a change in the proposed street or storm sewer system slope, the Plan of Record must reflect these elevation changes as per Contractor's redline plans.
- Label each plan sheet with the following note: "Plan of Record"
- After acceptance of review copy by PM, then a final hard copy of the Plan of Record can be submitted along with an electronic copy in PDF and DGN format.
- Plan of Record must be signed and sealed by a Professional Engineer

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Appendix 3A Survey Example

Parcel No.: P06-386

Project Name: IH-22 16-Inch Water Main: Woods /at Fair Oaks & Village Green

Owner's Name: Green Land Ventures, LTD.

Page 1 of 3

FIELD NOTES

DESCRIPTION OF A 30' WATER, SEWER AND RECYCLE WATER EASEMENT

0.119 OF ONE ACRE TRACT OF LAND (5,205 sq. ft.)

Being 0.119 of one acre (5,205 sq. ft.) of land in Bexar County, Texas, being out of and part of a 4.333 acre tract of land recorded in Volume 8888, Page 2222, Official Public Records of Real Property of Bexar County, Texas, out of and part of a 31.812 acre tract of land recorded in Volume 8888, Page 2222, Official Public Records of Real Property of Bexar County, Texas and out of and part of a 2.338 acre tract of land recorded in Volume 7777, Page 444, Official Public Records of Real Property of Bexar County, Texas, and being more particularly described by metes and bounds as follows:

BEGINNING at a ½" iron rebar with a "JDS" plastic cap found on the northeast right-of-way line of Interstate Highway 22 (R.O.W. ~ varies) at the south end of the cutback line from said northeast right-of-way line to the southeast right-of-way line of Woodland Parkway, The Woods Subdivision Unit 2 recorded in Volume 9999, Page 111, Deed and Plat Records of Bexar County, Texas, being the southwest corner of the remaining portion of said 4.333 acre tract and of this easement;

THENCE North 14°09'05" East, along said cutback line and northwest line of said remaining portion of a 4.333 acre tract, a distance of 35.36 feet to a ½" rebar with a "JDS" plastic cap found on the said southeast right-of-way line of Woodland Parkway and the north line of said remaining portion of said 4.333 acre tract for an angle point of this easement;

Project No.: 06-1222-133

Parcel No.: P06-386

Page 2 of 3

THENCE North 59°09'05" East, along the said southeast right-of-way line of Woodland Parkway, a distance of 5.00 feet to a ½" rebar with a "JDS" plastic cap set for the northeast corner of this easement, said point bears South 59°09'05" East, a distance of 4.89 feet from a ½" iron rebar with a "JDS" plastic cap found for a point of curvature for said Woodland Parkway;

THENCE South 30°50'55" East, crossing said remaining portion of said 4.333 acre tract, 2.338 acre tract and 31.812 acre tract, a distance of 181.83 feet to a point on the common line of the south line of said remaining portion of a 31.812 acre tract and the north line of Lot 2, Block 1, of The Woods Subdivision Unit 2, being the southeast corner of this easement, from which a set ½" iron rebar with a "JDS" plastic cap bears South 30°50'55" East a distance of 2.00 feet;

THENCE South 51°13'35" West, along the said common line, a distance of 30.29 feet to a ½" rebar with a "JDS" plastic cap set on the existing northeast right-of-way line of Interstate Highway 22, for the southwest corner of said remaining portion of a 31.812 acre tract and the northwest corner of said Lot 2, being the southwest corner of this easement;

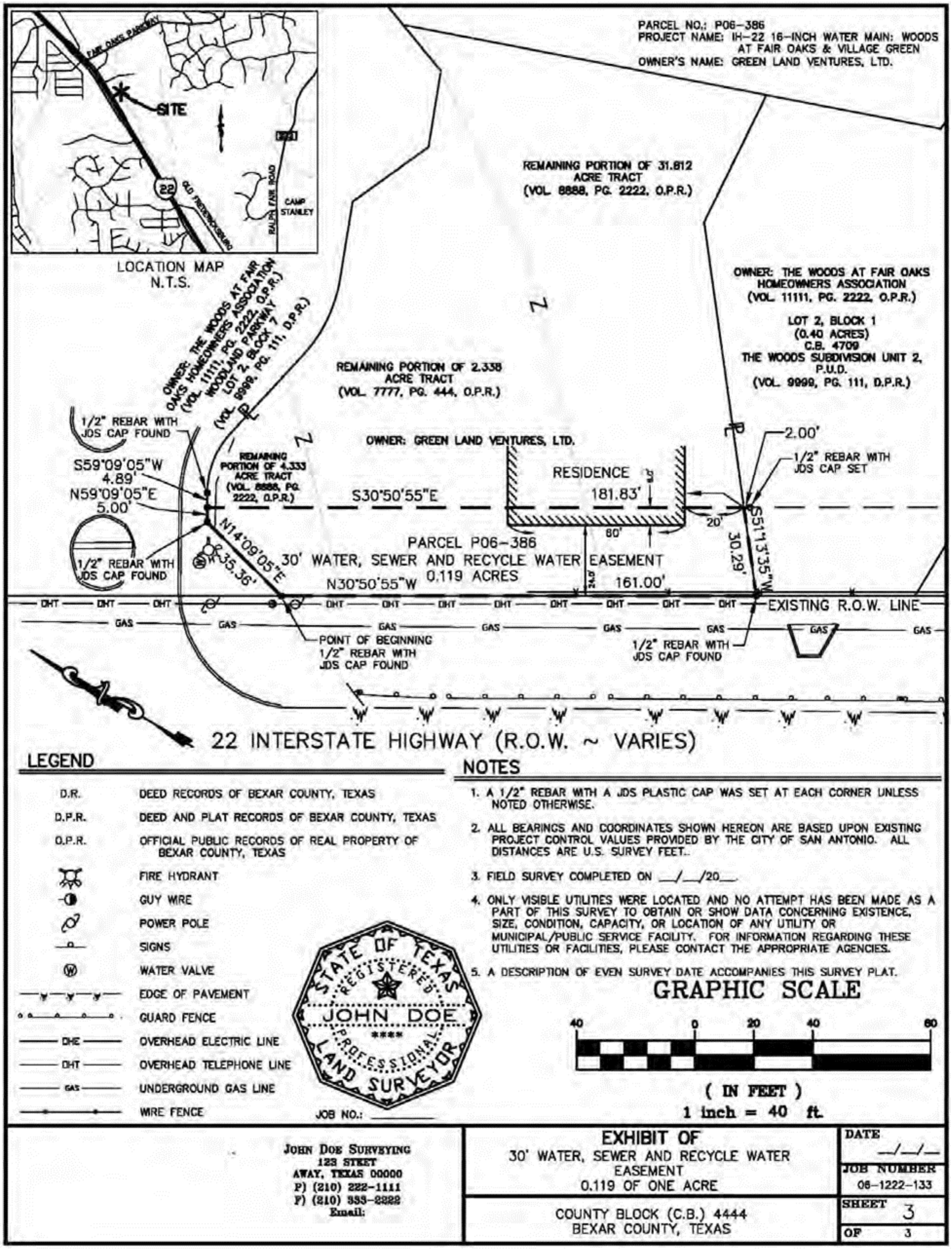
THENCE North 30°50'55" West, along said northeast right-of-way line, a distance of 161.00 feet to the **POINT OF BEGINNING** and containing 0.119 of one acre (5,205 sq. ft.) of land, more or less.

All bearings and controls shown hereon are based upon existing project control values provided by the City of San Antonio. All distances are U.S. survey feet.

This description was prepared from a survey made on the ground by employees of John Doe Surveying (JDS).

A survey plat of even survey date accompanies this metes and bounds description.

John Doe R.P.L.S. # 0000   Date


PARCEL NO.: P06-386
PROJECT NAME: IH-22 16-INCH WATER MAIN: WOODS AT FAIR OAKS & VILLAGE GREEN
OWNER'S NAME: GREEN LAND VENTURES, LTD.
SITE
FAIR OAKS PARKWAY
22
OLD FREDERICKSBURG
RALPH FAIR ROAD
CAMP STANLEY
LOCATION MAP
N.T.S.
REMAINING PORTION OF 31.812 ACRE TRACT (VOL. 8888, PG. 2222, O.P.R.)
OWNER: THE WOODS AT FAIR OAKS HOMEOWNERS ASSOCIATION (VOL. 11111, PG. 2222, O.P.R.)
LOT 2, BLOCK 1 (0.40 ACRES) C.B. 4709 THE WOODS SUBDIVISION UNIT 2, P.U.D. (VOL. 9999, PG. 111, D.P.R.)
OWNER: THE WOODS AT FAIR OAKS HOMEOWNERS ASSOCIATION (VOL. 11111, PG. 2222, O.P.R.) WOODLAND PARKWAY LOT 2, BLOCK 7 (VOL. 9999, PG. 111, D.P.R.)
REMAINING PORTION OF 2.338 ACRE TRACT (VOL. 7777, PG. 444, O.P.R.)
OWNER: GREEN LAND VENTURES, LTD.
REMAINING PORTION OF 4.333 ACRE TRACT (VOL. 8888, PG. 2222, O.P.R.)
1/2" REBAR WITH JDS CAP FOUND
S59°09'05"W 4.89'
N59°09'05"E 5.00'
S30°50'55"E
RESIDENCE
181.83'
2.00'
1/2" REBAR WITH JDS CAP SET
20'
60'
N14°09'05"E 35.36'
PARCEL P06-386
30' WATER, SEWER AND RECYCLE WATER EASEMENT
0.119 ACRES
N30°50'55"W
161.00'
S51°13'35"W 30.29'
1/2" REBAR WITH JDS CAP FOUND
EXISTING R.O.W. LINE
POINT OF BEGINNING 1/2" REBAR WITH JDS CAP FOUND
1/2" REBAR WITH JDS CAP FOUND
22 INTERSTATE HIGHWAY (R.O.W. ~ VARIES)
LEGEND
D.R. DEED RECORDS OF BEXAR COUNTY, TEXAS
D.P.R. DEED AND PLAT RECORDS OF BEXAR COUNTY, TEXAS
O.P.R. OFFICIAL PUBLIC RECORDS OF REAL PROPERTY OF BEXAR COUNTY, TEXAS
FIRE HYDRANT
GUY WIRE
POWER POLE
SIGNS
WATER VALVE
EDGE OF PAVEMENT
GUARD FENCE
OVERHEAD ELECTRIC LINE
OVERHEAD TELEPHONE LINE
UNDERGROUND GAS LINE
WIRE FENCE
NOTES
1. A 1/2" REBAR WITH A JDS PLASTIC CAP WAS SET AT EACH CORNER UNLESS NOTED OTHERWISE.
2. ALL BEARINGS AND COORDINATES SHOWN HEREON ARE BASED UPON EXISTING PROJECT CONTROL VALUES PROVIDED BY THE CITY OF SAN ANTONIO. ALL DISTANCES ARE U.S. SURVEY FEET.
3. FIELD SURVEY COMPLETED ON __/__/20__.
4. ONLY VISIBLE UTILITIES WERE LOCATED AND NO ATTEMPT HAS BEEN MADE AS A PART OF THIS SURVEY TO OBTAIN OR SHOW DATA CONCERNING EXISTENCE, SIZE, CONDITION, CAPACITY, OR LOCATION OF ANY UTILITY OR MUNICIPAL/PUBLIC SERVICE FACILITY. FOR INFORMATION REGARDING THESE UTILITIES OR FACILITIES, PLEASE CONTACT THE APPROPRIATE AGENCIES.
5. A DESCRIPTION OF EVEN SURVEY DATE ACCOMPANIES THIS SURVEY PLAT.
STATE OF TEXAS REGISTERED JOHN DOE PROFESSIONAL LAND SURVEYOR
GRAPHIC SCALE
40 0 20 40 80
(IN FEET)
1 inch = 40 ft.
JOB NO.:
JOHN DOE SURVEYING
123 STREET
AWAY, TEXAS 00000
P) (210) 222-1111
F) (210) 333-2222
Email:
EXHIBIT OF
30' WATER, SEWER AND RECYCLE WATER EASEMENT
0.119 OF ONE ACRE
COUNTY BLOCK (C.B.) 4444
BEXAR COUNTY, TEXAS
DATE __/__/__
JOB NUMBER 06-1222-133
SHEET 3
OF 3

```
Project: Mon December 04 09:19:38 2006
-----------------------------------------------------------------------
----
Parcel name: P06-386 Point

     of Beginning

   North: 13810593.3871 East : 2075955.8374
Line Course: S 30-50-55 E Length: 181.83
        North: 13810437.2815 East : 2076049.0746
Line Course: S 51-13-35 W Length: 30.29
        North: 13810418.3125 East : 2076025.4597
Line Course: N 30-50-55 W Length: 161.00
        North: 13810556.5351 East : 2075942.9035
Line Course: N 14-09-05 E Length: 35.36
        North: 13810590.8220 East : 2075951.5485
Line Course: N 59-09-05 E Length: 5.00
        North: 13810593.3858 East : 2075955.8411

   Perimeter: 413.47 Area: 5,205 sq.ft. 0.119 acres

Mapcheck Closure - (Uses listed courses, radii, and deltas)
Error Closure: 0.0040            Course: S 71-40-32 E
   Error North: -0.00124           East : 0.00375
Precision 1: 103,370.00
```

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Appendix 3B Standard Feature Codes

COSA Codes Alphabetical by Feature

Feature	Code	Indicator
Above Ground Tank	AGT	*, F, *F
Abutment (Bridge) (Goes to Zone 1)	ABUT	*, G, *G
Aerial Target	AT	F
Air Conditioner	AC	*, F, *F
Air Vent	VA	F
Antenna	ANT	F
Asphalt	ASPH	G
Attenuation System	AS	*, G, *G
Azimuth Mark (Existing)	AZ	F
Azimuth Mark (New)	AZM	F
Back of Curb	CRB	*, G, *G
Bank (Top, Bottom)	BNK	*, G, *G
Barn	BRN	*, G, *G
Baseline	BL	*, F, *F
Bench/Bus Stop	BEN	*, F, *F
Benchmark (Azimuth)	BAZ	F
Benchmark (Magnetic)	BMAG	F
Benchmark (New)	BM	F
Benchmark (Reference)	BREF	F
Benchmark (Temporary)	BTMP	F
Benchmark (Triangulation)	BTRI	F
Benchmark (Traverse)	BTRA	F
Bikeway	BIKE	*, G, *G
Billboard	BLB	*, G, *F
Bottom of Slope	SLPB	*, G, *G
Box Culvert	CLV	*, G, *F
Box Panel (Flight)	BOX	F
Brace Pole	BPL	G
Brass Cap	BC	F
Brick Fence	BFN	*, G, *G
Bridge Abutment (Goes to Zone 1)	ABUT	*, G, *G
Bridge Approach Slab (Zone 1)	BAS	*, G, *G
Bridge Approach Slab (Zone 1)	BAS	*, G, *G
Bridge Armor Joint	BAJ	*, G, *G
Bridge Bent	BBT	*, G, *G
Bridge Centerline	BCL	*, G, *G
Bridge Curb	BCRB	*, G, *G
Bridge Deck	DECK	*, G, *G
Bridge Elements	BE	*, G, *G
Bridge Gutter	BGUT	*, G, *G
Bridge Overhang	BOV	*, G, *G
Bridge Rail (Metal, Concrete)	BRL	*, G, *G
Bridge Sidewalk	BSW	*, G, *G
Bridge Spot Elevation	BSE	G, *G
Bridge Stripe Dashed	BPSD	*, G, *G
Bridge Stripe Solid	BPS	*, G, *G
Bridge Truss (Railroads)	BTR	*, G, *G
Building (Foundation, Wall, etc)	BLD	*, G, *G
Cable Guard Rail	GRC	*, G, *F
Cable in Pavement Detector	CAB	*, G, *F
Cable TV Line	CTV	*, G, *F
Cable TV Pedestal	CPED	F
Cable TV Service Box	CSB	F
Camp Stove/Grill	GRL	F

Feature	Code	Indicator
Canal	CAN	*, G, *G
Catch Basin	CBS	*, G, *G
Cattle Guard	CG	*, G, *G
Cemetery	CEM	*, G, *F
Center Line	CL	*, G, *G
Center of Road	CR	*, G, *G
Center of Stream	CST	*, G, *G
Center Section Corner	CTRS	F
Chain Link Fence	CFN	*, G, *F
Channel	CH	*, G, *G
Channel (Concrete)	CCH	*, G, *G
Chiseled Plus (SCRIBE)	CHP	F
Chiseled, Drilled or Plug Mark	CHM	F
Cinder Block Fence	CBFN	*, G, *G
Clean Out	CO	F
Column	COL	G
Concrete - Edge of	EC	*, G, *G
Concrete Channel	CCH	*, G, *G
Concrete Guard Fence	GFC	*, G, *F
Concrete Marker (Cast Type 1)	CMKR	F
Concrete Monument (Poured Type 2)	MON	F
Concrete Pavement	CPV	*, G, *G
Concrete Paving - Edge of	ECPV	*, G, *G
Concrete Pipe (Reinforced)	RCP	*, G, *F
Concrete Traffic Barrier (Permanent)	CTB	*, G, *G
Concrete Traffic Barrier (Temp)	CBT	*, F, *F
Conduit Electric	CNDE	*, G, *F
Conduit Telephone	CNDT	*, G, *F
Coniferous Tree	PINE	G
Construction Point	CNP	F
Control Point	CP	F
Corrugated Metal Pipe	CMP	*, G, *F
Cotton Spindle	SPIN	F
Country Line	CTR	*, F, *F
County Line	COLN	F
Crown of Road	CR	*, G, *G
Culvert (Box)	CLV	*, G, *F
Culvert (Pipe)	PCLV	*, G, *F
Culvert Structure	STRU	*, G, *G
Curb - Back	CRB	*, G, *G
Curb Cut Ramp	CCR	*, G, *G
Curb Inlet	CI	*, G, *G
Dam (Earthen)	ED	*, G, *G
Digital Photograph Taken	PHOTO	F
Digital Photograph Taken	PHOTO	F
Directional Arrow (Pavement Marking)	DA	*, G, *F
Dirt Road	DR	*, G, *G
Ditch (Back)	BDT	*, G, *G
Ditch (Bottom)	DTB	*, G, *G
Ditch (Top)	DTT	*, G, *G
Ditch Bottom Inlet	DBI	*, G, *G
Ditch Pavement	DPV	*, G, *G
Drain Feature (Special)	SDF	*, G, *F

