Acknowledgements

This document is the product of Seattle Public Utilities' (SPU) Base Map Drafting Group. The Base Map Group is a part of Technical Resources under Engineering Support for the Engineering Services Division of SPU.

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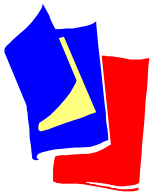
DOCUMENT CONVENTIONS

Use the document conventions to quickly scan this guide for information you need.



Several formatting styles are used in this manual to bring attention to its varying content:

Cross References

Cross references to other sections or appendices are in bold text:

See **Section 3.8.** See **Appendix 3: SPU Presentation Standards and Examples**.

Examples

Examples of various base map scenarios are shaded in blue:

EXAMPLE:

Transition items

Due to either technological advances or changes in policies or procedures, some items are in transition at the time of this writing. These items are marked with this symbol: ***

Links

Links to on-line information are shown in blue underline:

WWW:/SPU

Key Terms

Important terms used in the base map process are in italics:

as-built, control, or *field check*

Quotations

Direct quotations or phrases are placed in quotes:

“Sample here”

INTRODUCTION

The *Guide to SPU Base Map Production* is a training and reference manual for creating Seattle Public Utilities (SPU) base maps.

Creating base maps is part science and part art. The science is in knowing how to interpret survey data and as-built documents. The art is in knowing how to reflect that information.

The focus of this manual is the technical content of SPU base maps rather than software procedures used in base map production.

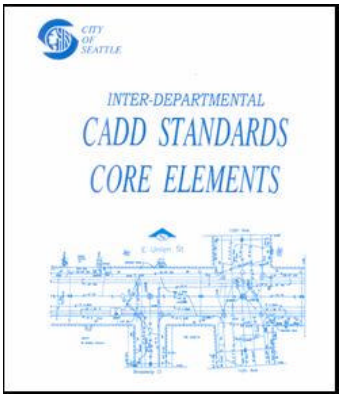
We have attempted to present material in a sequence that reflects base map production. It is impossible, however, to cover every instance encountered while creating base maps. Some areas have unique circumstances. In these cases, judgment calls will need to be made. Most likely, a decision will be a collaborative effort made by Base Map group members.

While the desired outcome of base mapping has not changed much over the years, the technology for producing base maps is ever-changing. This manual is a "living document" designed to accommodate frequent revisions. The following are some key features of the manual.

PREREQUISITIES

The CADD Standards Core Elements is a prerequisite for creating SPU base maps.

This guide assumes the user is familiar with SPU's engineering practices, file management conventions, file naming conventions, line types, symbols, and layering standards. These items are explained in detail in the City of Seattle *Inter-Departmental CADD Standards Core Elements* manual.



BASE MAP CHECKLIST

Use the Base Map Checklist as you read this manual. You'll find a copy inside the front cover and in Appendix 1.

The Base Map Checklist is a tool to use in conjunction with this manual. The checklist highlights the steps in creating a base map. Specific items within each step are cross-referenced to their corresponding sections in the manual. A copy of the Base Map Checklist is located in **Appendix 1** and in the inside cover pocket of this manual.

Documents once available only as hard copy are now available electronically. More improvements are in the works!

APPENDICES

The following are appendices to this manual:

- Appendix 1 is the Base Map Checklist.
- Appendix 2 illustrates SPU Presentation Standards through more than 60 examples of base maps.
- Appendix 3 explains support documents for SPU's base-mapping process.
- Appendix 4 is a detailed list of research resources used to create base maps at SPU.

SUPPLEMENTARY DOCUMENTATION

Two related documents are used in base-mapping:

- *City of Seattle Standard Plans*
- *Inter-departmental CADD Standards Core Elements*

Information on the *CADD Standards Core Elements* is available through our software under "Help," "SPU Help" and as a hardcopy document. Contact Dean Noble at **206-684-5137**.

Section 1
FUNDAMENTALS OF BASE MAPPING

Section 1 Objectives

After you complete this section, you should be able to:

- Identify the basic parts of base maps
- Understand base map accuracy
- Know how to use GIS themes
- Discuss reusing existing base maps and the role of unconventional base maps

1.1 What is Base Map?

Base maps show features above the ground and below. At SPU, we use base maps for designing CIP projects.

A base map is a graphical representation, usually depicted at 20 and sometimes 10 Scale (for crowded areas). Base maps show existing topographic features and underground utilities in a project area. A base map will also reflect the City's property lines as they relate to public Right-of-Way (ROW) and other pertinent legal lines. This information is vital to the City of Seattle's Capital Improvement Program (CIP) design process. Base maps give engineers and designers detailed information they need to plan improvements while avoiding conflicts with existing conditions above- and belowground. Most SPU base maps are located within the city limits and public ROW.

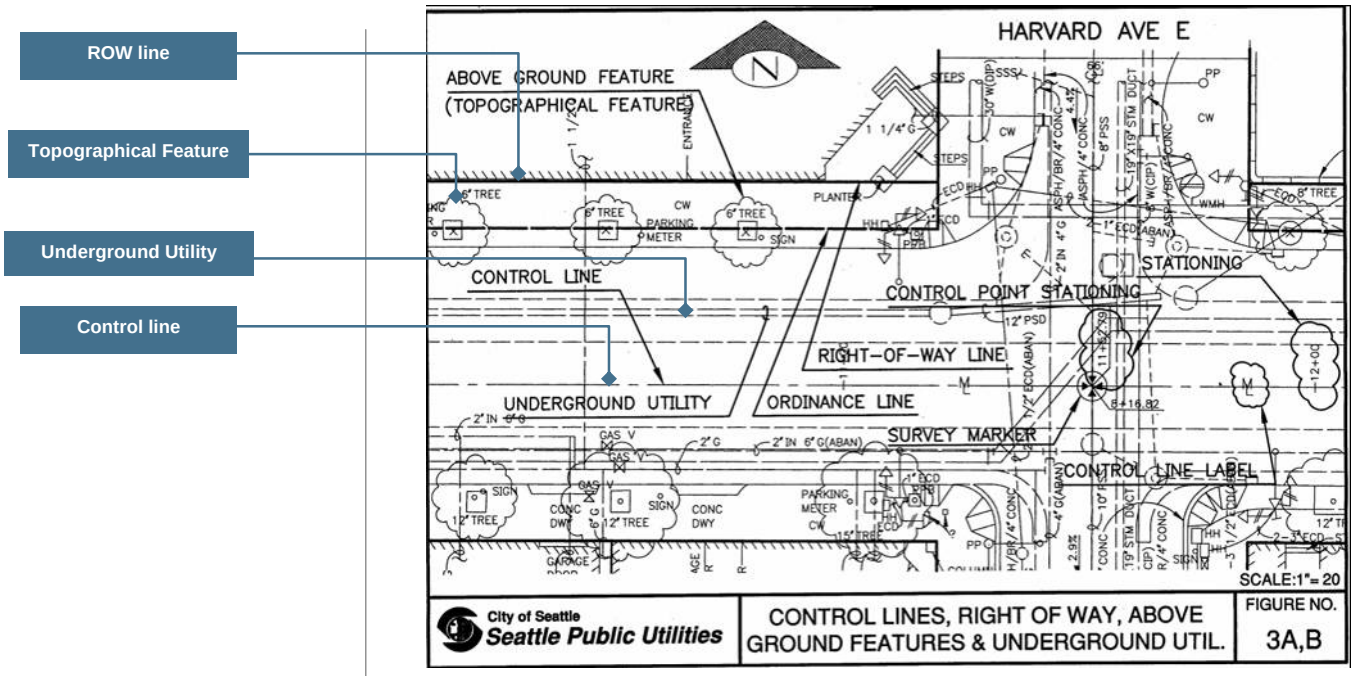
1.2 A Base Map Contains Three Primary Parts

Base maps have 3 parts: control and ROW lines, topographical features (aboveground), and underground utilities.

SPU base maps contain 3 basic parts:

- Control and Right-of-Way
- Topographical Features
- Underground Utilities

See **Appendix 2**, **Figure 3A**.



A) CONTROL AND RIGHT-OF-WAY LINES

i) Control

Control lines can be centerlines, monument lines or survey lines.

The *control* found on a SPU Base map usually refers to lines, often called centerlines, monument lines, survey lines, all known as *control lines*. These lines are not topographic features. They are legally defined by survey control markers that are topographic features such as monuments, brass plugs, tacks, and other types of markers. C*ontrol lines* are connected from survey marker to survey marker and can be found on almost every street and intersection within the public ROW. In fact, it is the placement of survey markers that defines the legal boundaries of the City's property lines. City property contained within these boundaries is better known as the "Public Right-of-Way."

ii) Right-of-Way

ROW lines show property boundaries for land the City owns

Public ROW is property within which the City of Seattle owns and maintains utilities. It is generally adjacent to private property. Public ROW contains roadways, walkways, and various public utilities. A base map will contain ROW lines depicting boundaries of the portion of land the City owns. Like *control lines*, ROW lines are not real features. They are legally defined and recorded at a specified offset distance from the *control lines*.

B) TOPOGRAPHICAL FEATURES

Aboveground features in a base map—known as topographical features—are derived from survey data. Topographical features can include, but are not limited

to, castings, pavement surfaces, fences, trees, landscaping, creeks, power poles, signal equipment, and drainage ditches.

C) UNDERGROUND UTILITIES

By law, the City must show the existence of underground utilities.

The placement of underground utilities on base maps can include but are not limited to, sewers, storm drains, signals, lighting, electrical, phone, gas, water, cable, and steam. This information comes from historical engineering documents.

1.3 How Accurate is an SPU Base Map?

It is impossible to accurately reflect exactly what is above or below the ground. The limitations are numerous. The following are a few limitations:

- Slight errors in survey
- Actual construction of an improvement may differ slightly from the information contained in the historical engineering records.
- The needs of some projects dictate that some items are not reflected or are not reflected in great detail
- Limitations of the plotted scale to show every feature
- Movement of the earth versus historical data

Most of these limitations are accepted industry practice and incorporated as part of base-mapping. Keep in mind that most types of errors or omissions are minuscule and some accepted as “human error.”

A) SPU’S LEGAL OBLIGATION

The Revised Code of Washington (RCW) state law, Chapter 19.122.040 states:

> *“Project owners shall indicate in bid or contract documents the existence of underground facilities known by the project owner to be located within the proposed area of excavation.”*

Therefore, it is SPU’s legal obligation as “Project Owner” to indicate the existence and location of underground utilities.

B) DEGREES AND TYPES OF ACCURACY

The following is a partial list of instances in base mapping where degree and types of accuracy vary:

- Schematic symbols
- Content that vary according to design needs
- Artistic license.