Feature	Code	Indicator
Drain Pipe (Storm)	STM	*, G, *F
Drill Cores	BORE	F
Driveway	DRV	*, G, *G
Drop Inlet	DI	*, G, *G
Dumpster	TD	F
Earthen Dam	ED	*, G, *G
Easement Lines	ES	*, G, *F
Easement Lines	ES	*, G, *F
Edge of Concrete	EC	*, G, *G
Edge of Concrete Paving	ECPV	*, G, *G
Edge of Gravel	EG	*, G, *G
Edge of Pavement	EP	*, G, *G
Edge of Trees/Woods	WDS	*, G, *F
Edge of Water	EW	*, G, *F
Electric Junction Box	JBE	G
Electric Manhole	MHE	G
Electric Meter	EM	F
Electric Service Pole	SPLE	G
Electric Tower, Single Column	TWR	F
Electric Transformer	TRNS	F
Electrical Pedastel	EPED	F
Elevation of Water	WE	*, G, *F
Encasement Pipe	ENP	*, F, *F
End Wall	EWL	*, G, *G
End Wall (Special)	SEW	*, G, *G
Entrance - Private	PE	*, G, *F
Faucet	FAU	F
Fence (Generic)	FN	*, G, *F
Fence Gate	GAT	*, G, *F
Fiber Optic Cable	FOC	*, G, *F
Filler Cap	FC	G
Fire Hydrant	FH	F
Flag Pole	FP	F
Flared End Section	FLR	*, G, *G
Flight Panel (?) (Horizontal)	HP	
Flight Panel (Box Panel)	BOX	
Flight Panel (Vertical Only)	HPV	F
Flight Panel (Vertical Panel Point)	VPT	F
Flow Line	FL	*, G, *G
Flume	FLM	*, G, *G
Footing (Concrete for signs)	FT	*, G, *G
Garage	G	*, G, *G
Gas Line	GL	*, G, *F
Gas Meter	GM	F
Gas Pump	GPU	F
Gas Pump Island	GPI	*, G, *G
Gas Tank (Underground)	UGT	*, G, *F
Gas Tank Cover	TC	F
Gas Valve	GV	F
Gas Valve Cover	VCG	F
Gas Vent	VG	F
Gate (Fence gate)	GAT	*, G, *F
Gauge (Stream or Tide)	GAU	F
GPS Monument	GPS	F
Grade Break	GB	*, G, *G

Feature	Code	Indicator
Gravel - Edge of	EG	*, G, *G
Gravel Road	GRV	*, G, *G
Guard Fence	GF	*, G, *F
Guard Fence - Concrete	GFC	*, G, *F
Guard Post	GP	F
Guard Rail - Cable	GRC	*, G, *F
Gutter Flow Line	GUT	*, G, *G
Gutter Inlet	GI	*, G, *G
Guy Anchor	GUY	G
Guy Pole (Deadman)	GPL	G
Handicap Ramp	HCR	*, G, *F
Handrail	HR	*, F, *F
Headwall	HDW	*, G, *G
Headwall (Back)	HDWB	*, G, *G
Headwall (Forward)	HDWF	*, G, *G
Hedge	HDG	*, G, *F
High Mast Lighting Tower	HMLT	F
High Point	HI	G
High Voltage Transmission Line	HV	*, G, *F
Horizontal Panel (Flight?)	HP	F
Horizontal Pipe Runner	PRH	*, G, *G
Hour-Glass Panel	HGP	F
House	H	*, G, *G
Hub & Tack	HT	F
Incinerator	INC	*, F, *F
Invert Electric (Flow Line) (Zone 3)	INE	F
Invert Storm Sewer	INS	F
Invert Telephone (Flow Line) (Zone 3)	INT	F
Invert Wastewater (Flowline) (Zone 3)	INV	F
Iron Bar	IB	F
Iron Pipe	IP	F
Iron Rod	IR	F
Irrigation Stand Pipe	ISP	G
Island	ISL	*, G, *G
Junction Box	JB	G
Junction Box (Electric)	JBE	G
Junction Box (Telephone)	JBT	G
Lane Line	LL	*, G, *G
Levee	LEV	*, G, *G
Light Base	LB	F
Lot Corner	LOT	F
Low Point	LO	G
Luminare Standard	LS	F
Mailbox	MB	F
Manhole (Electric)	MHE	G
Manhole (Generic)	MH	G
Manhole (Storm Drain)	MHS	G
Manhole (Telephone)	MHT	G
Manhole (Wastewater)	MHW	G
Marker Post	MP	F
Marsh	MAR	*, G, *G
Match Line	ML	G
Miscellaneous Line	MIS	G, *G

Feature	Code	Indicator
Miscellaneous Point	MISC	G
Mitered End Section	MES	*, G, *G
Nail (60d, Conc, w/Shiner)	NAIL	F
Nail and Shiner	NS	F
Natural Ground	NG	**, G, *G
NGS Marker (Horizontal & Vertical)	HVM	F
NGS Marker (Horizontal Only)	HM	F
NGS Marker (Horizontal Only)	NGS	F
NGS Marker (Vertical Only)	VM	F
Noise Wall	NW	*, G, *F
Orchard Trees	OTR	G
Orchard/Grove	ORCH	*, G, *F
Ornamental Plant	OP	G
Overhead Electric (Power Line)	OE	*, G, *F
Overhead Telephone (Telephone Line)	OT	*, G, *F
Paint Stripe (Dashed)	PSD	*, G, *G
Paint Stripe (Solid)	PS	*, G, *G
Paint Stripe Yellow (Dashed)	PSDY	*, G, *G
Paint Stripe Yellow (Solid)	PSY	*, G, *G
Parcel	PAR	*, F, *F
Parcel (Take)	PARTK	*, F, *F
Parcel Remainder	PARR	*, F, *F
Parking Lot	PKL	*, G, *G
Parking Meter	PMT	F
Path	PATH	*, G, *G
Pavement - Concrete	CPV	*, G, *G
Pavement - Edge of	EP	*, G, *G
Pedestrian Signal Box	PSB	F
Picket Fence	PFN	*, G, *F
Piling/Pier	PIR	*, G, *F
Pipe Culvert	PCLV	*, G, *F
Pipe Runner (Horizontal)	PRH	*, G, *G
Pipe Runner (Vertical)	PRV	*, G, *G
Pipeline	PIP	*, G, *F
Pit, Fill	PIT	*, G, *G
Planter	PLT	*, G, *F
Plat Corner	PLAT	F
Playground	PLAY	*, G, *G
Point of Continuous (Compound) Curve	PCC	G
Point of Curvature	PC	G
Point of Intersection	PI	G
Point of Reverse Curve	PRC	G
Point of Tangency	PT	G
Point on Curve	POC	G
Point on Tangent	POT	G
Pole (Generic)	POLE	G
Porch	POR	*, G, *G
Portable Toilet	TOIL	F
Post (Generic)	PST	G
Power Line (Overhead Electric)	OE	*, G, *F
Power Line (Underground)	UE	*, G, * F
Power Pedestal	PPED	F
Power Pole	PP	G
Principal Point	PPT	F
Private Entrance	PE	*, G, *F
Property Corner	PCR	G
Pull Box	PBX	F
Pull Box	PBX	F
Pump House	PHSE	*, G, *G
Quarry	QRY	*, G, *G
Radius Point	RP	G
Railroad Control Box	RRCB	F

Feature	Code	Indicator
Railroad Crossing Sign	RRX	F
Railroad Mile Post	RRMP	F
Railroad Signal Standard	RRSS	F
Railroad Spike	RRSP	F
Railroad Switch	RRSW	F
Railroad Tracks	RR	*, G, *G
Reference Marker	RM	F
Reinforced Concrete Pipe	RCP	*, G, *F
Reinforcement Bar	RBAR	F
Retaining Wall	RW	*, G, *G
Ridge Line	RIDG	*, G, *G
Ring and Bolt	RB	F
Rip Rap (Top or Bottom)	RIP	*, G, *G
Road - Dirt	DR	*, G, *G
Road - Gravel	GRV	*, G, *G
Road Center	CR	*, G, *G
Road Crown	CR	*, G, *G
Road Shoulder	SHD	*, G, *G
Rock Wall	ROCK	*, G, *G
Rock Wall Fence	RWFN	*, G, *G
Rod with Cap Type 3	DM	F
Roof Tops (Goes to Zone 6)	ROOF	*, F, *F
ROW (Existing)	ROWE	*, G, *F
ROW (Proposed)	ROW	*, F, *F
Ruins	RNS	*, F, *F
Safety End Treatment	SET	*, G, *F
Satellite Dish	SDSH	F
Seawall	SWL	*, G, *G
Section Corner	SECT	F
Septic Tank/Cover	SEP	F
Septic Vent	VS	F
Service Pole Electric	SPLE	G
Service Pole Telephone	SPLT	G
Sewage Dump Station	SDS	*, G, *F
Shed	SHED	*, G, *G
Shoulder (of Road)	SHD	*, G, *G
Shrub	SHB	G
Sidewalk	SW	*, G, *G
Sign and Pole (Single)	SGN	F
Sign Footing (Concrete)	FT	*, G, *G
Sign with Double Support	DSN	F
Signal Control Panel	SCP	F
Signal Pedestal	SPED	F
Signal/ Span Wire Support/ Mast Arm	SS	F
Silo	SIL	*, G, *G
Slab	SLB	*, G, *G
Slope Bottom	SLPB	*, G, *G
Slope Top	SLPT	*, G, *G
Special Drain Feature	SDF	*, G, *F
Special End Wall	SEW	*, G, *F
Spillway	SPL	*, G, *G
Spot Elevation	SE	G
Sprinkler Head	SPK	F
State Border	STB	*, F, *F
Steps	STP	*, G, *G
Storm Drain Manhole	MHS	G
Storm Drain Pipe	STM	*, G, *F
Storm Sewer Drain Line	SDL	*, G, *F
Storm Sewer Invert	INS	F
Storm Shelter	STC	*, F, *F
Storm Water Drain Line	SDL	*, G, *F
Storm Water Drain Line	SDL	*, G, *F
Stream (Center)	CST	*, G, *G

Feature	Code	Indicator
Stream Gauge	GAU	F
Structure	STRU	*, G, *G
Subdivision/ Block/ Lot/ Property Line	PL	*, F, *F
Survey Station	STA	F
Swimming Pool	POL	*, G, *G
Tank (Above Ground)	AGT	*, F, *F
Tank Cover (Gas)	TC	F
Telephone Booth	TB	F
Telephone Junction Box	JBT	G
Telephone Line (Overhead Telephone)	OT	*, G, *F
Telephone Line (Underground)	UT	*, G, *F
Telephone Manhole	MHT	G
Telephone Pedestal	TPED	F
Telephone Pole	TP	G
Telephone Service Pole	SPLT	G
Test Holes	BORE	F
Tide Gauge	GAU	F
Toilet (Portable)	TOIL	F
Top of Slope	SLPT	*, G, *G
Tower, Single Column	TWR	F
Tractor Crossing	TRX	*, G, *G
Traffic Barrier - Concrete (Permanent)	CTP	*, G, *G
Traffic Barrier - Concrete (Temp)	CBT	*, F, *F
Traffic Separator	TSP	*, G, *F
Traffic Signal Light Pole (Single)	TSLP	F
Trail	TRL	*, G, *G
Transformer	TRNS	F
Transmission Line Tower Leg	HVTL	G
Trash Disposal	TD	F
Traverse/Turn Point	TPT	**, F, *F
Tree	TR	G
Tree Drip Lines	DRIP	*, G, *F
Tree Farm Outline	TFO	*, G, *F
Tree Stump	STMP	F
Tree, larger than TR	TRE	G
Tree, larger than TRE	TREE	G
Tree, larger than TREE	TREES	G
Type 1 Monument	CMKR	F
Type 2 Monument	MON	F
Type 3 Monument	DM	F
Underground Electric (Power Line)	UE	*, G, *F
Underground Gas Tank	UGT	*, G, *F
Underground Tank Gas	UGT	*, G, *F
Underground Telephone	UT	*, G, *F
User-Defined Point or Line	UA	*, U, *U
User-Defined Point or Line	UB	*, U, *U
User-Defined Point or Line	UC	*, U, *U
Valve (Generic)	VLV	F
Valve Cover (Gas)	VCG	F
Valve Cover (Generic)	VC	F
Valve Cover Water	VCW	F
Valve Water	WV	F
Vent (Air)	VA	F
Vent (Generic)	VENT	F
Vent (Septic)	VS	F
Vent Gas	VG	F
Vent Wastewater	VW	F
Vertical Panel Point (Flight Point)	VPT	F
Vertical Pipe Runner	PRV	*, G, *G
Wastewater Invert (Flowline) (Zone 3)	INV	F

Feature	Code	Indicator
Wastewater Line	WW	*, G, *F
Wastewater Manhole	MHW	G
Wastewater Vent	VW	*, G, F*
Water (Edge of)	EW	*, G, *F
Water Elevation	WE	*, G, *F
Water Line	WL	F
Water Meter	WM	F
Water Valve	WV	F
Water Valve Cover	VCW	F
Water Well/ Pump	WEL	F
Web Wall (Goes to Zone 1)	WEB	*, G, *G
Windmill	WML	F
Wing Panel Point (Vertical Control)	WING	F
Wing Wall	WNG	*, G, *G
Wire Fence	WFN	*, G, *F
Witness Corner	WIT	F
Wood Fence	WDFN	*, G, *F
Wooden Post	WP	G
Yard Drain	YD	*, G, *F
* Indicates a LINEAR pattern		
** Indicates a LINEAR pattern		
F Indicates Feature		
G Indicates		

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Appendix 3C Control Sheet Example

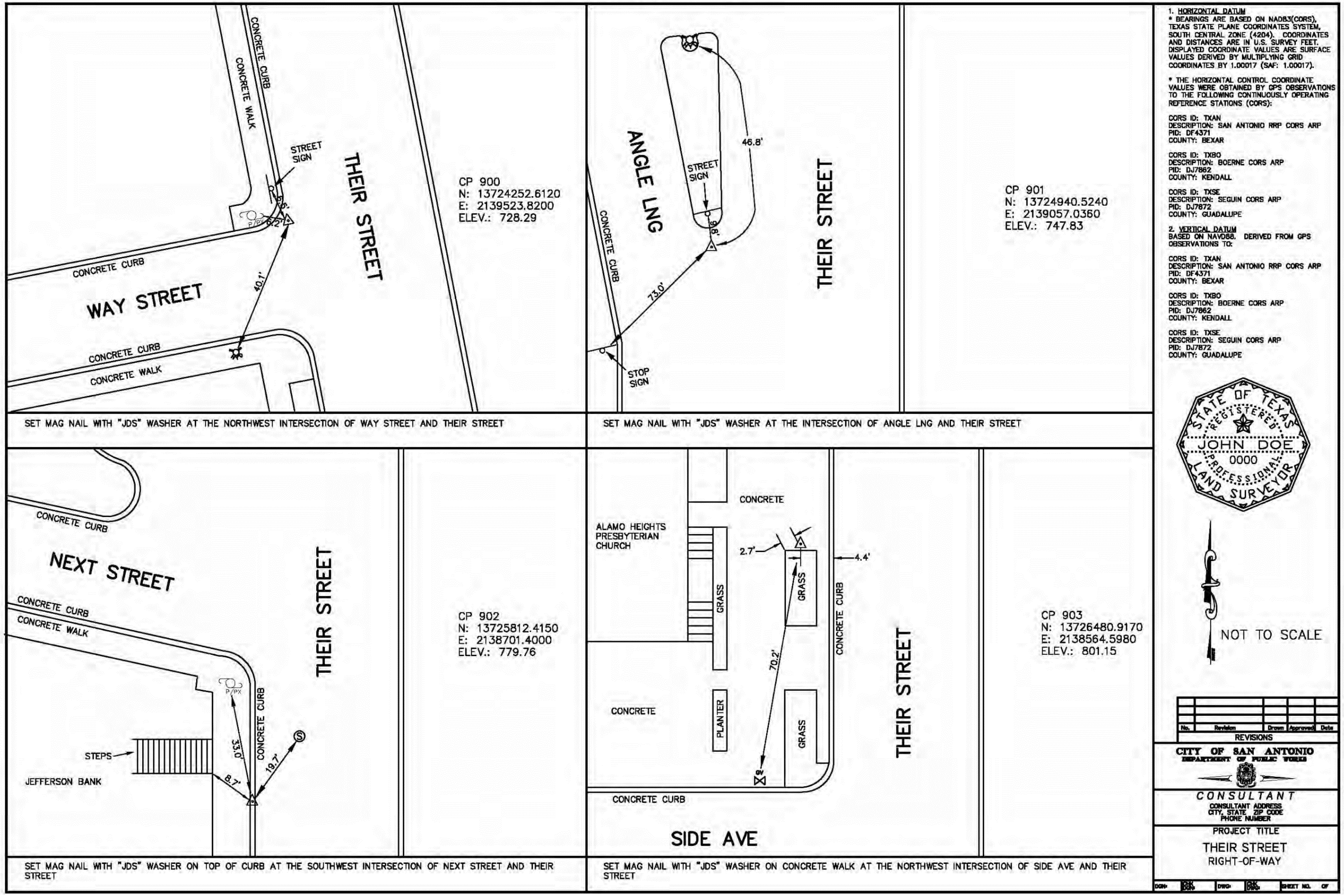

Figure3C-1: Control Sheet

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Appendix 5A Utility Points of Contact

Points of contact for primary utility companies in San Antonio can be found in the table below. This list is not all inclusive. There may be other utility companies that need to be contacted. As well, the contact information, current as of May 2013, may become out-of-date. Please use your discretion in researching updated contacts, as needed.