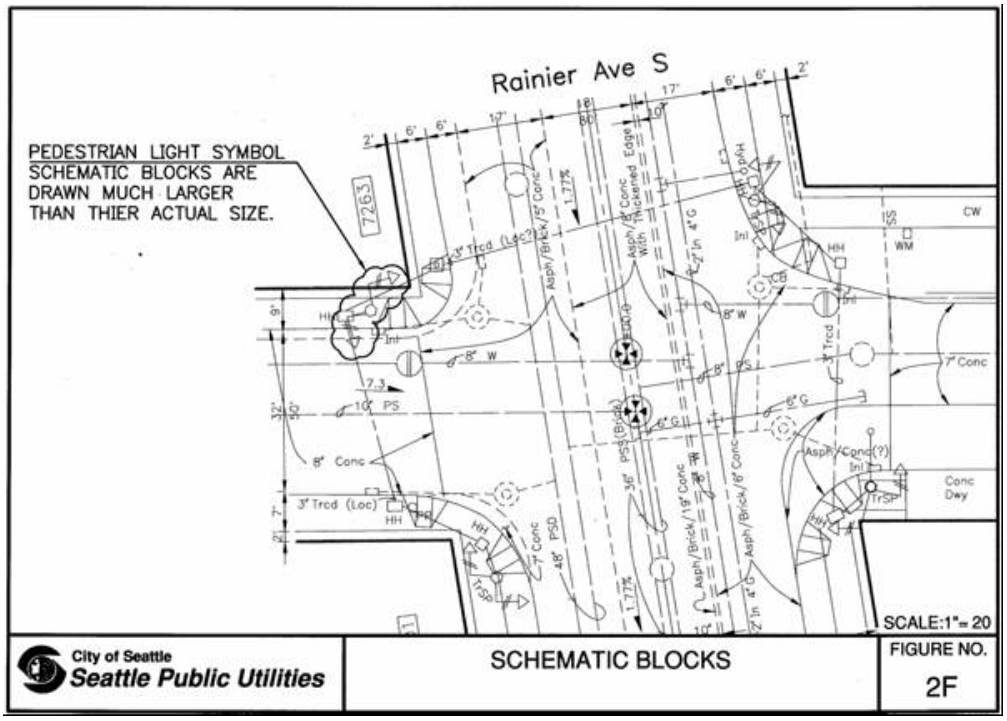
i) Schematic Symbols

Some symbols included in base maps are schematic rather than true size due to limitations of plotting scales.

Some symbols on base maps are not true to scale. They are referred to as "schematic."

EXAMPLE: DEGREE OF ACCRUACY

The pedestrian signal symbol is actually much larger than the actual piece of hardware it represents. However, if the symbol was drawn at its true size then it would be so small that it would not show clearly when plotted at 20 Scale. See **Appendix 2, Figure 2F.**



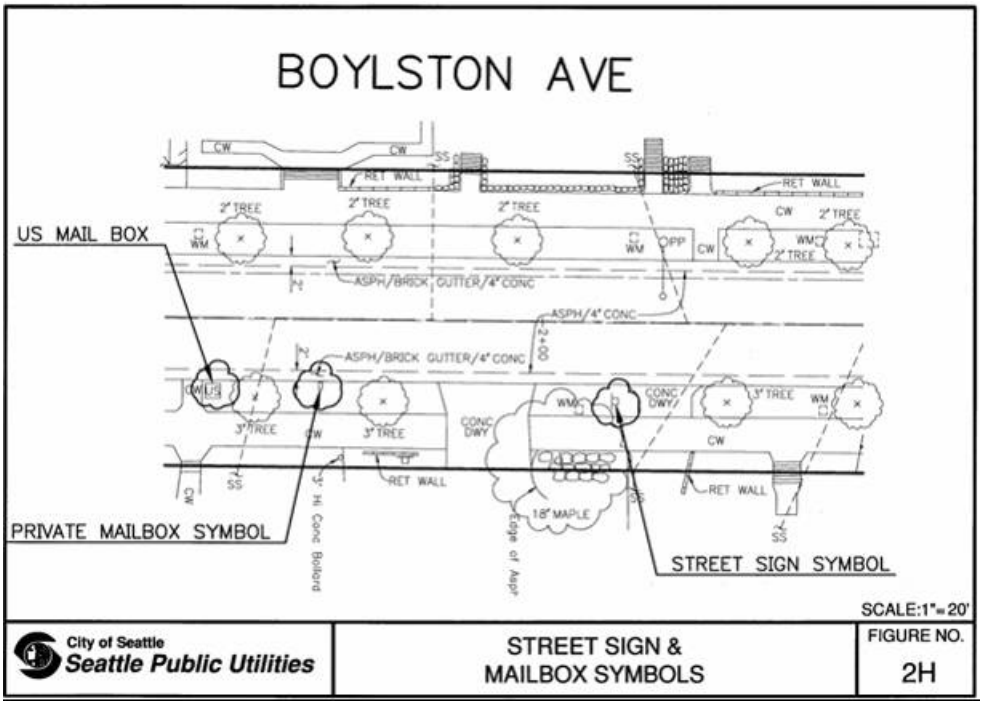
ii) Content Varies According to Design Needs

Various types of proposed improvements have slightly different needs for their base maps.

The Water Division has projects with different base map needs than those of the Drainage, Wastewater and Solid Waste Division. Therefore, content may vary.

EXAMPLE: CONTENT VARIES BASED ON DESIGN NEEDS

A base map requested by a water designer may include all items in the parking strip such as street name signs, mailboxes, and parking signs. These items are typically not shown but the designer may be aware that the proposed water main may need to be placed under or very near the parking strip. See **Appendix 2, Figure 2H.**



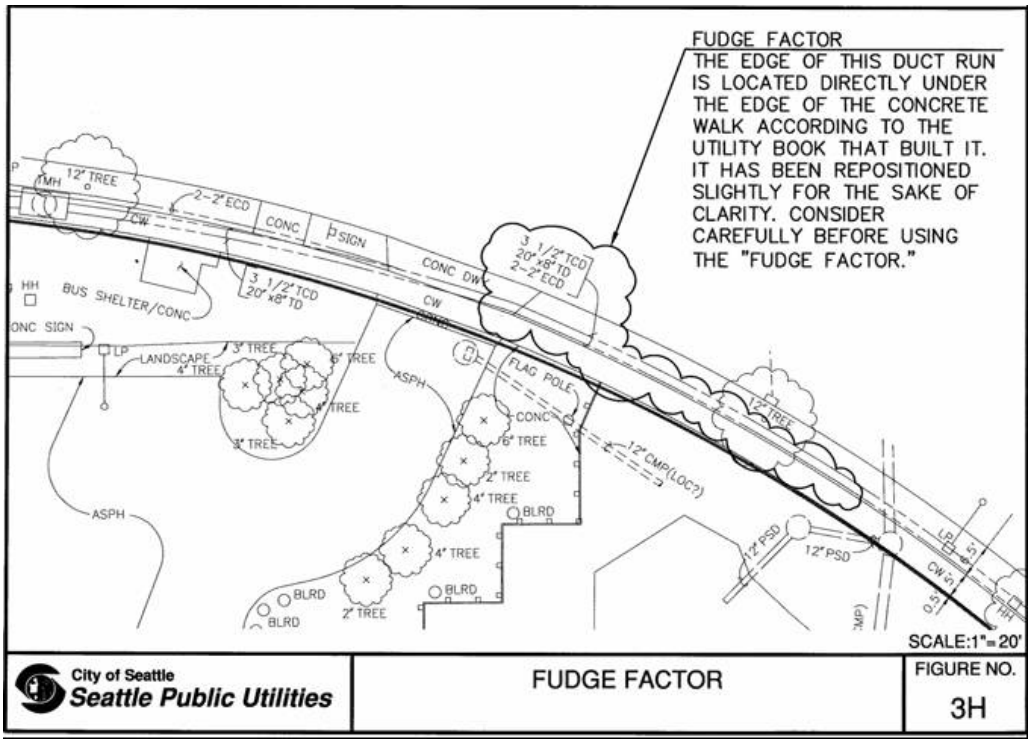
iii) Artistic License

On occasion, it may be necessary for the drafter to use artistic license (or the "fudge factor") to be able to illustrate certain conditions.

EXAMPLE: ARTISTIC LICENSE

According to historical information, an electrical conduit has been installed almost directly under the front edge of the sidewalk in the parking strip. If the conduit was drawn as shown in the as-built, the electrical conduit line would not show. It would be obscured by the line representing the front of the sidewalk. In this case, it is better to move the line representing the conduit into the parking strip just far enough for it to be seen when plotted. See **Appendix 2, Figure 3H.**

"Fudge Factor" is the term we use for illustrating unique and crowded situations.



Disclaimers are labels we give to items we cannot portray to our goal of accuracy.

C) GOAL OF BASE MAP ACCURACY IS WITHIN 0.2 FEET (2.4 INCHES)

Despite the limitations and examples listed above, most items included on a base map are reflected within a tolerance of 0.2' (2.4") or less. If a base map feature cannot be reflected accurately, then a disclaimer may need to be included on the map.

D) DISCLAIMER LABELS ON SPU BASE MAPS

A disclaimer label indicates that the creator of a base map has exhausted all resources available or appropriate to use for its creation. Disclaimer labels state in essence that mappers have given their best guess as to what is there, but are still unsure. The following is a partial list of disclaimers found on SPU Base maps and their meanings. See **Appendix 2**, **Figure 5A.**

- LOC? Best guess of location
- ABAN? May no longer be active
- REM? May have been removed
- CONN? Not sure where or what a pipe connects to.
- BURIED? Research indicates that a topological feature should be visible, but is not.

E) ACCURACY OF CONTROL AND RIGHT-OF-WAY

On a base map, the accuracy of the legally defined control and ROW lines is as good as the historical records available or the person who interprets that information. Typically, this information is provided by SPU's Survey group.

F) ACCURACY OF ABOVEGROUND FEATURES

Using current survey data is the most accurate method for locating aboveground features despite the limitations listed above.

G) ACCURACY OF UNDERGROUND UTILITIES

i) Historical Data from Engineering Records

Most historical data from engineering records is very useful to base mapping. Nonetheless, it can pose challenges when information is conflicting. In that case, we evaluate all available information and make a best guess. In some cases, a disclaimer label may be needed in the base map. See **Section 1.3D**.

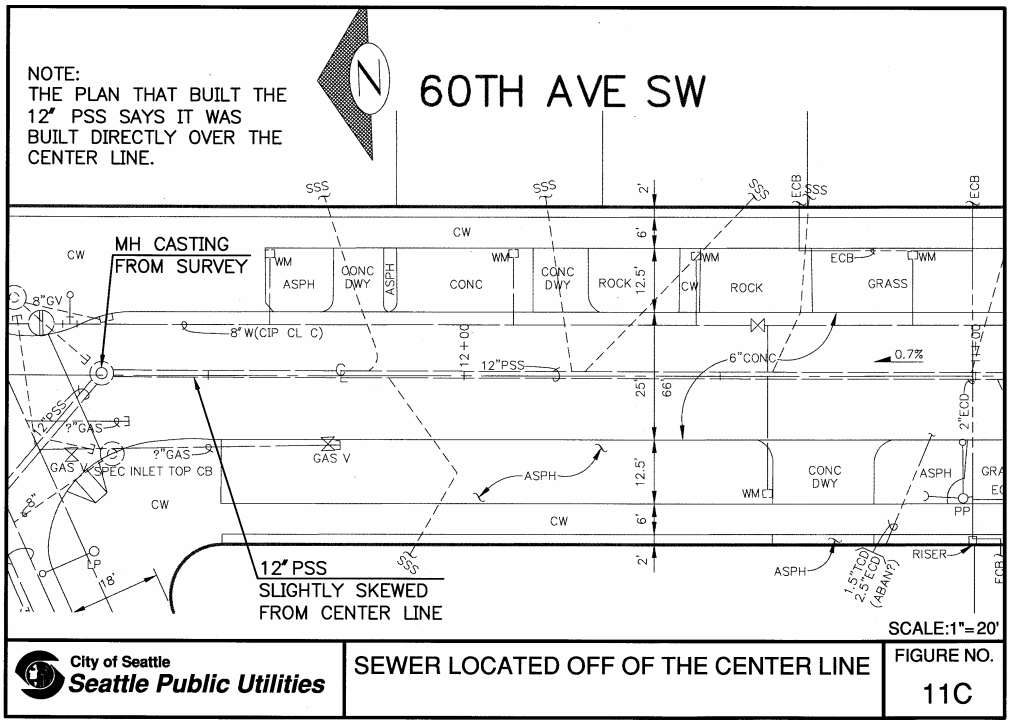
ii) Survey's Contribution to Accuracy of Underground Utilities

Survey locates points for maintenance holes (MHs) or valves.

Survey data provides survey points of castings located over maintenance holes (MH) or valves. When a sewer line is drawn on a base map from MH casting point to MH casting point, its location is considered more accurate than if it were drawn according to the historical engineering record alone.