Table5A-1. Utility Coordinators (

Utility	Contact Name	Contact #
San Antonio Water System (SAWS)	Governmental Relocation	(210) 233-3466 (210) 233-3705
CPS Energy (City of San Antonio Projects)	John Offer Jake Martinez	(210) 353-2012 (210) 426-1046
CPS Energy (Projects other than City of San Antonio)	Richard Rodriguez	(210) 353-2226
ATT	Santiago Prince, Long Distance Philip Austin, Local	(210) 471-0022 (210) 283-1839
Spectrum (TWC)	Frank Cyprian	(210) 279-5752
MCI / Verizon	Doug Kougl	(214) 732-5311
Grey Forest Gas	Vanessa Lopez	(210) 695-5992
Bexar Metropolitan Water District	Leonard Martin	(210) 354-6537
Grande Communications	Robert Martinez	(210) 304-9857
VIA	Ernest Sweet	(210) 362-4816
TxDOT	Curtis Rabenaldt, Signals Brad Adami, TransGuide	(210) 207-7765 (210) 731-5109
COSA Traffic	Adrian Olguin	(210) 207-7769

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Appendix 5B Utility Conflict Matrix

The Utility Conflict Matrix (.xls) file can be located by visiting:

http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Design-Guidance-Manual-and-Forms

and selecting Utility Conflict Matrix, found under the Design Guidance Manual Forms heading.

The static document displayed below is dated October 2017. For the most up-to-date version of the document, please download the file from the site listed above.

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UTILITY CONFLICT MATRIX

Project Name: ______________________________
Project No: ______________________________
Prepared By: ______________________________
Engineering Design Firm: ______________________________
Submittal: %______________________________

UTILITY	OWNER	LOCATION	STATION		CONFLICT DESCRIPTION	RECOMMENDED ACTION REQ'D	STATUS
WATER (PROPOSED)	**SAWS**						
16" WATER							
		Flores St	12+067	LT	crosses exist UG Telephone	verify vertical clearance	AT&T will abandon UG line
		Flores St	12+161	LT	crosses storm drain lateral	verify vertical clearance	will adjust water
6" WATER							
		Main Rd	12+230	LT	crosses exist UG Telephone	verify vertical clearance	AT&T will abandon UG line
STORM DRAIN (PROPOSED)	**COSA**						
48" RCP							
		Commerce St	11+708	LT	crosses exist 4" gas	coordinate w/CPS	information sent to CPS
POWER (EXISTING)	**CPS Energy**						
UNDERGROUND ELECTRIC							
		Main Rd	12+336 to 12+370	LT	duct bank in pavement approx 1ft below subgrade	vertical adjustment req'd	information sent to CPS and coordinating design
OVERHEAD ELECTRIC							
		Main Rd	11+753	RT	power pole in prop roadway	relocate power pole	power pole will be adjusted and it is included in CPS design sketch
		Main Rd	12+036	LT	power pole in prop sidewalk	verify clearance/ADA	power pole will be adjusted and it is included in CPS design sketch
UG TELEPHONE	**AT&T**						
BURIED CABLE (EXISTING)							
		Commerce St	11+663 to 11+818	LT	buried line in pavement approx 0.50 ft below subgrade (based on assm'd depth=2.0 ft from exist grade)	verify vertical clearance / adjust	Buried cable to be adjusted by AT&T to resolve conflicts
		Commerce St	12+041	LT	manhole in pavement	adjust top MH	AT&T will adjust MH frame & cover during construction (information included in the plans)
		Commerce St	12+060 to 12+260	LT	buried line in pavement approx 0.50 ft below subgrade (based on assm'd depth=2.0 ft from exist grade)	verify vertical clearance / adjust	Buried cable to be adjusted by AT&T to resolve conflicts
DUCT BANK (EXISTING)							
		Commerce St	11+820 to 11+885	RT	under sidewalk	verify vertical/horizontal location	AT&T will pothole to verify conflict

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Appendix 5C CPS – Things to Consider

Things to consider when designing or constructing a project around CPS Energy Utilities:

- ☐ Consider overhead line clearances and locations where large equipment may be used.
- ☐ Consider location of existing overhead lines for construction and design purposes. Sleeving of overhead primary lines will be a cost to the contractor. The shielding/sleeving of lines is for reference, not for protection from electrical shock.
- ☐ De-energizing of primary lines or transmission lines for construction purposes will be a cost to the contractor. De-energizing may not be possible in all instances.
- ☐ Consider possible need for temporary relocation of poles during construction. Associated costs will be the responsibility of the party making the request.
- ☐ Consider locations of both existing guy wires and proposed new guy wires. These could cause unforeseen construction interference. Any temporary bracing needed will be a cost to the contractor.
- ☐ Width, depth, and location of trenching or excavation must be considered around utility poles. This could necessitate bracing/shoring during construction at a cost to the contractor.
- ☐ Contractors are responsible for requesting a gas leak survey. Allow 10 working days to survey and 10 working days to adjust gas valves. All requests need to be coordinated through the agency inspectors.
- ☐ Gas subcontractors are responsible for adjusting gas valves that are within the project area. Agency Inspectors must notify their Utility Coordinators to request adjustments needed for valves that are inside the project area but not part of the joint bid.
- ☐ The Right-of-Way width must be considered for placement of relocated utilities.
- ☐ Include utility inspections and time needed where necessary in schedules.
- ☐ Call for locates before excavating.

The list provided above is not intended to be exclusive nor comprehensive but is provided for reference only. The information and data on this list is provided "as is" and without any warranties of any type, express or implied by CPS and CPS Energy does not warrant, represent or guarantee that the information or data provided on this list is correct, accurate or fit for any particular purposes. Recipient understands that its use of this document is at its sole risk.

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Appendix 7A Preliminary Design Conference

7A.1 Suggested Agenda

Prior to the Preliminary Design Conference, the City and Consultant Project Managers should meet or discuss the project to review existing conditions. Additional correspondence should be made with the Program Manager, traffic operations, construction and maintenance personnel and/or local citizens groups to gather as much pertinent data as possible to adequately address the important issues regarding the project. This agenda generally follows the Design Summary Report (DSR) format.

Project Data

- Scheduling
- Funding (street, drainage, and utilities)
- Necessary agreements
- Delivery process

Background

- Existing elements
- Roadway
- Drainage
- ROW
- Environmental issues
- Coordination: RR, airports, utilities, TxDOT, FHWA, SARA, USACOE, emergency services

Survey

- Available data
- Control requirements
- ROW/property issues

Geotechnical Needs

Permitting Issues

Community Relations

Design Issues

- Roadway/Pedestrian/Bicycle
- Traffic
- Drainage
- Construction/TCP/Phasing constraints
- Enhancements/Landscaping

Joint Bid Utility Plans

- Identify utility owners
- Agreements

Miscellaneous

- Access driveways
- Maintenance issues

Organization/Project Management

- Points of contact (City, Utilities and Consultant(s))
- Key staff roles and responsibilities
- Design schedule
- PRIMELink Issues
- Agreements between conference attendees

Assignment for preparation and distribution of meeting minute

Appendix 7B Preliminary Engineering Report Checklist

The COSA TCI Preliminary Engineering Report Checklist (.doc) file can be located by visiting:

http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Design-Guidance-Manual-and-Forms

and selecting Preliminary Engineering Report Checklist, found under the Design Guidance Manual Forms heading.

The static document displayed below is dated October 2017. For the most up-to-date version of the document, please download the file from the site listed above.

7B.1 Preliminary Engineering Report Checklist

The following is a list of recommended requirements for a PER Submittal. The Design Consultant must provide as much information as possible to assist City staff in the review and to simplify approval for the following submittal. The Consultant must coordinate closely with City Project Manager to meet project needs.

PROJECT NAME: ____

SUBMITTED TO: ____
(CITY PM)

SUBMITTED BY: ____
(CONSULTANT PM)

REVIEWED BY: ____

* FOLLOW TXDOT CRITERIA FOR LOCAL AREA MANAGEMENT (LAM) PROJECTS *

Table 7B-2. Preliminary Engineering Report Checklist (					
BASE MAPPING					
☐	Initial Survey Control				
☐	Topographic Map				
☐	Right-of-Way Map				
Comments:________________					
TRAFFIC ENGINEERING STUDY					
Existing Conditions					
☐	Existing Roadway Geometry and typical cross sections	☐	Existing Condition Capacity and Level of Service Analysis	☐	Existing Alternative Transportation Modes
☐	Existing Auxiliary Lanes	☐	Traffic Control Devices Inventory	☐	Existing Intersection and Roadway Lighting
☐	Turning Movement Traffic Counts for Critical Intersections	☐	Speed Limit Data	☐	Existing Intelligent Transportation Systems
☐	Hourly Approach Traffic Volume	☐	K and D factors		
☐	Directional Average Daily Traffic	☐	Peak Hour Factor by Approach and Speed		
☐	Collision Data	☐	Heavy Vehicle Percentage		

Table 7B-2. Preliminary Engineering Report Checklist (continued)					
Proposed Conditions					
☐	Typical Section	☐	Proposed peak hour volumes for all roadways	☐	Identification of Design Vehicle(s)
☐	Typical Section Alternatives	☐	Design year traffic volumes	☐	Projected Level of Service
☐	Potential Traffic Signal Improvements	☐	Access Management Requirements	☐	Signs
☐	Potential Intersection Improvements	☐	School Requirements	☐	Pavement Marking
☐	Bicycle/ Pedestrian Facilities	☐	Railroad Coordination	☐	Potential Traffic Handling Issues During Construction
Comments:____________________					
DRAINAGE STUDY					
☐	Existing Condition Drainage Area Map	☐	Floodplain Analysis (HECRAS Calculation and Summary)	☐	Outlet stabilization Plan
☐	Existing Condition Discharge Calculations	☐	Alternative Analysis	☐	Outfall Stabilization Plan
☐	Storm Sewer Layout	☐	Culvert Layout(s)		
☐	Storm Sewer Layout Alternatives	☐	Erosion and Stabilization BMPs		
Comments:____________________					

Table 7B-2. Preliminary Engineering Report Checklist (continued)					
UTILITY COORDINATION					
☐	Identify Apparent Utilities in Project Corridor	☐	Show Existing Utilities on Project Base-map	☐	Coordinate Utility Adjustment Design with Utility Companies
☐	Determine Utility Renewal and Replacement Requirements	☐	Identify Potential Utility Conflicts and Notify Utility Companies	☐	Develop Record of All Communications
☐	Present Minutes from Initial Utility Coordination Meeting	☐	Identify Follow-on Utility Location Requirements with Utility Companies		
Comments:____					
ROADWAY DESIGN					
☐	Proposed Roadway Alignment Alternative Layouts				
☐	Proposed Construction Phasing Alternatives				
☐	Potential Design Enhancement Alternatives				
Comments:____					

Table 7B-2. Preliminary Engineering Report Checklist (continued)					
PRELIMINARY GEOTECHNICAL STUDY					
☐	Proposed Pavement Design	☐	Hydrologic Inferences	☐	Preliminary Stabilization Requirements
☐	Pavement Section Alternatives	☐	Terrain and Cut/Fill Estimation	☐	Subsurface Exploration Guidance
☐	Proposed Alignment(s)	☐	Geologic Model	☐	Non-Destructive Testing Plan
☐	Project Type	☐	Soil Identification from Published Data		
☐	Feasibility Evaluation	☐	Soil Characteristics Estimation		
☐	Position of Natural Drainage Features	☐	Soil Properties Estimation		
Comments:____________________					
PERMITTING					
☐	Permitting Agency Jurisdictional Assessment				
☐	Design Alternatives				
Comments:____________________					

Table 7B-2. Preliminary Engineering Report Checklist (continued)	
PUBLIC INVOLVEMENT	
☐	Initial Needs Assessment
☐	Public Involvement Plan
Comments:____	
OTHER	
☐	Class 4 Cost Estimate
☐	Project Schedule
Comments:____	
SUBMITTAL TO CITY	
☐	Preliminary Engineering Report
☐	Design Summary Report
☐	Signed QA/QC Certification Form
☐	CD with PDF’s of All Deliverables (Upload to PRIMELink)
☐	Schedule PER Review Meeting

Appendix 7C City of San Antonio TCI 40% Design Checklist

The 40%Design Checklist (.doc) file can be located by visiting:

http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Design-Guidance-Manual-and-Forms

and selecting 40% Submittal List, found under the Design Guidance Manual Forms heading.

The static document displayed below is dated October 2017. For the most up-to-date version of the document, please download the file from the site listed above.

7C.1 40% Design Checklist

The following are minimum requirements for a 40% Submittal. The Design Consultant must provide as much information as possible to assist City staff in the review and to simplify approval for the following submittal. A submittal will be classified as incomplete if any of the items identified below are missing.

PROJECT NAME: ______________________________

SUBMITTED TO: ______________________________
(CITY PM)

SUBMITTED BY: ______________________________
(CONSULTANT PM)

REVIEWED BY: ______________________________

* FOLLOW TXDOT CRITERIA FOR LOCAL AREA MANAGEMENT (LAM) PROJECTS *

Table 7C-3. 40% Design Checklist (					
FRONT-END PLAN SHEETS					
☐	City Title Block	☐	Summary of Estimated Quantities		
☐	Index of Sheets				
☐	Project Layout/Control Points				
☐	General Notes				
Comments:____ ____ ____ ____					
EXISTING TYPICAL SECTION					
☐	ROW	☐	Curbs		
☐	Lane Widths	☐	Sidewalks		
☐	Medians	☐	Bike Lanes		
PROPOSED TYPICAL SECTION					
☐	ROW	☐	Shoulders	☐	Pavement Design
☐	Lane Widths	☐	Curb	☐	Bike Lanes
☐	Lane Direction	☐	Baseline / Centerline	☐	Medians
Comments:____ ____ ____ ____					

Table 7C-3. 40% Design Checklist (continued)					
SEQUENCE OF WORK OUTLINE FOR TRAFFIC CONTROL					
☐	Preliminary Construction Phasing Plan (This should show the basic concept of how to handle traffic during construction, including preliminary phasing and sequence of work narrative. Construction shall include City and all joint bid utility improvements)				
Comments:____________________ ____________________ ____________________ ____________________					
PLAN & PROFILE SHEETS					
Plan View					
☐	Min Design Values met	☐	Existing Drainage Structures	☐	Cross-Slopes PC/PT Sta.
☐	Existing & Prop ROW Lines	☐	Prop. Roadway Alignments	☐	P.I. Curve Data
☐	Existing Utilities	☐	Prop. Curb, Sidewalks & Drvwy	☐	Cross Drainage Structures
☐	Existing Edge of Pavement	☐	Prop. Lane Dimensions	☐	Legal Description/Property Owner Information/Addressee
☐	Existing Sidewalks, Curb, Driveways, Medians	☐	Flow Direction Arrow		

Table 7C-3. 40% Design Checklist (continued)					
Profile View					
☐	Min Design K Values met	☐	LT and RT ROW	☐	VPI Curve Data
☐	Proposed Vertical Alignment (LT & RT top of curb)	☐	Vertical Clearances (where required)	☐	Cross Drainage Structures
☐	Natural Ground	☐	Grades		
Comments:______________________________					
DRAINAGE					
☐	Drainage Area Map				
☐	Drainage Calcs (Hard Copy, executable digital copy and PDF)				
☐	Storm Drain System Plan and Profiles				
☐	Plan and Report Submittal Requirements – As per *Section 4 - Drainage*				
Comments:______________________________					

Table 7C-3. 40% Design Checklist (continued)	
TRAFFIC ENGINEERING	
☐	Intersection Layout
☐	Bicycle and Pedestrian Facilities Layout
☐	School Zone Layout
☐	Complete Streets Assessment and Field Analysis Checklist (Complete prior to 40% submittal)
Comments:____	
ENVIRONMENTAL	
☐	Confirm Phase I Environmental Site Assessment has been completed
☐	Survey Ordinary High Water Mark (OHWM) and show on plans. Coordinate with EMD.
☐	After 40% submittal, coordinate staking of storm sewer outfall with EMD.
Comments:____	

Table 7C-3. 40% Design Checklist (continued)			
OTHER			
☐	Street Cross Sections		
☐	Channel Cross Sections		
☐	Base Map of Existing Utilities w/Quality Level identification		
Comments:____			
SUBMITTAL TO CITY			
☐	40% Constr Plans (5 bound sets)	☐	Signed QA/QC Certification Form
☐	Utility Coordination Report	☐	CD with *PDF's and **DGN's of all deliverables (Upload to PRIMELink)
☐	Cost Estimates	☐	Complete Streets Public Meeting
☐	Construction Schedule	☐	Coordinate Public Meeting (If Req'd)
☐	Geotechnical Engineering & Pavement Design Report	☐	Coordinate 40% Review Meeting
☐	Written Response to All Comments		
☐	Insert Joint Bid Utility Plan Sheets		

Table 7C-3. 40% Design Checklist (continued)
General Comments:______________________________

*PDF files for the construction plans must be split into the following categories as shown in the index of sheets:

1. General
2. Traffic Control Plan
3. Roadway Plans
4. Drainage Plans
5. SWPP & Environmental Plan
6. Landscaping Plan
7. Traffic Items
8. SAWS Water and Sewer Plans
9. CPS Gas Plans

**DGN file must be a complete base drawing to include topography and all proposed improvements (roadway, drainage, water, etc.). Do not break down into sheets. AutoCAD files will not be accepted.

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Appendix 7D City of San Antonio TCI 70% Design Checklist

The 70%Design Checklist (.doc) file can be located by visiting:

http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Design-Guidance-Manual-and-Forms

and selecting 70% Submittal List, found under the Design Guidance Manual Forms heading.

The static document displayed below is dated October 2017. For the most up-to-date version of the document, please download the file from the site listed above.

7D.1 70% Design Checklist

The following are minimum requirements for a 70% Submittal. The Design Consultant must provide as much information as possible to assist City staff in the review and to simplify approval for the following submittal. A submittal will be classified as incomplete if any of the items identified below are missing.

PROJECT NAME: ______________________________

SUBMITTED TO: ______________________________
(CITY PM)

SUBMITTED BY: ______________________________
(CONSULTANT PM)

REVIEWED BY: ______________________________

* FOLLOW TXDOT CRITERIA FOR LOCAL AREA MANAGEMENT (LAM) PROJECTS *

Table 7D-4. 70% Design Checklist ((					
FRONT-END PLAN SHEETS					
☐	City Title Block	☐	Update Summary of Estimated Quantities		
☐	Index of Sheets	☐	Driveway Summary Sheet		
☐	Project Layout/Control Points	☐	Existing Typical Sections		
☐	General Notes	☐	Prop Typical Sections		
Comments:______________________________					
SEQUENCE OF WORK OUTLINE FOR TRAFFIC CONTROL					
☐	Traffic Control Plan (TCP should show a comprehensive method of how traffic is being handled during the duration of the project. These sheets should contain typical construction sections, work zone pavement marking, channelization devices, signing appropriate for the various phases, detour routes, temporary signals, dynamic message signs, etc.)				
☐	Update Construction Phasing and Sequence of Work Narrative				
Comments:______________________________					

Table 7D-4. 70% Design Checklist (continued)					
PLAN & PROFILE SHEETS					
Plan View					
☐	Min Design Values met	☐	Existing Drainage Structures	☐	Proposed Storm Drain (gray scale)
☐	Existing & Prop ROW Lines	☐	Prop. Roadway Alignments	☐	Cross-Slopes PC/PT
☐	Existing Utilities	☐	Prop. Curb, Sidewalks & Drvwy	☐	P.I. Curve Data
☐	Existing Edge of Pavement	☐	Prop. Drvy Penetrations	☐	Cross Drainage Structures
☐	Existing Sidewalks, Curb, Driveways, Medians	☐	Prop. Lane Dimensions	☐	Legal Descrp/ Property Owner Info /Addresses
☐		☐	Flow Direction Arrow		
Profile View					
☐	Min Design K Values met	☐	LT and RT ROW	☐	VPI Curve Data
☐	Proposed Vertical Alignment (LT & RT top of curb)	☐	Vertical Clearances (where required)	☐	Cross Drainage Structures
☐	Natural Ground	☐	Grades	☐	Retaining Wall Plan
Comments:____					

Table 7D-4. 70% Design Checklist (continued)	
DRAINAGE	
☐	Updated Drainage Calculations
☐	Drainage Area Map
☐	Storm Drain System Plan and Profiles
☐	Storm Sewer & Channel Hydraulic Calculations (EGL/HGL)
☐	Storm Water Pollution Prevention Plan and narrative
☐	Inlet Cross Sections
☐	Floodplain Permit
☐	Plan and Report Submittal Requirements – As per *Section 4 - Drainage*
Comments:______________________________	
TRAFFIC ENGINEERING	
☐	Intersection Layout
☐	Traffic Signal Layouts, Equipment, and Elevations
☐	Sign Layouts
☐	Pavement Markings
Comments:______________________________	

Table 7D-4. 70% Design Checklist (continued)	
STANDARD DETAILS (as required)	
☐	COSA Standard Details by Reference Only (www.sanantonio.gov/TCI)
☐	Special Details
☐	TxDOT Standard Details
☐	Other
Comments:____	
ENVIRONMENTAL	
☐	Confirm Phase II Environmental Site Assessment has been completed
☐	Check Permitting Status
☐	Incorporate Environmental Information Provided by EMD
Comments:____	

Table 7D-4. 70% Design Checklist (continued)			
OTHER			
☐	Street Cross Sections		
☐	Channel Cross Sections		
☐	Base Map of Existing Utilities w/Quality Level identification		
☐	Art Enhancement		
☐	Tree Survey & Preservation Plan		
Comments:___			
SUBMITTAL TO CITY			
☐	70% Constr Plans (5 bound sets)	☐	Signed QA/QC Certification Form
☐	Utility Coordination Report	☐	CD with *PDF's and **DGN's of all deliverables (Upload to PRIMELink)
☐	Updated Cost Estimates	☐	Schedule Test Shutdown of Water System with SAWS rep
☐	Project Schedule	☐	Coordinate 70% Review Meeting
☐	Written Response to All Comments		
☐	List of Governing Specifications, Special Provisions, and Special Specifications		
☐	Insert Joint Bid Utility Plan Sheets		

Table 7D-4. 70% Design Checklist (continued)
General Comments:____

*PDF files for the construction plans must be split into the following categories as shown in the index of sheets:

1. General
2. Traffic Control Plan
3. Roadway Plans
4. Drainage Plans
5. SWPP & Environmental Plan
6. Landscaping Plan
7. Traffic Items
8. SAWS Water and Sewer Plans
9. CPS Gas Plans

**DGN file must be a complete base drawing to include topography and all proposed improvements (roadway, drainage, water, etc.). Do not break down into sheets. AutoCAD files will not be accepted.

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Appendix 7E City of San Antonio TCI 95% Design Checklist

The 95% Design Checklist (.doc) file can be located by visiting:

http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Design-Guidance-Manual-and-Forms

and selecting 95% Submittal List, found under the Design Guidance Manual Forms heading.

The static document displayed below is dated October 2017. For the most up-to-date version of the document, please download the file from the site listed above.

7E.1 95% Design Checklist

The following are minimum requirements for a 95% Submittal. The Design Consultant must provide as much information as possible to assist City staff in the review and to simplify approval for the following submittal. A submittal will be classified as incomplete if any of the items identified below are missing.

PROJECT NAME: ____________________

SUBMITTED TO: ____________________
(CITY PM)

SUBMITTED BY: ____________________
(CONSULTANT PM)

REVIEWED BY: ____________________

* FOLLOW TXDOT CRITERIA FOR LOCAL AREA MANAGEMENT (LAM) PROJECTS *

Table 7E-5. 95% Design Checklist (					
FRONT-END PLAN SHEETS					
☐	City Title Block	☐	Final Typical Sections		
☐	Index of Sheets	☐	General Notes		
☐	Project Layout/Control Points	☐	Final Summary of Estimated Quantities		
☐	Existing Typical Sections	☐	Driveway Summary Sheet		
Comments:____					
SEQUENCE OF WORK OUTLINE FOR TRAFFIC CONTROL					
☐	Final Traffic Control Plan (TCP should show a comprehensive method of how traffic is being handled during the duration of the project. These sheets should contain typical construction sections, work zone pavement marking, channelization devices, signing appropriate for the various phases, detour routes, temporary signals, dynamic message signs, etc.)				
☐	Final Construction Phasing and Sequence of Work Narrative				
Comments:____					

Table 7E-5. 95% Design Checklist (continued)	
PLAN & PROFILE SHEETS	
Plan & Profile View	
☐	Final Street Design
☐	Minimum Design Values met
Comments:____	
DRAINAGE	
☐	Final Drainage Calculations and DA Map
☐	Final Storm Drain System P & P’s
☐	Final Storm Sewer & Channel Hydraulic Calculations (EGL/HGL)
☐	Final Storm Water Pollution Prevention Plan
☐	Plan and Report Submittal Requirements – As per *Section 4 - Drainage*
Comments:____	

Table 7E-5. 95% Design Checklist (continued)	
TRAFFIC OPERATIONS	
☐	Final Intersection Layout
☐	Final Traffic Signal and Equipment Layout
☐	Final Sign Layout
☐	Final Pavement Marking Layouts
Comments:____	
STANDARD DETAILS (as required)	
☐	COSA Standard Details by Reference Only (www.sanantonio.gov/TCI)
☐	Special Details
☐	TxDOT Standard Details
☐	Other
Comments:____	

Table 7E-5. 95% Design Checklist (continued)	
ENVIRONMENTAL	
☐	Finalize all Environmental Coordination
☐	Check Permitting Status
☐	Incorporate EPIC Sheet Provided by EDM
Comments:____	
OTHER	
☐	Final Street Cross Sections
☐	Final Channel Cross Sections
☐	Final Base Map of Existing Utilities w/Final Quality Level identification
☐	Final Art Enhancement Design and Details
☐	Final Tree Survey & Preservation Plan
☐	Driveway Plats
Comments:____	

Table 7E-5. 95% Design Checklist (continued)			
SUBMITTAL TO CITY			
☐	95% Construction Plans (5 bound sets)	☐	Insert Joint Bid Utility Plans and Specifications
☐	Final Design Summary Report	☐	Signed QA/QC Certification Form
☐	Final Utility Coordination Report	☐	CD with *PDF's and *DGN's of all Deliverables (Upload to PRIMELink)
☐	Final Cost Estimate	☐	Schedule Site Visit with SAWS and All Utilities Prior to Bid Phase
☐	Final Project/Construction Schedule	☐	TDLR
☐	Written Response to All Comments	☐	Coordinate Public Meeting (If Req'd)
☐	Final List of Governing Specs, Special Provisions, and Specifications	☐	Coordinate 95% Review Meeting
General Comments:____			

*PDF files for the construction plans must be split into the following categories as shown in the index of sheets:

1. General
2. Traffic Control Plan
3. Roadway Plans
4. Drainage Plans
5. SWPP & Environmental Plan
6. Landscaping Plan
7. Traffic Items
8. SAWS Water and Sewer Plans
9. CPS Gas Plans

**DGN file must be a complete base drawing to include topography and all proposed improvements (roadway, drainage, water, etc.). Do not break down into sheets. AutoCAD files will not be accepted.

Appendix 7F City of San Antonio TCI Bid Phase Checklist

The Bid Phase Checklist (.doc) file can be located by visiting:

http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Design-Guidance-Manual-and-Forms

and selecting Bid Phase Submittal List, found under the Design Guidance Manual Forms heading.

The static document displayed below is dated October 2017. For the most up-to-date version of the document, please download the file from the site listed above.

7F.1 Bid Phase (100% Design) Submittal Checklist

The following are minimum requirements for a Bid Phase (100%) Submittal. The Design Consultant must provide as much information as possible to assist City staff in the review and to simplify approval for the following submittal. A submittal will be classified as incomplete if any of the items identified below are missing.

PROJECT NAME: ______________________________

SUBMITTED TO: ______________________________
(CITY PM)

SUBMITTED BY: ______________________________
(CONSULTANT PM)

REVIEWED BY: ______________________________

* FOLLOW TXDOT CRITERIA FOR LOCAL AREA MANAGEMENT (LAM) PROJECTS *

Table 7F-6.Bid Phase (100% Design) Submittal Checklist ((			
100% DESIGN SUBMITTAL SPECIFICATIONS			
Assist COSA PM in preparing Advertising documents			
☐	Submit 100% Specifications (1 bound set and PDF)		
	☐	Form 010: Invitation for Bid (Bid Opening & Pre-Bid dates set after 100% mtg)	
	☐	Form 020: Bid Form	
	☐	Form 025: Unit Pricing Form	
	☐	Joint Bid Utility Special Provisions	
	☐	Technical Specifications	
		☐	Governing Specifications
		☐	Special Provisions
		☐	Special Specifications
		☐	Latest Project Sign
		☐	Joint Bid Utility Specifications
		☐	Environmental Management Specifications/Plan
100% DESIGN PLANS			
☐	Submit 100% Plans including Joint-Bid Utilities (5 bound sets and PDF)*		
100% REVIEW MEETING			
☐	Coordinate 100% Meeting to discuss the following:		
	☐	Finalize Constructability Issues (It is expected that the Design Consultant has been addressing all constructability issues during the early design stages)	
	☐	Review Utility Conflict Matrix and address pending items	
	☐	Review Comment Tracking Sheet to ensure all comments have come to a resolution	
	☐	Make the Construction Inspector and Inspections Supervisor aware of any special conditions and/or revisions to our standard details and specifications	
	☐	If required, coordinate and attend on-site meeting with all utilities and pertinent parties.	

Table 7F-6.Bid Phase (100% Design) Submittal Checklist (continued)			
ADVERTISEMENT AND BID OPENING			
ONLY after COSA PM approval			
☐	Distribute Plans and Specifications to Contractors (3 copies and 1 PDF)		
☐	Distribute Plans and Specifications to Plan Rooms (9 copies)		
☐	Maintain updated list of Planholder's List		
☐	Answer and maintain updated list Contractor questions		
☐	Prepare and distribute addenda if required		
☐	Attend Pre-Bid Meeting, Prepare, and Distribute Meeting Minutes		
☐	Load 100% plans, specs, and addenda to PRIMELink		
CONSTRUCTION PLAN SET & SPECIFICATIONS			
Assist COSA PM in preparing Advertising documents			
☐	Submit 100% Specifications (1 bound set and PDF)		
	☐	Form 010 – Invitation for Bid	
	☐	Form 020 – Bid Form	
	☐	Form 025 – Unit Pricing Form	
	☐	Form 040 – Standard Instructions to Respondents	
	☐	Form 041 – Certificate of Interested Parties	
	☐	Form 050.01 – SBEDA Guidelines (if necessary)	
	☐	Form 081 – General Conditions	
	☐	Wage Decision	
	☐	Joint Bid Utility Special Provisions	
	☐	Technical Specifications	
		☐	Governing Specifications
		☐	Special Provisions
		☐	Special Specifications
		☐	Latest Project Sign
		☐	Joint Bid Utility Specifications

Table 7F-6.Bid Phase (100% Design) Submittal Checklist (continued)			
		☐	Environmental Management Specifications/Plan
	☐	Addendum (if necessary)	
CONSTRUCTION PLANS			
☐	Submit 100% Plans including Joint-Bid Utilities (3 bound sets and PDF)		
Comments:____________________________________			

*PDF files for the construction plans must be split into the following categories as shown in the index of sheets:

1. General
2. Traffic Control Plan
3. Roadway Plans
4. Drainage Plans
5. SWPP & Environmental Plan
6. Landscaping Plan
7. Traffic Items
8. SAWS Water and Sewer Plans
9. CPS Gas Plans

**DGN file must be a complete base drawing to include topography and all proposed improvements (roadway, drainage, water, etc.). Do not break down into sheets. AutoCAD files will not be accepted.

Appendix 7G Complete Streets Assessment & Field Analysis Checklist

The Complete Streets Assessment and Field Analysis Checklist (.xls) file can be located by visiting:

http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Design-Guidance-Manual-and-Forms

and selecting Complete Streets Assessment and Field Analysis Checklist, found under the Design Guidance Manual Forms heading.

The static document displayed below is dated October 2017. For the most up-to-date version of the document, please download the file from the site listed above.

7G.1 Introduction

The Complete Streets Assessment & Field Analysis Checklist workbook contains seven worksheets:

- User Guide
- Basis of Scoring
- Complete Street Components

- Input Print
- Input
- Notes & Comments
- FDOT Generalized Planning Table

7G.2 User Guide

7G.2.1 User Guide Worksheet Macros

The User Guide worksheet contains four macros. Click a macro box to quickly switch worksheets.

Go to Input and Scoring Sheet	Clicking this macro displays the Insert Roadway Name w/ Limits table on the Input worksheet. (*This sheet is display only*.)
Go to Scoring Calculations	Clicking this macro displays the Basis of Scoring worksheet. This worksheet describes the various point valuations. (*This sheet is a display only*.)
View Complete Street Components	Clicking this macro displays the Complete Streets Components worksheet. This worksheet lists the components within the three feature sets: Pedestrian Features, Bicycle Features, and Transit Features. (*This sheet is display only*.)
Go to Notes & Comments	Clicking this macro displays the Notes & Comments worksheet. Use this worksheet to record notes or comments regarding the roadway this workbook scores.

7G.2.2 User Guide Worksheet

This worksheet is display only.

SAN ANTONIO COMPLETE STREETS EVALUAION FORM USER GUIDE (
INPUT SHEET (
Parameter Input
Parameters for the Roadway are entered on the left side of the Input sheet. Enter the road and limits for the project in cell B3. There are 30 input parameters. Use the drop down menus where provided to select the appropriate response. When a cell in the response column has been selected, additional instructions for selecting the parameter will be displayed. Always use the worst case if features are present on only part of the roadway. For example, respond that there are not existing sidewalks if there are areas along the corridor without sidewalks. If features are present on only one side of the roadway, assume the features are not present. **Average Daily Traffic (ADT) counts** can be found at: http://www.sanantonio.gov/publicworks/trafeng/pdf/Traffic%20Count%20Data%20Base.pdf *Ensure that the ADT data is bidirectional (includes both directions of traffic flow).* Information on **bike routes and the linear creekway system** of bike trails can be found at the following link. However, the draft bike plan, which has the most current info, will be provided and should be consulted first. : http://www.sanantonio.gov/oep/sabikes/bicycleMP.aspx Information on **VIA bus routes, stops, and headways** can be found on VIA's website at: http://www.viainfo.net/BusService/BusServiceMain.aspx Additional research may needed to identify information for other transit service such as university shuttles, private shuttles, etc. The inputs for all parameters must be filled out before the score can be calculated.
Calculate Score
Click the "Calculate Score" button at the top of the sheet to calculate the scores based on the input parameters. If the input sheet is not completely filled out, a pop-up message will indicate the score cannot be calculated until all parameters are filled out. **REMEMBER TO CLICK THE BUTTON AGAIN AFTER EACH CHANGE/ADDITION TO UPDATE THE SCORES.**
Scores
The scores, Level of Service (LOS), and Right-of-Way (ROW) considerations are shown on the right side of the "Input" sheet. Separate scores are given for each User Category - Pedestrians, Bicyclists, and Transit. The scores denote the need for Complete Streets features for each user based on the input parameters. All scores range from 1 to 10 with 10 showing the highest need to incorporate features to serve that mode of user, while a 1 shows the lowest need. Possible Complete Street features that can be incorporated are listed in the "Complete Street Components" sheet. The calculations used to determine the

SAN ANTONIO COMPLETE STREETS EVALUAION FORM USER GUIDE (cont.)

INPUT SHEET (cont.)

scores are shown on the "Basis of Scoring" sheet.

Level of Service (LOS) values are based on the Florida Department of Transportation (FDOT) Quality/Level of Service (Q/LOS) Handbook (2009). These calculations are based on assumptions outlined in Generalized Planning Analysis Table 1 of the Q/LOS manual, and are intended only to provide a preliminary LOS calculation. The Pedestrian LOS calculation assumes the minimum sidewalk and buffer shown below the pedestrian score. Bicycle LOS values are shown for the proposed roadway with and without bike lanes as well as the existing conditions.