EXAMPLE: SURVEY DATA IS MOST ACCURATE

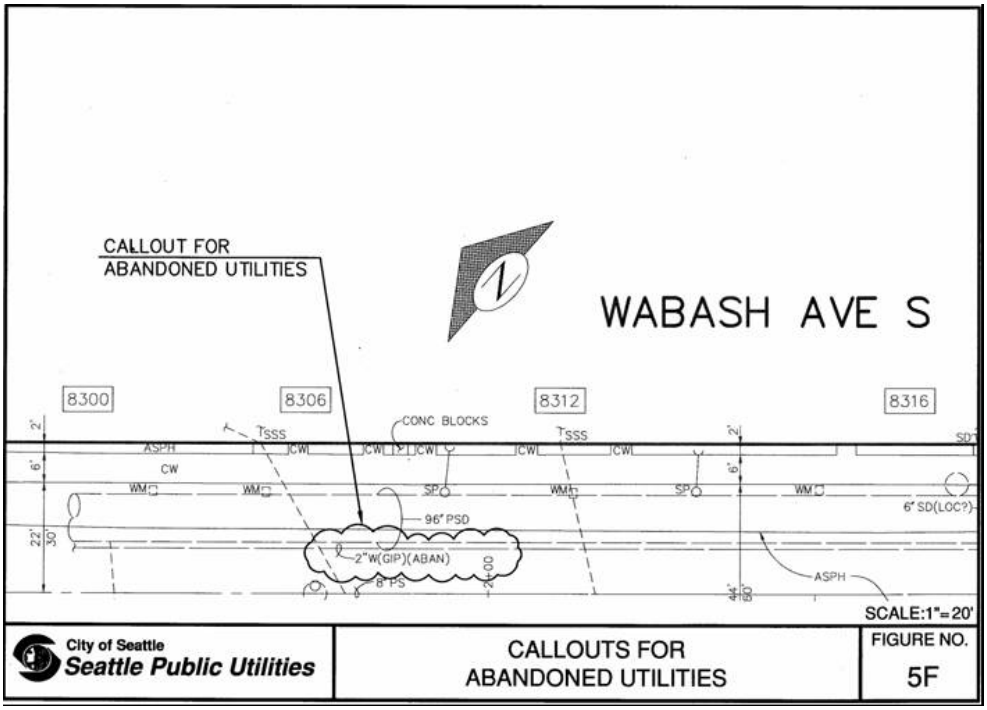
Survey locates an MH casting point 0.3' from the centerline of the street. The 85 year-old plan that built the sewer says the casting should be directly over the centerline. Which is correct? Almost without exception, the survey data is accepted as the most accurate. See **Appendix 2, Figure 11C**.



iii) Abandoned Underground Utilities

Some underground utilities are abandoned because they are old or can't keep up with demand. Very seldom are they removed. One can be very certain that unless there was an improvement in the exact location of a utility, it has been abandoned rather than removed.

EXAMPLE: SHOWING ABANDONED UNDERGROUND UTILTIES
We show abandoned utilities because they may cause confusion during construction. See **Appendix 2, Figure 5F.**



1.4 GIS Themes in Base Maps

Base maps used to design CIP projects require a greater degree of accuracy than most GIS themes can provide. Most GIS themes are used for reference only. However, in some instances it is appropriate to incorporate GIS themes directly into a base map.

A.) INCORPORATION OF GIS THEMES

Very few GIS themes are ever incorporated into a base map. An exception is a special request. The most commonly used themes are addresses and private property lines.

B.) GIS THEMES FOR REFERENCE ONLY

The following is a partial list of GIS themes that may be helpful when used for reference only:

- aerial photos
- Row lines
- pavement edges.

C.) *** SIDE SEWER CARD SYSTEM TRANSITION

Side Sewer as-built records were previously recorded on Side Sewer Cards but are no longer. Instead, this information will be available through the Virtual Vault at http://SPUIMS1/vaulteval/mapmain.asp.

1.5 Reusing Existing Base Maps

Use it again!
Old base maps can be reused from either scanned manually-drawn maps or those stored as ACAD drawing files from former projects.

It is a standard practice to look for existing base maps to reuse at the beginning of a new base map assignment. The primary reason is to save time and cost. If an existing base map is appropriate for re-use, then use historical engineering documents to update it from date of creation to the present. The update also consists of a field check by the drafter to locate changes, if any, to aboveground features. Occasionally, additional survey may be ordered, but it is usually minimal and will focus only on items pertinent to design.

1.6 Unconventional or “Down & Dirty” Base Maps

For special circumstances—emergency, funding crisis, or very simple designs—unconventional methods may be used to create non-standard base maps. These methods are usually very creative and typically do not benefit from a current survey to locate aboveground features. Usually, historical information will be the only source of data used to create unconventional maps.

One “down and dirty” method is to have an historical contract plan scanned and used as the base map. While a field check may be conducted to locate aboveground features, the end product will not be nearly as accurate had survey been done.

Tips: Fundamentals of Base Maps

- Base maps are used to give engineers and designers detailed information they need to plan improvements while avoiding conflicts with existing infrastructure and private property.
- The 3 primary sources of information contained in base maps are 1) control and ROW, 2) topographical data, and 3) underground utilities reflected by historical engineering records.
- Base map content may vary slightly according to the needs of the improvement for which it was created.

Section 2
STARTING A BASE MAP

Section 2 Objectives

This section describes how to start a base map project. To do that, you should be able to:

- Get familiar with a project by gathering information
- Know how to locate archived base maps
- Plan presentation style
- Estimate the job

2.1 Becoming Familiar with a Base Map Project

When a base map is assigned, your first task is to get familiar with the project. The more you know about a project, the easier it is to start production without complications. The following is list of the most common resources for starting a map:

A) MEET WITH SUPERVISOR OR LEAD

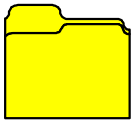
Normally, either a supervisor or lead has compiled a good deal of information before a base map is even assigned. It's good practice to go over this information one-on-one with your supervisor or lead.