Right-of-Way Considerations

The Right-of-Way (ROW) considerations are shown below the transit score. The total complete street ROW width is the sum of the proposed pavement width and median, plus 5-foot bike lanes on each side, sidewalks and buffers on each side consisting of the widths identified below the pedestrian score, 2 feet each side for the width of curbs, and 5 feet each side beyond the back of each sidewalk to accommodate utilities. If this width is larger than the actual ROW width, the ROW is determined to be insufficient to accommodate Complete Street features for both pedestrians (sidewalk and buffer) and bicyclists (bike lanes). The needed ROW widths are also calculated for a street section with the following attributes:

1. Sidewalk and buffer are included; bike lanes excluded
2. Sidewalk and bike lanes included; sidewalk buffer excluded (sidewalk located at back of curb)
3. Sidewalk and buffer is included on one side of street; 10 foot shared use path and 4 foot buffer on other side of street; bike lanes excluded
4. Vehicle lanes are reduced by 1 foot each (it is assumed proposed roadway lanes widths are originally 12 feet)

If the ROW width is insufficient, and the vehicular volumes indicate the roadway may operate with an acceptable vehicular LOS, a message indicating the roadway may be a candidate for a road diet will be displayed. The assumed vehicular LOS is based on the Q/LOS Generalized Planning Table 1, and is only for preliminary planning purposes. An additional study will be necessary to determine if a road diet is feasible.

Notes & Comments

Additional information, notes, and explanations can be recorded on the Notes & Comments sheet. Comments can be typed or handwritten on a printout of the sheet. Use this sheet to provide explanations if Complete Street elements such as bike lanes cannot be incorporated into the proposed roadway or to identify additional Complete Street features which may be included in the project.

Additional Information

Additional information on Complete Streets may be found at:

http://www.completestreets.org/

7G.3 Basis of Scoring

This worksheet is display only.

Basis of Scoring (			
Pedestrian Score:			
Scores Range from 1-10			
	2.5 pts if surrounding land uses generate large pedestrian volumes		
	2.0 pts if located within 0.25 miles of a hospital, school, etc.		
	1.5 pts if there are transit stops on the corridor		
	1 point if sidewalks connect to other pedestrian facilities 3 pts if Pedestrian LOS is A		
	2.4 pts if Pedestrian LOS is B		
	1.8 pts if Pedestrian LOS is C		
	1.2 pts if Pedestrian LOS is D		
	0.6 pts if Pedestrian LOS is E 0 Pts if Pedestrian LOS is F		
	1 point if adjacent to University or College		
Bicycle Score:			
Scores Range from 1-10			
	Bike Score = 10 if there are existing bike lanes / shoulders		
	Otherwise,		
	Bike Score = Bike Score Part 1 + Bike Score Part 2 + Bike Score Part 3 + Bike LOS Score		
		Bike Score Part 1 (max 5 pts)	
			5 pts if roadway is on a Tier 1 bike route
			4 pts if roadway is on a Tier 2 or Secondary bike route
			5 pts if roadway provides access to a biking facility
			3 pts if roadway is located within 1 mile of a linear creekway system.

Basis of Scoring (continued)			
		Bike Score Part 2 (max -5 pts)	
		Bike Score Part 2 = 0 if Bike Score Part 1 > 0	
			-2 pts if speeds >=50 mph
			-2 pts if >5% heavy vehicles
			-1 pt if grades > 5% for over 1,000'
		Bike Score Part 3 (max -9 pts)	
			-7 pts if ADT < 1,000
			-5 pts if ADT is between 1,000-3,000
			-3 pts if ADT is between 3,000-5,000
			-7 pts if posted speed < 30 mph
			-2 pts if posted speed = 30 mph
		Bike LOS Score (max 5 pts)	
			5 pts if existing roadway has an acceptable bike LOS and proposed roadway with bike lanes does not have acceptable LOS
			Otherwise,
			0-5 pts Based on difference in LOS between roadway with bike lanes and roadway without bike lanes Acceptable bike LOS is C for arterials, B for local/collector
	1 point if adjacent to University or College		
	Scores <1 are set equal to 1, and scores >10 are set equal to 10.		
Transit Score			
Scores range from 1-10			
	Score = (pedestrian factor + bike factor)*(0.5+ transit score 1)+ transit score 2		
	Pedestrian Factor (max 4.5 pts)		
		2.0 pts if surrounding land uses generate large pedestrian volumes	
		1.5 pts if roadway is within 0.25 miles of a hospital, school, etc.	
		1 pts if sidewalks connect to other pedestrian facilities	

Basis of Scoring (continued)			
	Bike Factor (max 1.5 pts)		
		Bike Factor = Bike Score Part 1 / 3.333	
	Transit Score 1 (max 1 pt)		
		Transit Stop Spacing	
			0.6 pts if < 1/4 mi
			0.5 pts if 1/4-1/2 mi
			0.4 pts if 1/2-1 mi
			0.3 pts if >1 mi
		Transit Headways	
			0.6 pts if 10-20 min
			0.5 pts if 20-30 min
			0.4 pts if >30 min
		Number of Routes on Roadway	
			0.3 pts if 3 or more routes
			0.25 pts if 2 routes
			0.2 pts if 1 route
		Transit Score 2 (max 3 pts)	
			3 pts if ammenities are provided at bus stops
			2.5 pts if transit stops on roadway
			1.5 pts if transit routes on roadway
		1 point if adjacent to University or College	

7G.4 Complete Street Components

This worksheet is display only.

COMPLETE STREETS COMPONENTS (	
PEDESTRIAN FEATURES	
Wide sidewalks	
Increase buffer / planting strip between sidewalks and travel lanes	
Street Trees	
Street Furniture	
Pedestrian scale lighting	
Curb Extensions	
Smaller Corner Radii	
Minimal sidewalk obstructions	
Provide on-street Parking	
Crosswalk Treatments	
Larger Pedestrian Landing areas at intersections	
Improved Driveway Design:	
	Reduce Driveway Width
	Continue Sidewalk through driveway
	Move Sidewalk further away from street
	Maintain ADA requirements through driveway
Access Management (medians, right in/right out driveways)	
Pedestrian Refuge Islands	
Traffic Calming Features	
BICYCLE FEATURES	
Bike lanes	
Striped outside shoulder	
Wide outside lane / Sharrow markings if insufficient ROW for bike lanes	

COMPLETE STREETS COMPONENTS (continued)
Shared use path
Slower speeds
Limit on-street parking or convert to reverse angle parking
Illumination
Colored buffer strip between bike lane and travel lane
TRANSIT FEATURES
Sidewalks, curb ramps, and crosswalks near bus stops
Pedestrian pathways from transit stops to adjacent buildings
Illumination
Boarding area at least 8' in depth
Transparent, well-lit shelters
Benches, trash cans, and other ammenities
Curb extensions
Closer spacing of bus stops
Placement of transit stops near major trip generators
Corner radii large enough to accommodate bus design vehicle
No obstructions at transit stops
Bike racks at transit stops

7G.5 Input Print

Use this worksheet to *display and print* the values entered in the Input worksheet. Printing the Input worksheet does not print the values entered for the roadway; it only prints the final form.

(*Please use ONLY the Input worksheet to enter values*.)

NOTE:

This worksheet links to the Input worksheet. The Input sheet displays this table in the far left columns. Altering values in the Input Print sheet automatically updates the values in the Input sheet.

This worksheet is not locked/protected. Use care to not alter the values displayed. The value fields in this worksheet to do not require numbers. Accidentally entering figures or symbols can change the formula and entry for the corresponding field in the Input worksheet.

Roadway Name:

Insert Roadway Name w/ Limits (

Existing ROW (ft)	**0**
Proposed ROW (ft)	**0**
Posted Speed (mph)	**0**
Functional Roadway Classification	**0**
Existing ADT (vehicles per day)	**0**
Existing Number of Lanes per Direction	**0**
Proposed Number of Lanes per Direction	**0**
Proposed Pavement Width (excluding medians, turn lanes, bike lanes and/or shoulders)	**0**
Proposed Median or Center Turn Lane Width	**0**
Does Roadway have existing bike lanes or shared use path?	**0**
Is Facility located on a bike route identified in the San Antonio Bicycle Master Plan?	**0**
Does Roadway provide access to locations expected to attract bicyclists such as Trails, Parks, Transit Centers, or Schools?	**0**
Is the Roadway located within one mile of an	**0**

Roadway Name:

Insert Roadway Name w/ Limits (continued)

existing or proposed linear creekway system?	
Existing Pavement Quality (1=poor, 3=average, 5=excellent)	**0**
Are there existing sidewalks?	**0**
If there are existing sidewalks, is there a buffer strip between the sidewalk and pavement?	**0**
If no existing sidewalks, are worn pedestrian paths visible?	**0**
Will the proposed sidewalks connect to existing or proposed pedestrian facilities or sidewalks?	**0**
Do the surrounding existing or future planned land uses promote pedestrian traffic?	**0**
Is the Roadway within 0.25 miles of schools, hospitals, parks, or other high pedestrian generators?	**0**
Is the roadway located adjacent to a college or university?	**0**
How many transit routes are on the Roadway?	**0**
What is the average spacing of Transit Stops in miles?	**0**
What are typical bus headways at the transit stops in minutes?	**0**
Are there existing bus/transit amenities at stops such as benches and shelters?	**0**
Does Roadway have vertical grades in excess of 5% for distances greater than 1,000 feet?	**0**
Does Roadway have significant Heavy Vehicle traffic?	**0**
Does Existing Roadway have on-street Parking	**0**
Does Proposed Roadway have on-street Parking?	**0**

7G.6 Input

Use this worksheet to enter values and answer questions posed. See the User Guide section (the User Guide worksheet in the electronic version) for instructions.

NOTE: This worksheet links formatting and values from the Input columns with formatted columns found in the Input Print worksheet. The editable Input worksheet columns (circled in red below) do ***not*** print when you opt to print the worksheet. (The purple circle delineates the columns that print.)

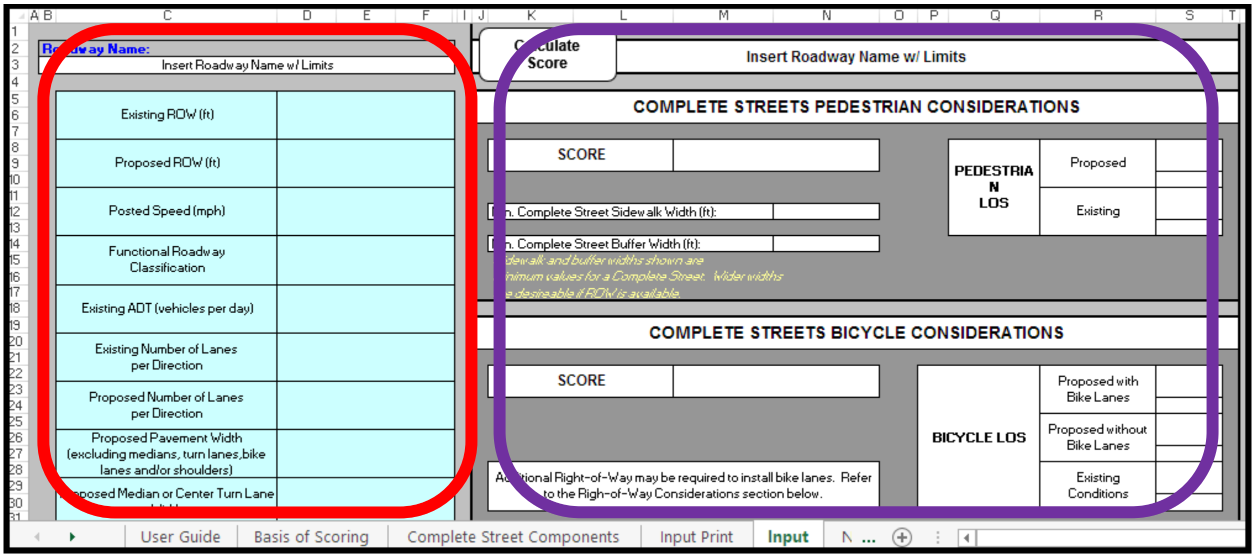
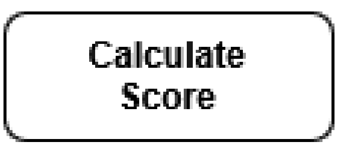


Figure 7G- 1: Complete Streets Analysis Checklist - Input Worksheet

7G.7 Input Worksheet Macro

The Input worksheet contains one macro. Click the macro box to calculate the score for the roadway.



Clicking this macro calculates the Complete Streets Roadway score for each of the five listed features.

- Complete Streets Pedestrian Considerations
- Complete Streets Bicycle Considerations
- Complete Streets Transit Considerations
- Vehicle Level of Service
- Right-of-Way Considerations

7G.8 Roadway Value Entries

Use the Roadway Value Entries portion of the Input tab (circled in red below) when recording information for the roadway.

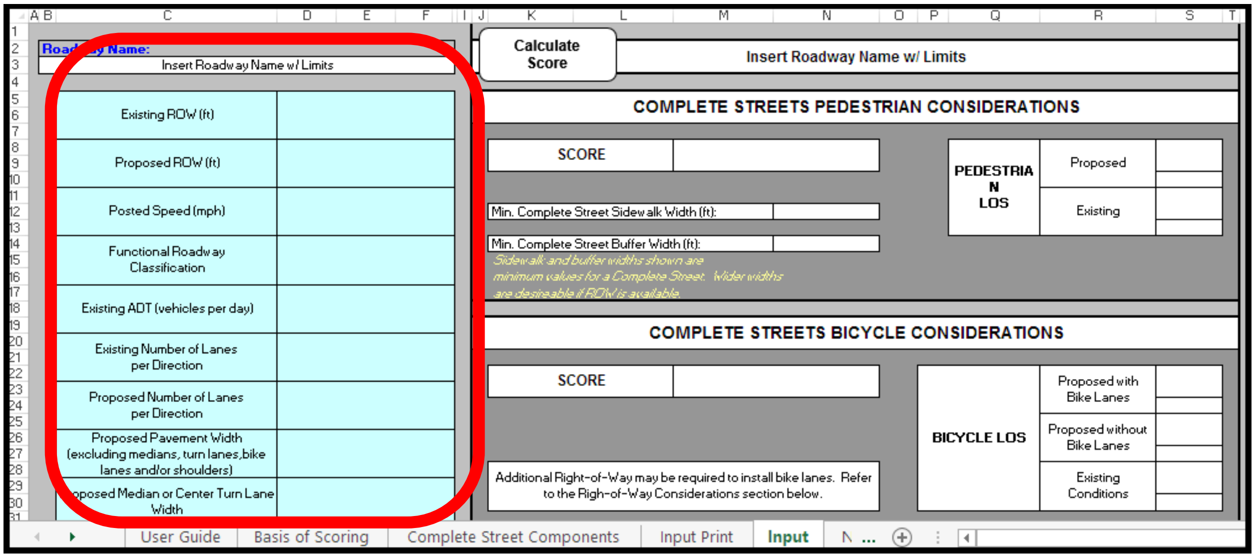


Figure 7G- 2: Input Worksheet – Roadway Value Entries

Clicking in a value field displays a note detailing the entry requirements. Enter values using the provided method. (Method depends on the field.) The two methods are:

- numerical value entry
- drop-down selection

Numerical Value Entry

Value fields that accept numeric entries display no changes when you click inside the field. (See image below.)

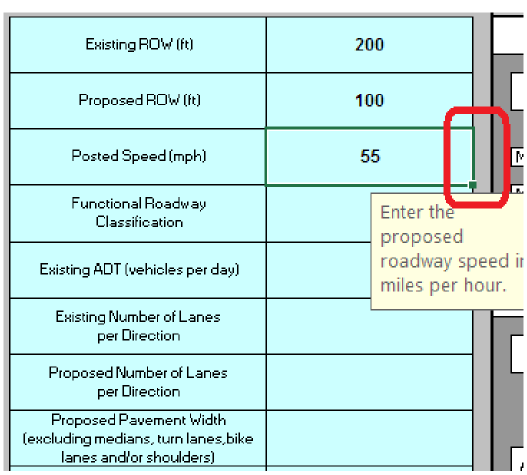


Figure 7G- 3: Input Worksheet – Numeric Value Entry

The red circle in the image above illustrates that no changes occurred when clicking inside the field or when making an entry.

Drop-down selection

Non numeric value fields display a drop-down menu arrow when you click inside the field. (See image below.)

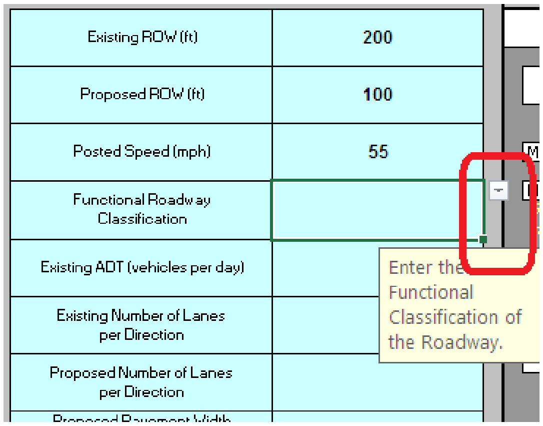


Figure 7G- 4: Input Worksheet – Non Numeric Value Entry

The red circle in the image above highlights the drop-down menu arrow that displays when clicking inside the field. Be aware that the arrow can be quite small, depending on the zoom percentage of your workbook program.

To display the drop-down menu, click the arrow or click the top edge of the field. The drop-down menu displays, as shown in the next figure.

NOTE: Double-clicking a drop-down menu field automatically populates that field with the first entry in the drop-down menu – without ever displaying the drop-down menu.

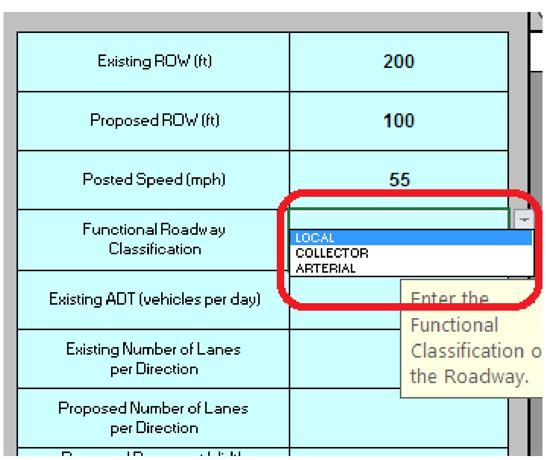


Figure 7G- 5: Input Worksheet – Non Numeric Value Drop-Down Menu

7G.9 Complete Streets Score Sheet

Once all fields in the Input worksheet have entries, click the Calculate Score button to generate the Complete Street Considerations scores. See Figure 7G- 6 for an example of a completed score sheet.

Update Scores

Change value field entries and then click Calculate Score to update the Complete Streets Considerations scores.

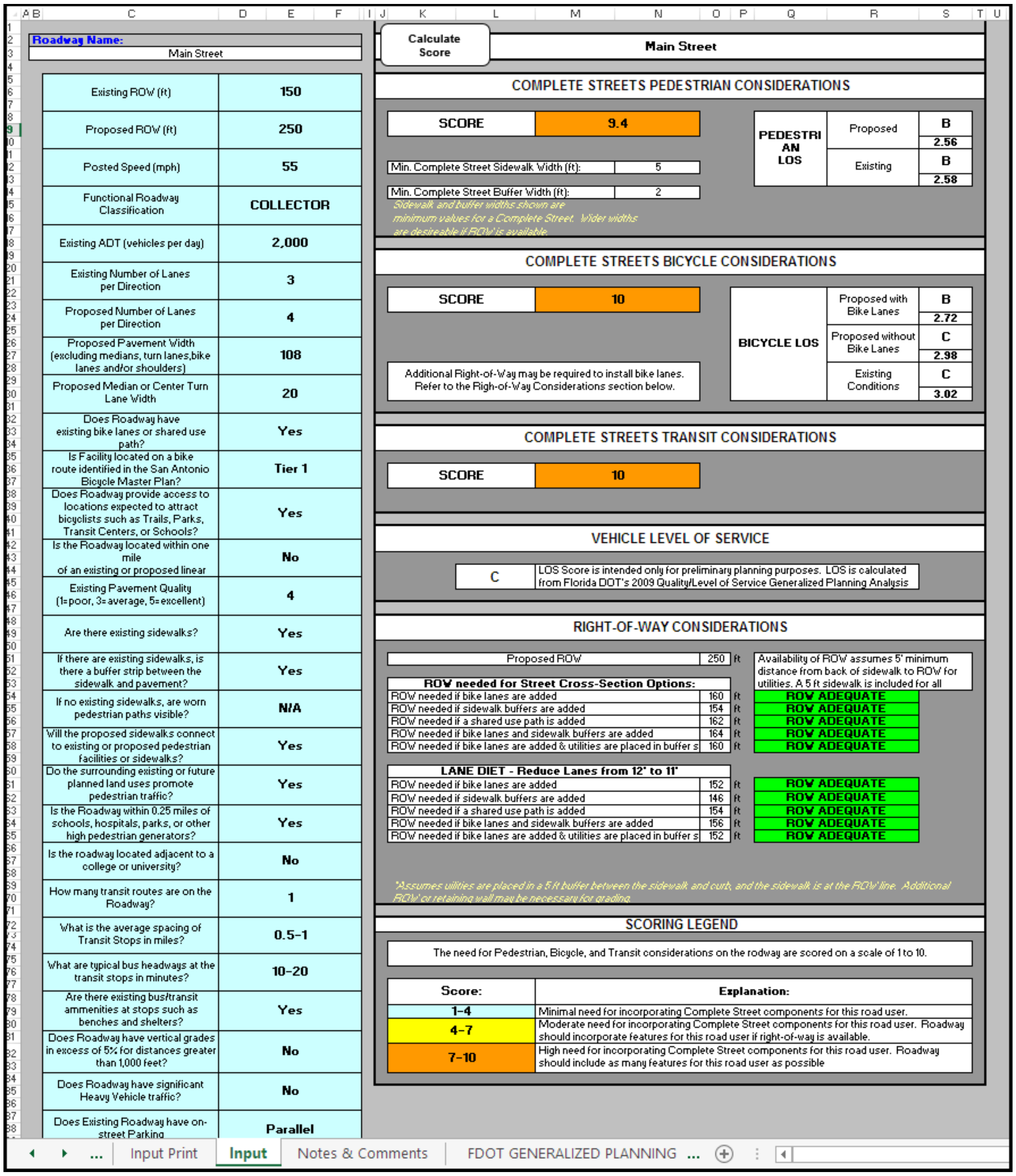


Figure 7G- 6: Input Worksheet – Complete Streets Scores Calculated

7G.10 Notes & Comments

Use the Notes & Comments worksheet to enter and retain any comments, notes, reminders, etc., regarding the roadway.

NOTE: The street name populates from the Input worksheet. Entering a name in the Name field can cause errors on the Input worksheet.

Notes& Comments (
Insert Roadway Name w/ Limits

7G.11 FDOT Generalized Planning Table

This worksheet is display only.

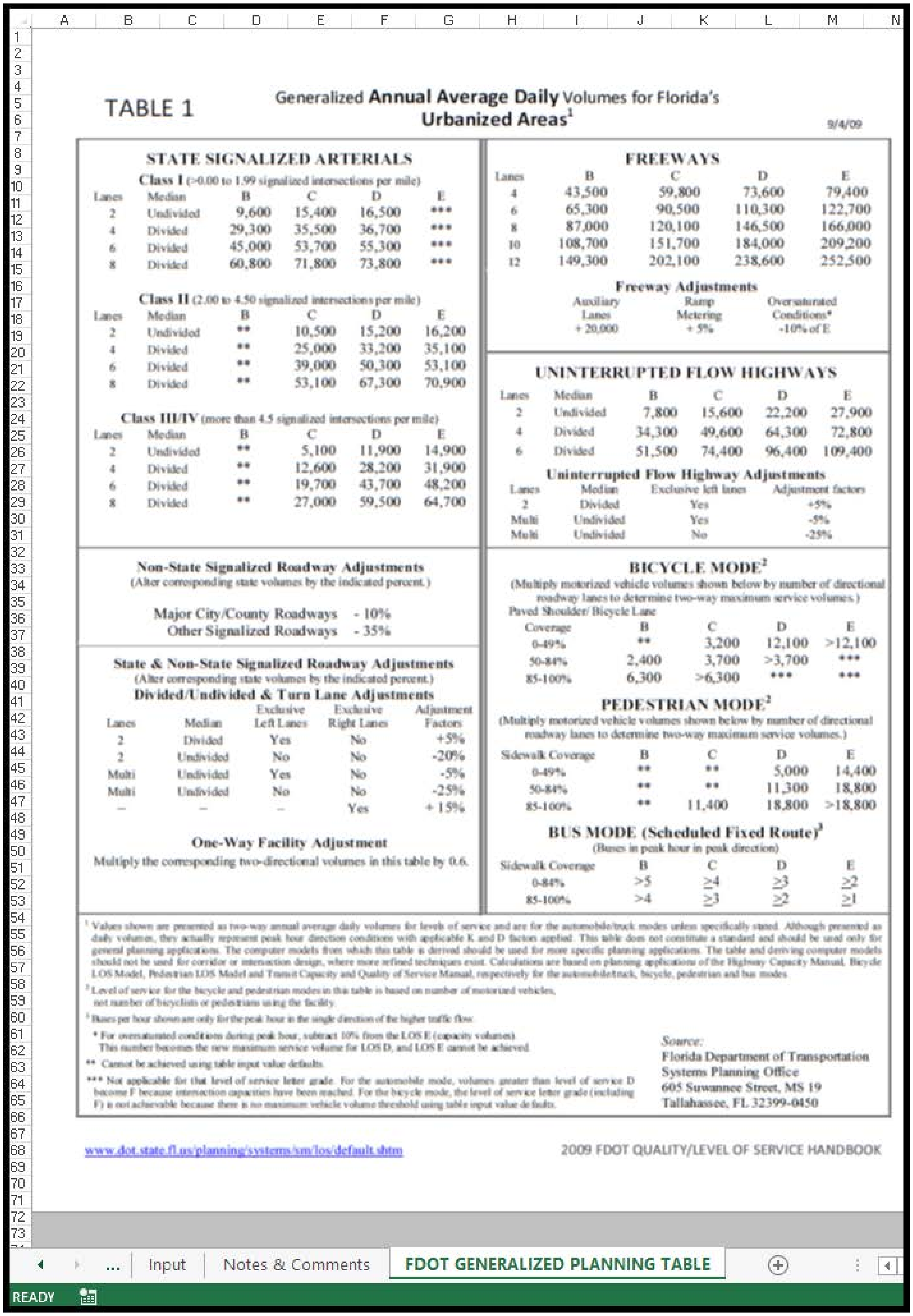


TABLE 1

Generalized **Annual Average Daily** Volumes for Florida's **Urbanized Areas**[1]

9/4/09

STATE SIGNALIZED ARTERIALS

Class I (>0.00 to 1.99 signalized intersections per mile)

Lanes	Median	B	C	D	E
2	Undivided	9,600	15,400	16,500	***
4	Divided	29,300	35,500	36,700	***
6	Divided	45,000	53,700	55,300	***
8	Divided	60,800	71,800	73,800	***

Class II (2.00 to 4.50 signalized intersections per mile)

Lanes	Median	B	C	D	E
2	Undivided	**	10,500	15,200	16,200
4	Divided	**	25,000	33,200	35,100
6	Divided	**	39,000	50,300	53,100
8	Divided	**	53,100	67,300	70,900

Class III/IV (more than 4.5 signalized intersections per mile)

Lanes	Median	B	C	D	E
2	Undivided	**	5,100	11,900	14,900
4	Divided	**	12,600	28,200	31,900
6	Divided	**	19,700	43,700	48,200
8	Divided	**	27,000	59,500	64,700

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Major City/County Roadways - 10%

Other Signalized Roadways - 35%

State & Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Divided/Undivided & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 15%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6.

FREEWAYS

Lanes	B	C	D	E
4	43,500	59,800	73,600	79,400
6	65,300	90,500	110,300	122,700
8	87,000	120,100	146,500	166,000
10	108,700	151,700	184,000	209,200
12	149,300	202,100	238,600	252,500

Freeway Adjustments

Auxiliary Lanes	Ramp Metering	Oversaturated Conditions*
+ 20,000	+ 5%	-10% of E

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
2	Undivided	7,800	15,600	22,200	27,900
4	Divided	34,300	49,600	64,300	72,800
6	Divided	51,500	74,400	96,400	109,400

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/Bicycle Lane

Coverage	B	C	D	E
0-49%	**	3,200	12,100	>12,100
50-84%	2,400	3,700	>3,700	***
85-100%	6,300	>6,300	***	***

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	**	**	5,000	14,400
50-84%	**	**	11,300	18,800
85-100%	**	11,400	18,800	>18,800

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	>5	≥4	≥3	≥2
85-100%	>4	≥3	≥2	≥1

[1] Values shown are presented as two-way annual average daily volumes for levels of service and are for the automobile/truck modes unless specifically stated. Although presented as daily volumes, they actually represent peak hour direction conditions with applicable K and D factors applied. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual, Bicycle LOS Model, Pedestrian LOS Model and Transit Capacity and Quality of Service Manual, respectively for the automobile/truck, bicycle, pedestrian and bus modes.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* For oversaturated conditions during peak hour, subtract 10% from the LOS E (capacity volumes). This number becomes the new maximum service volume for LOS D, and LOS E cannot be achieved.

** Cannot be achieved using table input value defaults.

*** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
605 Suwannee Street, MS 19
Tallahassee, FL 32399-0450

www.dot.state.fl.us/planning/systems/sm/los/default.shtm

2009 FDOT QUALITY/LEVEL OF SERVICE HANDBOOK

... Input | Notes & Comments | FDOT GENERALIZED PLANNING TABLE

READY

Figure 7G- 7: FDOT Generalized Planning Table Sheet

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Appendix 8A Permitting Contacts

Please be aware that, in all levels of government, agency organization and names periodically change. If the information listed in the tables below is out of date, at the time of this reading, use your discretion in researching the appropriate replacement agency/department. An outdated agency/department name in no way ameliorates the requirements set out by the City of San Antonio.

This contact information below will be updated, as needed, with each release of this manual.

Table 8A-1: Federal Permit Contacts	
Agency	**Department**
U.S. Department of Defense	U.S. Army Corps of Engineers; Regulatory Branch
	Joint Base San Antonio Facilities
U.S. Department of Housing and Urban Development	
United States Department of Interior	National Park Services* (* local contact provided in Table 8A-3)
	U.S. Fish and Wildlife Services
U.S. Department of Transportation	Federal Highway Administration
	Federal Aviation Administration
U.S. Environmental Protection Agency	

Table 8A-2: State Permit Contacts (	
Agency	**Department**
Texas Commission on Environmental Quality	Rate Analysis & Plan Review Team
	Water Resources Division, WW Permitting Section
	Water Quality Standards
Texas Department of State Health Services	
Texas Department of Transportation	
Texas Historical Commission	Archeological Division
Texas Parks and Wildlife Department	

Table 8A-3: Local Permit Contacts (	
Agency	**Department**
San Antonio River Authority	Real Estate
Edwards Aquifer Authority (a.k.a. Edwards Underground Water District)	
City of San Antonio	Transportation and Capital Improvements (TCI)
	Historic Design and Review Commission (HDRC)
*US Department of Interior; National Park Services	Professional Services Div., San Antonio Missions, National Historic Parks
San Antonio Water System	Stormwater Department

Appendix 10A City of San Antonio Pavement Design Standards

10A.1 Introduction

Article 5 Section 35-506 Subsection (p) of the Unified Development Code (UDC) (dated January 1, 2006) titled "Pavement Standards" provides guidance on the design of pavements and also includes recommended curb and gutter as well as median and divider details. The pavement design standards included herein are to be used to supplement the pavement design standards found in the UDC and are based upon newer technologies and design methods currently being utilized in the industry.

10A.2 Pavement Type

Allowable pavement structures for City maintained roadways include both flexible and rigid structures, as defined by the *American Association of State Highway and Transportation Officials (AASHTO)*. Perpetual pavements (see Figure 1A-1), which are considered to be long-life structures using premium hot-mixed asphalt (HMA) mixtures which require periodic maintenance to renew the surface, are also acceptable pavement structures. Pavement type selection shall be based upon the project conditions, economics, and long-term performance or as directed by the City. If necessary, life-cycle cost analysis (LCCA) shall be conducted for pavement type selection.

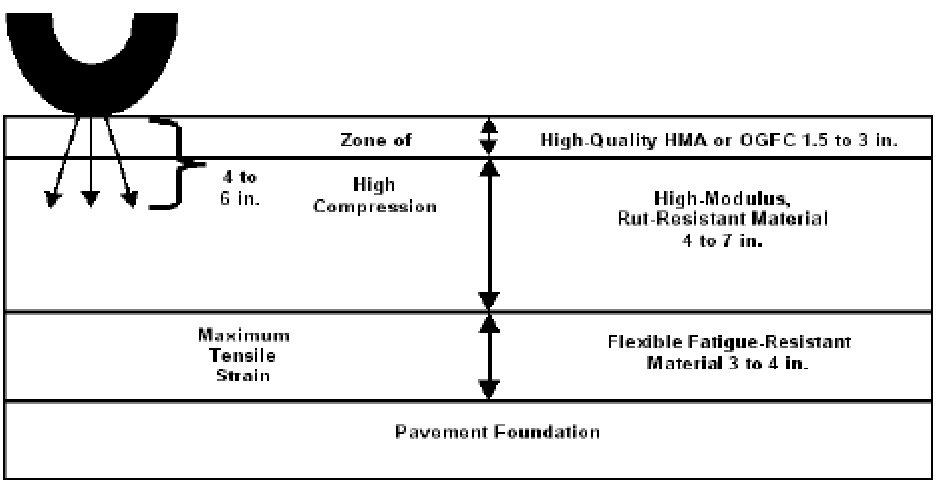

Figure 1A-1: Perpetual Pavement Design – Typical Cross Section

10A.3 Pavement Design Methodologies

The design of both flexible and rigid pavement structures shall be in accordance with the *AASHTO Guide for Design of Pavement Structures*, 1993 or latest approved edition. Flexible pavement design may also be conducted using the Texas Department of Transportation (TxDOT) program entitled *Flexible Pavement System 19 for Windows (FPS19w)*.

Perpetual pavement design may be conducted as described in the *TxDOT Pavement Design Manual* (October 2006 edition, Chapter 5 Section 5 or latest edition). Other methodologies may be utilized, at the design engineer's discretion, if the method is applicable to local conditions and all engineering calculations are provided to the City.

A pavement design report shall be prepared and signed by, or under the supervision of, a professional engineer registered in the State of Texas.

10A.4 Pavement Design Parameters

The following input variables are utilized when using the procedures detailed in the 1993 Edition of the *AASHTO Guide for Design of Pavement Structures*:

- Performance Period
- Subgrade Foundation Support
- Design Traffic, 18-kip ESALs
- Reliability, %
- Overall Standard Deviation
- Serviceability Indices

10A.4.1 Performance Period

Flexible and rigid pavements shall be designed for a twenty-year and thirty-year service life, respectively.

10A.4.2 Subgrade Foundation Support

A soil investigation must be performed for the design of pavement structures. The number of borings and locations shall be sufficient to accurately determine the stratum along the roadbed. Any existing soil information that is available either from the city or from private sources will be evaluated and, if determined to be applicable and valid, will be allowed in place of new soil tests.

10A.4.2.1 Resilient Modulus

For flexible pavement design, the resilient modulus shall be determined directly, back calculated from deflection data, or estimated based upon other soil strength or characteristic properties and correlated to the resilient modulus. The AASHTO T 307-99 (or latest version) entitled *Standard Method of Test for Determining the Resilient Modulus of Soils and Aggregate Materials* shall be used when the subgrade resilient modulus is measured directly in the laboratory. Specimens shall be compacted to 95% of the maximum density at the optimum moisture content. Results from the testing shall be utilized to determine the nonlinear relationship between the soil resilient modulus and the stress state of the soil using the following equation:

$$M_r = k_1 \sigma_d^{k_2} \sigma_3^{k_5}$$

where:

M_r = resilient modulus of the soil, psi

k_1, k_2, k_3 = regression coefficients

σ_d = deviator stress, psi

σ_3 = confining pressure, psi

The pavement designer should determine the design resilient modulus of the soil at the in-situ stress state using an iterative procedure. Seasonal variation of the design resilient modulus shall be considered by assuming the following:

- 4 months of the year the modulus will be as determined at the optimum moisture content.
- 3 months of the year the soil will be considered saturated and the modulus will be reduced 33%.
- 5 months of the year the soil will be considered dry and the modulus will be increased by 25%.