B) SPU SURVEY/BASE MAP REQUEST

The SPU Survey/Base Map Request form is completed by either the lead designer or project manager. This form is available online. See **Appendix 3, Figure 11**.

Digital photos are a tool for you to visualize the site. But a site visit is usually required.

Starting and keeping a research folder is important



C) THE SCOPE

The *Scope* is a document used at project inception to define the following:

- area to be improved
- need for improvement
- course of action
- project manager and lead designer.

A review of the project scope gives you a greater understanding of what is required to complete the base map. The scope can usually be found in the supervisor's folder or in the project directory.

D) VISIT SITE WHEN NECESSARY

Generally, survey crews or designers supply digital photos before base mapping begins. On rare occasions even when photos are supplied, an area may contain such odd physical features that it may be difficult to visualize. If the base map area is large (greater than 2 blocks), visit the site to help associate surveyed points with landmarks you can view in the field.

E) PHOTOS

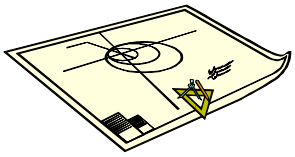
Carry a digital camera into the field. Even if photos have been supplied, additional shots may be needed to help clarify odd circumstances. You may have to photograph an entire area.

F) START A RESEARCH FOLDER

Miscellaneous documents pertaining to the project go into a research folder of hardcopy information. Start this folder if one hasn't begun already. In most cases, the supervisor or lead will provide copies of miscellaneous information on the project in addition to *scope*. Typically, a map of the project area is included in folder.

EXAMPLE: LOOK IN THE FOLDER

A water system designer may provide a water *GIS* map whereas a sewer designer may provide an *SS card* or a sewer *GIS* map. Also, there may be copies of correspondence from the designer or project manager.



SPU's Virtual Vault is a source for manually-drawn maps

2.2 Using Archived Base Maps

A project area may contain archived base maps that can be reused to save time and money. You can use archived maps even it the existing base map covers only a portion of the project area. If you decide not to use the existing map, at the very least it is a valuable research resource.

Archived base maps come in 2 forms. They can be found as the following:

1) scanned and archived manually-drawn base maps
2) ACAD drawing files.

In either case, consider reusing them. If you reuse an archived base map, then update it from the time of its creation to the present.

A) LOCATING ARCHIVED MANUALLY-DRAWN BASE MAPS

The SPU Virtual Vault may be used to view and print scanned images of the manually-drawn base maps. With SPU Virtual Vault file number in hand, you can check-out original Mylar sheet(s) from the SPU Records Vault.

B) *** LOCATING ARCHIVED ACAD BASE MAP DRAWING FILES

The process for locating archived ACAD base maps is in transition. They will soon be available through the SPU Virtual Vault.

CAUTION: **If** the scanned images are not in standard SPU ACAD drawing file format needed for a base map . . .

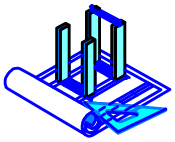
Then, convert the manually-drawn base map to a standard SPU ACAD drawing file.

2.3 Planning the Presentation

Plan base map presentation early to save time and cost.

A) ORIENTATION

Orient the base map according to the SPU presentation standard. To do this, place the control line parallel with the bottom of the page and the north arrow pointing either up or to the left. While not a hard and fast rule, follow the SPU standard. There are exceptions to the presentation standard for difficult fits. Depending on the angle of the base map, the orientation could vary. Most often, the north arrow may be skewed slightly. It is important to choose the orientation early. Should it have to change later, text may also have to be changed. See **Appendix 2, Figure 3D**.



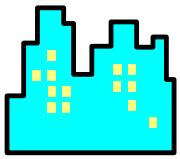
Presentation scale is 20 for most maps

B) TEXT ORIENTATION

Most text should read from left to right or from bottom to top. The text that reads bottom to top is usually labels of items in a cross street. There are exceptions to this rule, but it should be adhered to whenever possible. See **Appendix 2, Figure 4B**.

C) PRESENTATION SCALE

Most base maps use a 20 Scale presentation. In some instances, however, 10 Scale presentation is preferred. See **Appendix 2, Figure 3G**.



Areas in the downtown are usually 10 scale

i) 20 Scale

For most areas in Seattle, 20 Scale presentation is sufficient. It allows aboveground features like fire hydrants and driveways to be shown clearly along with the underground utilities.

ii) 10 Scale

If a project is located in the downtown or any utility intensive area, 10 Scale will likely be needed. Changing base map presentation scale from 20 to 10 Scale later on causes significant and costly delays because both text and symbols must be re-scaled, moved, and rotated.

2.4 Estimating

The Base Map group routinely estimates the number of hours needed to complete a project. To do so, the primary information needed is the area to be mapped in linear feet (both length and width). Next, complexity is determined based on the number of past improvements to the area. The resulting estimate is then used to schedule work and determine a completion date. In turn, the completion date is passed onto the lead designer and project manager. The Base Map group has developed a template for estimating. See **Appendix 3, Figure 2**.

Quarter-section maps are the most commonly used reference source for linear feet

A) ESTIMATING AREA USING QUARTER SECTIONS

Quarter-section maps are our most commonly used reference tools to estimate linear feet. They provide clearly defined information about the distance between monuments (length) and the ROWs (width).

Planform is a list of improvements that have been built in an area

B) DETERMINING COMPLEXITY

The level of complexity, defined by the number of past improvements to an area will need to be determined. This is done by using *Planform*, a compiled list of improvements for the area. See **Section 3.3.**

C) TRACKING AGAINST ESTIMATE

The Base Map group has developed a template for tracking time spent against the estimate. See **Appendix 3, Figure 2a**.

D) MODIFYING THE ESTIMATE

There are numerous occasions when an estimate must be modified.

EXAMPLE: MODIFYING THE ESTIMATE

It's decided that an existing base map will be used for the project. The significant time and cost savings means the estimate needs to be modified.

When an estimate needs to be modified because some of the work has been completed beforehand, the best approach is to estimate the base map as if it were being created from scratch. Then modify

the estimate. The *Estimate Breakdown form* is a useful tool for modifying estimates. See **Appendix 3, Figure 2a**.