If correlations are used to determine the soil resilient modulus from other soil strength parameters (e.g. California Bearing Ratio, shear strength, etc.), the correlation shall be disclosed with appropriate backup information provided in the geotechnical report.

10A.4.2.2 Modulus of Subgrade Reaction

For rigid pavement design, concrete slab support is characterized by the modulus of subgrade/subbase reaction, otherwise known as the k-value with units typically shown as psi/in. A subbase layer is typically recommended for higher traffic volume roadways or in areas where additional concrete slab support is warranted. Recommended subbase options include one of the following:

- four inches of asphaltic concrete pavement (ACP) or asphalt stabilized subbase
- a one-inch asphalt concrete bond breaker over six inches of a cement stabilized subbase

An effective k-value shall be used in the design of rigid pavements if a subbase is utilized. If a subbase is not used and the concrete slab will be placed directly on a fine-grained soil, it is recommended that the subgrade be treated with lime or cement to facilitate construction as well as to provide additional support to the pavement structure. It is also recommended that significant volume changes in the subgrade resulting from moisture variations or other causes be minimized through the use of select fill in the upper subgrade.

10A.4.2.3 Subgrade Treatment

Roadbed soil having a plasticity index (PI) greater than twenty (20) shall be treated with lime. Application rate of lime shall be determined based on laboratory testing and shall be the lowest percentage of lime that provides:

- a pH of 12.4 or the highest pH achieved in accordance with TxDOT standard test procedure TEX-121-E
- a PI of less than 20 with TxDOT standard test procedure TEX-106-E
- an unconfined compressive strength of at least 50 psi with TxDOT standard test procedure TEX-121-E, Part I
- a swell value of less than 1% when tested by ASTM D4546 *Standard Test Methods for One-Dimensional Swell or Settlement Potential of Cohesive Soils*

In no case shall the lime be less than fifteen (15) pounds/yd^2 for six (6) inches of lime treated subgrade.

Portland cement may also be used for treatment of recycled base and/or subgrade soils. Research has shown that cement, with or without fly-ash, can effectively reduce the PI of clays with a PI in excess of 35 as well as provide significant strength gain. Cement treatment may also be considered when construction duration is limited and sulfate bearing soils (i.e. sulfate contents in excess of 3,000 parts per million, ppm) have been encountered. Recycled base materials treated with cement should be limited to a 7 day unconfined compressive strength of 300 psi. The pavement designer should consider the use of a Crack Attenuating Mixture (CAM) or Reflective Crack Relief Interlayer (RCRI) directly above cement treated mixtures if shrinkage cracking is a possibility. Utilize TxDOT standard test procedure TEX-120-E to determine optimum cement content.

Treated subgrade will be included as a “structural layer” within the pavement design calculations.

10A.4.2.4 Sulfate Bearing Soils

If lime treatment is considered as a method to improve pavement subgrade conditions, it is also recommended to perform additional laboratory testing to determine the concentration of soluble sulfates in the subgrade soils, in order to investigate the potential for adverse reaction to lime in certain sulfate-containing soils. The adverse reaction, referred to as sulfate-induced heave, has been known to cause cohesive subgrade soils to swell in short periods of time, resulting in pavement heaving and possible failure.

Techniques for determining the quantity of soluble sulfates, stabilization selection, and construction guidelines shall be followed according to TxDOT’s “Guidelines for Modification and Stabilization of Soils and Base for Use in Pavement Structures,” published by the *Construction Division; Materials & Pavements Section; Geotechnical, Soils & Aggregates Branch* dated September 2005 or latest edition.

10A.4.2.5 Rock Subgrade

Where the roadbed is in a rock excavation a “structural layer” within the pavement design calculations can be used that is equivalent to a 6 inch structural layer for stabilized subgrade. If a roadbed structural layer is used in the pavement calculation for rock subgrade an engineering report will be provided to the City addressing the consistency of the subgrade prior to base placement. A rock subgrade is defined as in-tact, massive rock formations that must be excavated through blasting or with the use of a milling machine. A rock subgrade is typically not a rippable material, nor would it contain significant interspersed expansive clay materials.

To take the “rock credit” in the pavement design clay lenses exposed in rock formations, which will serve as the roadbed foundation, shall be removed and filled with a material that provides similar strength properties to the surrounding rock. In addition, exposed karst features shall also be filled with a material that provides similar strength to the surrounding rock. Unexposed, shallow karst features that are known to exist shall be filled, to the extent possible and to the satisfaction of the Engineer, with a material that provides similar strength to the surrounding rock subgrade[8].

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[8] Fill materials shall comply with the rules and regulations of the Texas Commission on Environmental Quality (TCEQ).

10A.4.3 Design Traffic Levels

Characterization of traffic load for input to the pavement design will be based upon the cumulative expected 18-Kip equivalent single axle loads (ESAL) for the pavement's service life. The city has predetermined 20 year flexible pavement ESAL values for the street classifications defined in Table 506-1: *Functional Classification System Description* found in Article 5 Section 35-506 of the UDC. The expected range of vehicles per day for the streets defined by the functional classification system are shown in Article 5 Section 35-502 Subsection (a) Part 9 of the UDC. The predetermined flexible pavement ESAL values are show in Table 506-6 *Pavement Specifications* of the UDC and are reiterated below in Table 10A-1.

The UDC does not address ESAL values for rigid pavement design. Therefore, the 30 year predetermined ESAL values shown below for rigid pavement shall be utilized.

Table 10A-1: Minimum Acceptable ESAL Values for Pavement Design (		
Roadway Functional Classification	**Flexible Pavement 18-kip ESALs**	**Rigid Pavement 18-kip ESALs**
Primary and Secondary Arterials	3,000,000	4,500,000
Collector and Local Type B streets	2,000,000	3,000,000
Local Type A street with bus traffic	1,000,000	1,500,000
Local Type A street without bus traffic	100,000	150,000

In most cases, the ESAL values shown above will be appropriate for design. However, it is important for the designer to understand if other site specific circumstances are present that will cause the predetermined ESAL values to be inappropriate. A review of the Traffic Impact Analysis (TIA) by the pavement designer should be conducted to determine if a modification to the predetermined ESAL values is justified. The predetermined ESAL values will not be lowered in any circumstances unless specifically allowed by the City Engineer.[9]

In situations where the design number of ESALs needs to be determined by the pavement designer, the 1993 AASHTO method for conversion of traffic to ESALs shall be utilized. ESALs are determined by:

$$ESAL = (ADT) \times (ESAL\ Factor) \times DD \times LDF \times \%Trucks \times TFGR \times TVGR \times 365\ days \times design\ years$$

using the following parameters:

[9] Predetermined ESAL values for primary and secondary arterials, collectors, and local type B streets include bus traffic. The pavement designer shall also consider the use of appropriate paving materials and details to accommodate buses, which may include bus pads and improved surface course HMA mixtures in the bus lane.

- **ADT:** Two-Way Daily Traffic in terms of the number of vehicles per day
- **ESAL Factor**: Average Initial Truck Factor (ESALs/Truck) which can range from 0.85 to 4.35 depending on the traffic mix
- **DD:** % of Trucks in Design Direction (typically 50%; however, a directional distribution factor should be applied if the traffic is unevenly distributed between the two directions, e.g. if one side services an industrial facility)
- **LDF:** % of All Trucks in Design Lane (Table 10A-2 provides the City's recommended lane distribution factors or LDFs)
- **%Trucks:** % of Heavy Trucks (typically FHWA vehicle classes 4 through 13)
- **TFGR:** Annual Truck Factor Growth Rate
- **TVGR:** Annual Truck Volume Growth Rate

Table 10A-2: Recommended Lane Distribution Factors (	
(from TxDOT Pavement Design Guide, October 2006 Edition)	
Total Number of Lanes in Both Directions	**LDF**
≤4	1.0
6	0.7
≥8 *	0.6
* Unless field observations show otherwise	

10A.4.4 Reliability

Both pavement type design procedures (flexible and rigid) provide a common method for incorporating reliability by applying a reliability factor based on a shift in the design traffic. The pavement reliability level is defined by AASHTO as the probability that the actual design traffic to terminal serviceability is greater than or equal to the actual design period traffic. The reliability factor to be used for each roadway functional classification is assigned by the City and shown below in Table 10A-3.

Table 10A-3: Reliability Factor for Flexible and Rigid Pavement Design (	
Roadway Functional Classification	**Reliability Factor**
Primary and Secondary Arterials	95
Collector and Local Type B streets	90
Local Type A street with bus traffic	70
Local Type A street without bus traffic	70

10A.4.5 Overall Standard Deviation

Overall standard deviation accounts for both chance variation in the traffic prediction and normal variation in pavement performance prediction for a given traffic level. The AASHTO Design Guide recommends a range of values for S_0 based on the data analysis from the AASHO Road Test and are:

0.40 - 0.50 for Flexible Pavements

0.30 - 0.40 for Rigid Pavements

Higher values represent more variability; thus, the pavement thickness increases with higher overall standard deviations. Designs conducted for the City shall utilize a standard deviation (S_0) as follows:

0.45 for flexible pavements

0.35 for rigid pavements

10A.4.6 Serviceability

The serviceability of a pavement is defined as the pavement's ride quality and its ability to serve the type of traffic (automobiles and trucks) which uses the facility. The initial serviceability index (P_0) for flexible pavements shall be 4.2 and for rigid pavement shall be 4.5. The minimum terminal serviceability index (P_t) for local streets shall be 2.0 and for collectors and arterials shall be 2.5.

10A.5 Design Parameters Specific to Rigid Pavements

There are several design parameters required by the 1993 AASHTO Guide that are specific to rigid pavements. The following sections provide guidance regarding these parameters for roadways designed for the City.

10A.5.1 28-day Concrete Modulus of Rupture, M_r

The M_r of concrete is a measure of the flexural strength of the concrete as determined by breaking concrete beam test specimens. A modulus of rupture of 600 psi at 28 days shall be used with the current City specification for concrete pavement. If a different value is used it must be documented with an explanation

10A.5.2 28 day Concrete Elastic Modulus

Elastic modulus of concrete is an indication of concrete stiffness and varies depending on the coarse aggregate type used in the concrete. A modulus of 4,000,000 psi shall be used for City pavement designs. If a different value is used it must be documented with an explanation.

10A.5.3 Load Transfer Coefficient

The load transfer coefficient is used to incorporate the effect of dowels, reinforcing steel, tied shoulders, and tied curb and gutter on reducing the stress in the concrete slab due to traffic loading and therefore causing a reduction in the required concrete slab thickness. The coefficients recommended in the AASHTO Guide are based on findings from the AASHO Road Test and are shown in Table 10A-4.

Table 10A-4: Recommended Load Transfer Coefficients (

(from TxDOT Pavement Design Guide – October 2006 Edition)

CRCP or Load transfer devices at transverse joints	**Tied PPC shoulders, curb, and gutter, or greater than two lanes in one direction**	
	YES	**NO**
Yes	2.9	3.2
No	3.7	4.2

The City prefers that tied PCC shoulders be provided, if sufficient right-of-way (ROW) is available or there are no other geometric constraints. In case it is not feasible to provide tied PCC shoulders, the use of a minimum 2-ft wider outside lane should be considered.

10A.5.4 Drainage Coefficient

The drainage coefficient characterizes the quality of drainage of the subbase layers under the concrete slab. Good draining pavement structures do not give water the chance to saturate the subbase and subgrade; thus, pumping is not as likely to occur. Subbase shall be designed to be dense-graded, non-erosive, and stabilized. For the City of San Antonio and surrounding areas a drainage coefficient of 1.01 to 1.03

shall be utilized for rigid pavement design and is based upon an average annual rainfall of 28 to 31 inches per year.

10A.5.5 Rigid Pavement Standards/Details

All applicable standards and details are to be included in the pavement design report. See the following lists for applicable details that are utilized by TxDOT and are acceptable to the City:

- BAS-94, Bridge Approach Slab (2 Sheets): apply to approaches to bridge structures.
- CRCP (1)-03, Continuously Reinforced Concrete Pavement, One-Layer Steel Bar Placement: applies to CRCP that is from 8 to 13 inches thick.
- FDRCP-94, Full-Depth Repair of Concrete Pavement: used for repairing existing concrete pavement.
- CPCD-94, Concrete Pavement Details, Contraction Design (CPCD): standard for plain jointed concrete pavement and covers pavement thickness from 8 to 15 inches.
- TA (CP)-99, Terminal Anchorage for Concrete Pavement: shows a terminal anchorage system usually constructed near bridge ends to restrain the movement at the joint between the bridge approach slab and the end of the pavement. Restraining the slab movement will hopefully reduce the chance of damaging adjacent structures. Such anchors are mainly used for CRCP, but they can also be used for CPCD as well.
- JS-94, Concrete Paving Details, Joint Seals: specifies joint sealing requirements for concrete pavement.

10A.5.6 Joint Spacing and Details

Construction joint spacing should not exceed 15 ft in either the longitudinal or transverse direction. The depth of saw cut should be a minimum of ¼ of the slab depth (⅓ the slab depth is recommended) if utilizing a conventional saw or 1 inch when using an early entry saw (early entry sawing is recommended). The width of the joint will be a function of the sealant chosen to seal the joint. It is recommended that a joint seal be utilized to minimize the introduction of incompressible material into the joint.

It is recommended that dowel bars be used to provide load transfer and reduce differential movement (or faulting) across transverse joints. Dowels should be smooth #9 bars (Grade 60 steel) spaced 12 inches on center with an embedment length of at least 8 inches.

Tie bars should be used to tie longitudinal joints within the pavement lanes and at the shoulder. Tie bars should be deformed #4 bars at a minimum (Grade 60 steel) spaced 36 inches on center with a minimum length of 30 inches.

Isolation joints must be used around fixed structures including light standard foundations and drainage inlets to offset the effects of differential horizontal and vertical movements. Pre-molded joint fillers should be used around the fixed structures prior to placing the concrete pavement to prevent bonding of the slab to the structure and should extend through the depth of the slab but slightly recessed from the pavement surface to provide room for the joint sealant.

10A.6 Acceptable Materials for Structural Pavement Layers

Alternative pavement materials may be used where the existing soil or subsurface conditions, or the alternative materials, provide comparable, better, pavement performance to the materials otherwise required by this section. Proposals for alternative pavement materials with supporting engineering documentation may be submitted to the city for consideration. Over the last few years, newer pavement material technologies have been developed and used to extend pavement service lives and reduce maintenance costs.

The combination of the following materials will be allowed to develop pavement structures:

- Lime Treated Subgrade
- Cement Treated Subgrade
- Cement Treated Base
- Flexible Base (Type A, Grades 1 or 2 are recommended in most situations)
- Prime Coat (non-structural)
- Tack Coat (non-structural)
- Hot Mixed Asphaltic Concrete Pavement (HMAC)
  - Dense Graded Surface Course
  - Dense Graded Base Course[10]
  - Premium Mixtures for Surface Course (with approval by the City Engineer)

[10] Asphalt treated base is rarely used by the Texas Department of Transportation and is generally being replaced with Type B asphaltic concrete. Use of Type A asphaltic concrete is also being discouraged by TxDOT due to the difficulties with determining an appropriate maximum theoretical specific gravity that can be used for compaction control during placement.

- Jointed Plain Concrete Pavement (JPCP) with Dowels and Tie Bars as needed[11]
- Continuously Reinforced Concrete Pavements (with approval by the City Engineer)
- Base Reinforcement (Geogrids)

HMAC premium mixtures shall include stone-matrix asphalt, Superpave, ultra-thin bonded wearing courses, and porous friction courses. Premium mixtures with high permeability shall not be used on streets with integral curb and gutters, unless approved by the City Engineer.

10A.7 Flexible Pavement Structural Coefficients

Structural layer coefficients for flexible pavement design are recommended as the following:

- Lime Treated Subgrade – 0.08
- Cement Treated Subgrade – 0.08
- Cement Treated Base
  - Target 7 day unconfined compressive strength = 150 psi – 0.12
  - Target 7 day unconfined compressive strength = 300 psi – 0.18
- Flexible Base
  - Type A Grades 1 or 2 – 0.14
  - Type A Grades 1 or 2 (With base reinforcement within the flexible base, geogrids) – 0.17
  - Type A Grade 3 – 0.10 (Use of Grade 3 must be approved by the City Engineer)
- Hot Mixed Asphaltic Concrete Pavement (HMAC)
  - Dense Graded Surface Course – 0.44
  - Dense Graded Base Course – 0.38
  - Premium Mixtures for Surface Course – 0.48[12]

Performance graded binders shall be used as stated in Item 205 unless there is a compelling reason to deviate. Deviations shall be submitted in the pavement design report with appropriate backup.

[11] Research into the performance of Portland cement concrete pavements indicates that jointed, un-reinforced concrete with dowel bars at the transverse joints and tie bars at the longitudinal joints consistently performs better than jointed, reinforced concrete pavements and requires less maintenance. The American Concrete Pavement Association (ACPA) also encourages the use of JPCP for city streets and other highway applications.

[12] Values in excess of 0.44 shall be approved by the City Engineer with appropriate backup to justify the use of a higher value.

10A.8 Required Structural Pavement Sections

A range of acceptable pavement thicknesses are required by the City and are a function of the roadway classification. The acceptable ranges for both flexible (in terms of the structural number) and rigid (in terms of slab thickness) pavements are shown in Table A-5.

Table 10A-5: Acceptable Pavement Structural Sections (				
Roadway Functional Classification	**Flexible Pavement Structural Number**		**Rigid Pavement Slab Thickness**	
	Minimum	**Maximum**	**Minimum**	**Maximum**
Primary and Secondary Arterials	3.80	5.76	9.0	13.0
Collector and Local Type B streets	2.92	5.08	7.0	9.0
Local Type A street with bus traffic	2.58	4.20	6.0	8.0
Local Type A street without bus traffic	2.02	3.18	5.0	6.0

10A.9 Minimum Compacted Layer Thicknesses

If the following compactable pavement materials are utilized in proposed pavement sections, the minimum compacted thickness for the components shall be as shown in Table 10A- 6.