E) REVISING AN ESTIMATE MID-PROJECT

After a base map is underway, it may be necessary to revise the original estimate to justify additional time spent due to circumstances unknown at the initial estimate. Unknown circumstances can include greater complexity than originally thought, missing research data or survey errors.

Give a revised file the name “REV1” to distinguish it from the original.

Tips: Starting a Base Map

Try to have the following information in hand when starting a base map:

- scope
- Survey/Base Map Request
- estimate
- photo of site
- SPU presentation style
- Base Map Checklist
- research folder.

Section 3
CONDUCTING & ORGANIZING RESEARCH

Section 3 Objectives

This section describes the research resources used throughout the base map process. After this section, you'll understand

- The primary research sources are SPU Records Vault plans, franchise utility books, and side sewer cards.
- How to organize research using Planform
- The use of secondary resources such as gas maps

3.1 Types of Research Resources

Research is a key component in base-mapping and is the primary tool for defining underground utilities. Research provides everything that survey cannot. SPU owns or has at its disposal as-built plans that date back to the late 1800s.

Research resources generally fit in 2 categories, primary and secondary. On occasion, a third category, special research resources, applies. See **Appendix 4** for a comprehensive list of the research resources available for base-mapping.

A) PRIMARY RESEARCH RESOURCES

Primary research resources are the a*s-built* records that are the main source of underground utility information for SPU.

B) SECONDARY RESEARCH RESOURCES

The 2 main types of secondary research resources are 1) compilation documents and 2) supplementary documents.

i) Compilation Documents

Compilation documents are utility systems maps that include water maps, gas maps, and more. The source of data contained on utility system maps is typically a compilation of various sorts of *as-built* information, often schematic. Compilation documents contain useful information, but are not nearly as detailed as *as-built documents*. We use these compilations *for reference checking only*. They may be used to resolve conflicting or vague information.

ii) Supplementary Documents

Supplementary documents include *inspector's books* or *street use permits*. *Inspector's books* and *street use permits* hold information that supplemented or accompanied creation of the as-builts. Typically, supplementary documents are only used to resolve conflicting or vague information.

iii) Special Research Resources

Almost always research materials are available within SPU. Special research resources can be necessary, however, when other agencies occupy property within the City. Two such agencies are WSDOT and the Seattle Parks Department (Parks). Both are occasional clients for base map and engineering services. Other times, we make base maps for areas outside Seattle because our infrastructure extends beyond city limits. In either case, it's important to document the correct source.

3.2 Primary Research Resources

Many primary resources are used for base maps. The most common are:

- SPU Records Vault Plans
- franchise utility books
- *** Side Sewer Cards

The side sewer card system is in transition. Side Sewer as-built records will soon be available on GIS. In the interim use the *side sewer cards*.

3.3 Organizing Research Using Planform

Planform is a report used to catalogue research documents. Before drafting the base map, fill out Planform completely to help organize research documents. For specific instructions on the use of Planform, see **Appendix 3, Figure 3.**

A) BASE MAP "INFO" SECTION OF PLANFORM

The base map information section of Planform contains general information about the project. Filled it out as much as possible at the start and during mapping.

B) PLANFORM'S USE IN ESTIMATING

Complexity is a key factor used to estimate time and cost of a base map. Before estimating, a partially completed Planform containing just the list of SPU Records Vault plan and Franchise Utility book numbers can be used to tally the

number of improvements in an area. The downtown area has many improvements (SPU Vault plans and franchise utility books) while a residential street may not.

C) PLANFORM'S USE IN BASE MAPPING

Planform contains more than a list of improvements. It also contains detailed information about each of those improvements as well as other data. This list can be used to sort the research records chronologically or by type of improvement.

3.4 SPU Records Vault Plans

Vault plans are historical engineering documents stored in SPU's *Records Vault* or *Virtual Vault*. Most are *as-built* plan sets of capital improvements. Some plan sets are private improvements that change or improve the public ROW. Examples of plans found in the SPU *Records Vault* are storm drains, sewers, water mains, paving, and signals and lighting. The SPU *Records Vault* also has a limited amount of WSDOT highway plans.

The Virtual Vault is the online version of the SPU Records Vault. Not all plans are yet available on the Virtual Vault. The Virtual Vault address is http://spuims1/vaultprod/

*** A) SPU RECORDS VAULT PLAN INDEXES

There are thousands of plans filed in the SPU's *Records Vault*. Each is assigned a number, similar to a library system. Just like the library, an index is needed to locate the plans. We use 2 indices:

1. One is the *VPI* (*Vault Plan Index*), a hardcopy index located in the SPU *Records Vault*.
2. The other is the new and semi-complete automated SPU *Virtual Vault Index*.

i) Vault Plan Index (VPI)

A hardcopy index of the vault plans is located in the SPU *Records Vault*. In fact there are 2 of them. One is for the north end of Seattle, and the other for the south. Guides for both are located nearby. This master index has maps of the city with a grid imposed over it. The squares within the grid correspond to map/page numbers inside the vault plan indexes (VPIs). When referring to correct map/page number, check the desired location. The numbered map/pages show the vault plan file numbers near the desired location.

Given variations in record-keeping over the years, an occasional plan reference may be missing or incorrect on the *VPI*. Usually the wayward plan will be located in another manner.

EXAMPLE: MISSING PLANS

A sewer plan not found on the *VPI* will be referenced on the *side sewer card.*

ii) SPU Virtual Vault Index

The SPU *Virtual Vault Index* is an automated index. It is very similar to modern library automated indices. Data such as "street names" is input, and a database shows a list of possible plans with that street name.

B) VAULT PLAN CHECKOUT

Utility Books are as-built drawings of improvements various franchise utilities have made over the years.

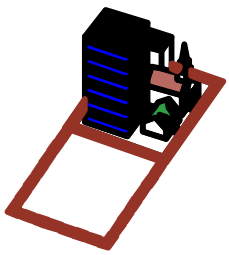
The Engineering Records Vault works much like a library: plans need to be checked out. Base map research may require 20 or more plans. The Vault staff has asked that we email them a list of the plans we'd like to check out. Their email address is EngRecordsVault SPU.