Table 10A- 6: Minimum Compacted Layer Thickness (	
Pavement Layer	**Minimum Thickness, in inches**
Hot Mixed Asphaltic Concrete Surface	1.5
Hot mixed Asphaltic Concrete Binder	2.5
Hot Mixed Asphaltic Concrete Base	4.0
Flexible (Granular) and Treated Base	6.0
Lime and Cement Treated Subgrade	6.0

10A.10 Pavement Design on Expansive Soils

Several areas throughout the city will have roadways directly over expansive subgrade soils. The City expects designers to consider the harmful effects of swell when developing pavement sections over expansive soils.

The AASHTO procedure includes provisions to account for roadbed swelling through a reduction in serviceability or ride quality over time as the roadbed swells. The AASHTO Guide states on page II-10, “If…roadbed swelling…can lead to a significant loss in serviceability or ride quality during the analysis period, then it should be considered in the design analysis for all pavement structural types…” The intent of this portion of the AASHTO design procedure is to take into consideration what will happen to the pavement section if underlying expansive soils are wetted to a point where they will swell due to exposure to water. In many soils, additional pavement structure may be sufficient and cost effective to reduce the effect of swell due to expansive soils. Therefore, it is recommended that pavement designers utilize this procedure to reduce the effect of soil induced swell on pavement performance.

In deep, highly expansive soils, other mitigation techniques, like over excavation and select fill replacement may also need to be considered in the pavement design to further reduce the potential for underlying clay soils to swell and cause damage to the pavement section. Additionally, other design features should be considered to protect the underlying expansive clays from being wetted by transient ground water.

The estimated Potential Vertical Rise (PVR) for roadways should be determined using the empirical procedure, TxDOT’s standard test procedure Method Tex-124-E, *Method for Determining the Potential Vertical Rise (PVR)* and included in the pavement design report. An appropriate surcharge load, active zone, and moisture conditions should be considered in estimating the PVR values. Boring depths shall be sufficient to determine the active zone for the expansive soil. Other methods for determining swell may be utilized if detailed in the pavement design report and have been approved by the City Engineer.

10A.10.1 Options to Reduce the Effect of Soil Heave on Pavements

Provided pavement sections are sufficiently designed and constructed to perform in the native soil environments, pavements constructed over highly expansive clays require significant routine maintenance to correct pavement roughness caused by underlying soil swelling. Swell can be reduced through various measures but cannot be totally eliminated without full removal of the problematic soil in the first place. Measures acceptable to the City for reducing swell include the following:

- Chemical Injection of Soil
- Soil Treatment with Lime or Cement
- Geogrids
- Removal and Replacement of High PI Soils
- Drains or Barriers to Collect or Inhibit Moisture Infiltration

10A.10.1.1 Chemical Injection

Chemical stabilization/injection techniques are used to treat expansive clay soils. The method involves the injection of potassium based chemical(s) into the soil to supply cations to the clay and neutralize the clay's imbalanced electrical charge. Some methods consists of drilling one to two inch diameter holes in the soil to depths ranging from one to ten feet on a grid (a 2 x 2 foot grid is typical). Chemical injection is completed using high injection pressures of about 200 to 300 psi and is injected through the access holes for a period of time. This injection time may vary depending on the soil conditions and project requirements (a few hours to several days may be needed).

Chemical stabilization is best utilized on soils that are in an in-situ condition that is dryer than the optimum moisture content of the questionable soil as well as soils that have cracks and fissures and/or a soil matrix that is “open” or in other words allows the pressure injected chemicals to easily permeate the soil matrix. Non-fissured soils can be chemically treated given ample time and high enough pressures for the chemical to permeate the soil.

10A.10.1.2 Soil Treatment

Soil treatment with lime or cement is typically used to reduce the swelling potential of the upper portion of the pavement subgrade. Lime or cement and water are mixed with the top 6 to 12 inches (or possibly more) of the subgrade and allowed to mellow or cure for a period of time. After curing the treated soil mixture is compacted to form a strong soil matrix that can improve pavement performance and reduce soil heave.

Lime shall be placed in slurry form only, unless written permission is granted by the Engineer and a safety and containment plan is submitted to the Engineer by the Contractor seven days prior to use. In circumstances where it would be beneficial to utilize lime for “drying” subgrade materials to expedite construction, the Contractor may request approval from the Engineer to use pelletized lime.

10A.10.1.3 Geogrids

The primary function of geogrids used in pavements is reinforcement, in which the geogrid mechanically improves the engineering properties of the pavement system. The three primary uses of a geogrid in a pavement system are to:

1. serve as a construction aid over soft subgrades
2. improve or extend the pavement’s projected service life
3. reduce the structural cross section for a given service life

Biaxial geogrid is also an acceptable for improving pavement performance over subgrades that are weak and tend to swell with moisture. Past experience with flexible base pavement sections on highly expansive clay soils indicates that the use of a geogrid base reinforcement provides considerable tensile strength to the pavement section. This tensile strength is achieved without making the section more brittle, as occurs with many other subgrade or base stabilization methods. The added tensile strength and flexibility allows the pavement section to move and flex, as the expansive clay subgrade undergoes the normal shrink and swell with changes in climatic conditions.

Geogrid should conform to TxDOT Departmental Material Specification (DMS) – 6240, Geogrid for Base/Embankment Reinforcement Type 1 for Local Type A without Bus Traffic city streets and Type 2 for Primary and Secondary Arterials, Collectors, Local Type B, and Local Type A with Bus Traffic city streets when tested with TxDOT standard test procedure Tex-621-J, Testing Geogrids. Geogrid should be installed in accordance with the manufacturer’s specifications and constructed in accordance with City of San Antonio Standard Specification Item 234 – *Base Reinforcement*. Geogrid should be placed on top of the prepared subgrade in instances that the total thickness of the overlying compacted base material is 10 inches or less. In instances that the total thickness of the compacted base material layer is greater than 10 inches the Geogrid should be placed at the mid-section of the compacted base material layer.

10A.10.1.4 Removal and Replacement

Removal of highly expansive soils and replacement with lower PI soil or select fill significantly reduces the potential for vertical rise or heave of soils underlying a pavement. The amount of soil to remove and replace is dependent upon the acceptable amount of swell, the PI of the natural soil, the available moisture, and the overburden pressure from the overlying pavement. Removal and replacement can be a very effective method for minimizing heave but can be labor intensive and cause complications in construction depending on the job site conditions. However, the resulting cost savings to future maintenance can make this technique cost effective over the life cycle of the pavement. With highly expansive clays removal of up to 5 or 6 feet or more of the subgrade and replacement with a non-expansive select fill typically would reduce the PVR to acceptable levels.

10A.10.1.5 Drains and Moisture Barriers

Capturing water infiltration via French drains, pavement edge drains, or inhibiting water through the use of vertical moisture barriers would reduce the potential for heave since one important component of the heaving mechanism, water, would be reduced.

10A.11 Pavement Rehabilitation Design

Currently, the UDC does not explicitly consider pavement rehabilitation design and thus infers that pavement rehabilitation only includes reconstruction. There are rehabilitation methods available other than complete reconstruction that may be more cost effective and considerably quicker.

Pavement rehabilitation design should be considered over full pavement reconstruction in situations where practical. The use of Falling Weight Deflectometer (FWD) data and analysis, ground penetrating radar (GPR), and/or profile measurements using an inertial profiler should all be considered when developing appropriate pavement rehabilitation designs. Laboratory testing of existing paving materials should also be considered to characterize the ability of the materials to be recycled when recycling the existing materials is a possible rehabilitation option.

The pavement designer shall determine the appropriate technique for rehabilitation which will be determined based upon the existing condition of the roadway, roadway geometry, site conditions, material availability and/or other factors. Rehabilitation techniques acceptable to the City shall include:

- Non-Structural Surface Treatments or Overlays
  - Cracksealing
  - Patching
  - Single or double treatment surface seals

- Slurry Seals
- Microseals
- Mill and Inlay HMAC
- Hot In-Place Recycling without Overlay[13]
- Ultra-Thin Bonded Wearing Course

▪ Structural Rehabilitation

- HMAC Overlay
- Hot In-Place Recycling with Overlay
- Partial Depth Reclamation with Overlay
- Full Depth Reclamation with Overlay

10A.12 FHWA Vehicle Classifications with Definitions

1. **Motorcycles**: All two or three-wheeled motorized vehicles. Typical vehicles in this category have saddle type seats and are steered by handlebars rather than steering wheels. This category includes motorcycles, motor scooters, mopeds, motor-powered bicycles, and three-wheel motorcycles. This vehicle type may be reported at the option of the State.
2. **Passenger Cars**: All sedans, coupes, and station wagons manufactured primarily for the purpose of carrying passengers and including those passenger cars pulling recreational or other light trailers.
3. **Other Two-Axle, Four-Tire Single Unit Vehicles**: All two-axle, four-tire, vehicles, other than passenger cars. Included in this classification are pickups, panels, vans, and other vehicles such as campers, motor homes, ambulances, hearses, carryalls, and minibuses. Other two-axle, four-tire single-unit vehicles pulling recreational or other light trailers are included in this classification. Because automatic vehicle classifiers have difficulty distinguishing class 3 from class 2, these two classes may be combined into class 2.
4. **Buses**: All vehicles manufactured as traditional passenger-carrying buses with two axles and six tires or three or more axles. This category includes only traditional buses (including school buses) functioning as passenger-carrying vehicles. Modified buses should be considered to be a truck and should be appropriately classified.

NOTE: In reporting information on trucks the following criteria should be used:

[13] Hot in-place recycling may be used in circumstances where the existing pavement section is structurally adequate and the surface does not contain significant distress (e.g. the pavement should have low severity cracking and raveling). This method should also be limited to use on lower volume roadways where the risk of delamination is reduced.

- Truck tractor units traveling without a trailer will be considered single-unit trucks.
- A truck tractor unit pulling other such units in a “saddle mount” configuration will be considered one single-unit truck and will be defined only by the axles on the pulling unit.
- Vehicles are defined by the number of axles in contact with the road. Therefore, “floating” axles are counted only when in the down position.
- The term “trailer” includes both semi- and full trailers.

1. **Two-Axle, Six-Tire, Single-Unit Trucks**: All vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, etc., with two axles and dual rear wheels.
2. **Three-Axle Single-Unit Trucks**: All vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, etc., with three axles.
3. **Four or More Axle Single-Unit Trucks**: All trucks on a single frame with four or more axles.
4. **Four or Fewer Axle Single-Trailer Trucks**: All vehicles with four or fewer axles consisting of two units, one of which is a tractor or straight truck power unit.
5. **Five-Axle Single-Trailer Trucks**: All five-axle vehicles consisting of two units, one of which is a tractor or straight truck power unit.
6. **Six or More Axle Single-Trailer Trucks**: All vehicles with six or more axles consisting of two units, one of which is a tractor or straight truck power unit.
7. **Five or fewer Axle Multi-Trailer Trucks**: All vehicles with five or fewer axles consisting of three or more units, one of which is a tractor or straight truck power unit.
8. **Six-Axle Multi-Trailer Trucks**: All six-axle vehicles consisting of three or more units, one of which is a tractor or straight truck power unit.
9. **Seven or More Axle Multi-Trailer Trucks**: All vehicles with seven or more axles consisting of three or more units, one of which is a tractor or straight truck power unit.

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Appendix 13A City of San Antonio QA / QC Certification Form

The QA / QC Certification Form (.xls) file can be located by visiting:

http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Design-Guidance-Manual-and-Forms

and selecting QA / QC Certification Form, found under the Design Guidance Manual Forms heading.

The static document displayed below is dated October 2017. For the most up-to-date version of the document, please download the file from the site listed above.

Turn to page 500 for Table 13A-1: City of San Antonio QA/QC Certification Form.

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Table 13A-1: City of San Antonio QA/QC Certification Form							
Project:				**Date:**			
Engineer:				**Phase:**			
Check All Appropriate Boxes, Fill in the Blank, or Mark N/A if Not Applicable	**YES**	**NO**	**N/A**	**Check All Appropriate Boxes, Fill in the Blank, or Mark N/A if Not Applicable**	**YES**	**NO**	**N/A**
Project Management							
Design Firm's QA/QC Program Followed				**Contract Documents**			
Design Schedule Updated				Hardcopy of Roadway and Drainage Plans			
Meeting Minutes Posted				Hard Copy of All Joint-Bid Utilities			
Previous Review Comments Addressed				Bid Documents			
Design Exceptions Submitted				Bid Proposal			
Constructability Review Performed				Special Provisions			
				List of Governing Specifications Included			
Design				Special Specifications Included			
Quantities Checked and Verified				PDF and DGN of all Submittals on CD			
Plans Reviewed and Checked for Accuracy				Documents Posted to PRIMELink			
Applicable Specs Reviewed and Checked				Drainage Design Calculations on CD			
Surveying and Mapping Complete				All Meeting Minutes Documented and Distributed			
Drainage Submittal Complete For This Phase							
Traffic Engineering Complete For This Phase				**Project Closeout**			
TCP Reviewed and Includes Joint-Bid Utilities				Lessoned Learned Meeting Minutes			
Roadway, Bicycle & Pedestrian Design Complete				Recapitulation of Project Cost			
Permitting Resolved				Final Field Alteration			
CADD Standards Met				Plan of Records Hard Copy and CD			
Geotechnical Complete							
Public Involvement Complete for This Phase							
Cost Estimate Checked and Verified							

Table 13A-1: City of San Antonio QA/QC Certification Form (continued)

Project:					**Date:**			
Engineer:					**Phase:**			
Check All Appropriate Boxes, Fill in the Blank, or Mark N/A if Not Applicable	**YES**	**NO**	**N/A**		**Check All Appropriate Boxes, Fill in the Blank, or Mark N/A if Not Applicable**	**YES**	**NO**	**N/A**
Utility Coordination								
Utility Basemap Updated								
Utility Quality Levels Updated								
Utility Coordination Report Complete								
Conflict Matrix Updated								

Every design firm needs an internal, written QA/QC program. It is the design firm's responsibility to ensure the QA/QC program has been followed. The program will act as your guideline for setting and establishing a high quality design and submittal for both the prime and sub=consultants. With the signatures below, the design firm confirms that the QA/QC program has been followed and all requirements as established in the Design Guidance Manual and the approved scope of services have been followed.

Consultant Remarks:

Project Manager **Date**

QA/QC Reviewer **Date**

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Appendix 13B City of San Antonio Comment (TCI) Comment & Resolution Form

The Comment and Resolution Form (.xls) file can be located by visiting:

http://www.sanantonio.gov/TCI/Current-Vendor-Resources/Design-Guidance-Manual-and-Forms

and selecting Comment and Resolution Form, found under the Design Guidance Manual Forms heading.

The static document displayed below is dated October 2017. For the most up-to-date version of the document, please download the file from the site listed above.

See page 506 for Table 13B-1: COSA TCI Comment & Resolution Form.

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Table 13B-1: COSA TCI Comment & Resolution Form (

Comment & Resolution Form

City of San Antonio – Transportation & Capital Improvement
114 W. Commerce
San Antonio, TX
78205

40% Submittal Review Record

Project		Engineering Firm:			Project WBS		
COSA PM:		Engineering Firm Project Manager:			*WBS Number (40xXX)*		
No.	**Sheet No.**	**Review Comment**	**COSA Dept**	**Reviewer**	**Consultant's Response**	**Complete (Y/N)**	**Reviewer Response**
		General Sheets:					
1	1	Use COSA Standard Sheet	PM Team				
2	2	Index Should Follow Sheet Order Listed in the DGM	Tech Srvc				
3	3	Show Primary and Secondary Control Points on Project Layout	PM Team				
4	4	Follow Estimated Quantity Sheet as shown in DGM	Tech Srvc				
5	5	Show Rate of Lime Treatment on Typical Sections	Tech Srvc				
		Traffic Control Plans:					
6	15	Show typical utility installation on section	PM Team				
7	15	Show type of temp pavement	Tech Srvc				
8	16	Show limits of Begin Full Construction	Inspections				
9	18	Show temporary striping	Inspections				
10	20	Show temporary traffic barriers	PM Team				
		Roadway Plans:					
11	All Rdwy Plans	Show proposed storm sewer inlets and pipe, using shaded line-style	PM Team				
12	59	Add note for storm water protection	Environmental				
13	59	Use TxDOT detail in TxDOT ROW	PM Team				
14	63	Add VC to VPI Sta XX + XX.XX	PM Team				

Table 13B-1: COSA TCI Comment & Resolution Form (continued)

Comment & Resolution Form

City of San Antonio – Transportation & Capital Improvement
114 W. Commerce
San Antonio, TX
78205

40% Submittal Review Record

Project	Engineering Firm:				Project WBS		
COSA PM:	Engineering Firm Project Manager:				*WBS Number (40xXX)*		
No.	**Sheet No.**	**Review Comment**	**COSA Dept**	**Reviewer**	**Consultant's Response**	**Complete (Y/N)**	**Reviewer Response**
				Roadway Plans:			
15	All X-Sec Sheets	Show UG Utilities	Tech Srvc		*Response*		
16	70	Show limits of driveway penetration	PM Team		*Response*		
				Roadway Plans:			
17	99	Show update Stormwater details	Strm Wtr		*Response*		
18	99	In the profile, show headwater and tailwater elevations at the culvert for the 25 and 100-year storm events.	PM Team		*Response*		
				Roadway Plans:			
19	122	Show begin striping Stationing	PM Team		*Response*		
20	122	Add Traffic notes	Traffic		*Response*		

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Appendix 13C Periodic Construction Observation Report

Report No. ________________

Project: ____ Date: ____________________

Contractor: _____________________________________ Time: ____________________

Site Conditions:

Work Observed:

Traffic Control / Phasing:

Is Work Performed in General Compliance with Construction Plans? Explain:

Comments: (attach pictures or drawings if necessary)

_________________________ _________________________ _______________

Consultant Name Signature Date

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