- When vault plans are not available for checking out, microfilm versions are available in most cases.
- Use Planform to record the vault plan information.

CAUTION: The online version of the franchise utility books and index maps is only current to the time they were scanned. For the most up-to-date franchise utility information, visit SDOT as directed in **Appendix 4**.

3.5 Franchise Utility Books

Franchise utility books, or simply utility books, are as-built documents of improvements built by entities required to take out Street Use Permits from the Street Use & Permits Section of the Seattle Department of Transportation (SDOT). Franchise utilities include phone, cable, gas, and communications. Seattle City Light (SCL) must also take out Street Use Permits. These permits result in as-built documentation contained within utility books. See **Appendix 4** for how to access both the hardcopy and online franchise utility books.



A) MAP INDEXES FOR FRANCHISE UTILITY BOOKS

Franchise utility book index maps are used to show *utility book numbers* adjacent to the i*mprovement area*. Gas, electrical and telephone are shown on the map, each as a different color line. The utility book and page number are placed near the line it represents. See **Appendix 4**.

Two types of map indexes reference franchise utility books. The indexes are for areas 1) outside the downtown and 2) inside the downtown core. The reason for 2 indexes is the increased density of improvements to the downtown area. Each works slightly differently:

i) Map Index for Outside the Downtown Area

The map index for outside the downtown area uses a master index map of the city with a grid imposed over it. The squares within the grid reference a map number for that area.

The map number for this index will refer to a rolled 100 Scale ¼ section linen or Mylar map. That map will provide the utility book numbers.

ii) Map Index for Inside Downtown Area

The map index for inside the downtown area uses a master index map of the downtown area with a grid imposed over it. The squares within the grid reference a map number for that area. The map number for this index will refer to a rolled 10 Scale, rather than 100 Scale, linen map that is very clear and easy to read. The 10 Scale presentation is used because of the density of utilities downtown.

B) HISTORY OF 10 SCALE UTILITY MAPS

It is important to know a bit of history about these index maps before using them.

Before the 10 Scale utility maps were created. another system was used to index franchise utilities. The previous system indexed the oldest franchise utility improvements in the City. This older system, which is kept on index cards, is very difficult to use. It is rarely ever used.

At some point, the downtown 10 Scale utility maps were created. They are hand drawn on linen and each type of utility is assigned a color code. See **Appendix 3, Figure 8**. The 10 Scale utility maps replaced the need for the old index cards and the utility books they referenced. It appears the transfer was done by copying information from those utility books onto the 10 Scale maps. Thus, many utilities drawn on the 10 Scale maps do not have a utility book reference and are represented only by the 10 Scale utility maps. Those drawings have proven to be very accurate. It is usually not necessary to find the utility book reference or the book. When necessary, however, these references can be found in the card index.

It's very important to note that franchise utility information is kept up-to-date on the 10 Scale utility maps, but improvements from CIP projects (sewer and paving mostly) in the SPU Records Vault are not. They are shown only as they were at the time the 10 Scale utility maps were created and have not been updated since and therefore may in accurate CIP planning.

It is permissible to treat the 10 Scale map like a primary, rather than secondary research resource, but only when no utility book reference is found. Otherwise, use the utility book referenced as the primary research resource. Occasionally utility book references can be found on adjacent 10 Scale utility maps and should be checked as well.

C) CHECKOUT CARDS

Utility books must be checked out if they are going to be removed from the Street Use area on the 37th floor. Checkout cards are available nearby. Once filled out, the card should be placed in the bookshelf in place of the utility book. The checkout cards help users locate a book in circulation.

D) MISSING BOOKS

If a *utility book* is missing, track it down. If it's unavailable, try again later. In the meantime, make a note on your Planform. Contact your lead designer or supervisor if necessary to help acquire this information.

E) NUMBERING SYSTEM

The utility books are numbered and lettered to indicate the type of utility permit information it contains. For example, all of the gas books are numbers, while a SCL book is an alphanumeric number that starts with a 72 then a letter after it, e.g. 72GG. For more information, see **Appendix 3, Figure 8.**

F) COPYING AND LABELING UTILITY BOOK INFORMATION

Many utility books are available online. See **Appendix 4**. The utility books do not belong to SPU and no back-up copies exist. Therefore, every effort must be made to return utility books as soon as possible. Even though you can keep these book on loan, make a copy of all utility book pages referenced and place it in the research folder. The books may need to be returned mid-project.

Look for and copy the following from each utility book:

- entire project area
- Areas directly adjacent (handy reference)
- permit page of each reference.
- any legends or keys.

i) Copying Utility Book Index Maps

Copy utility book index map(s) in the project area. Label the copy with the map number in bold pen.

ii) Copying Utility Books

All utility book pages used must be copied and labeled with the book number. Be certain to label the cover (permit page) page with the utility book number in bold pen. Gather and staple any subsequent pages. If the cover page goes unlabeled, it's very difficult to know which utility book it came from. Another benefit of copies is that they can be highlighted, making them easier to work with.

G) USE PLANFORM TO RECORD FRANCHISE UTILITY BOOK INFORMATION

See **Appendix 3, Figure 3**.

H) NEW STREET USE PERMITS

The project area may have *Street Use Permits* issued that are so new they have yet to be recorded in the franchise utility books. As a precaution, contact Street Use to check for recent or ongoing permits in the project area. Current contact is **Rex Stratton 206-684-5193**.

Rex will provide a permit number and the name of the Street Use Inspector assigned to the job. We contact the inspector with the hope that they will provide copies of their *as-built* permit notes. If so, label those items with the permit number, inspector's name, date received, and your initials.

3.6 Side Sewer Cards

*** *Side Sewer Cards* are a type of *as-built* record that portrays the location of sewer and drainage connections from private buildings to sewer and drainage mainlines. A private property owner takes out a permit with the City for the connection. The result is an *as-built* location of the connection on the *Side Sewer Card*.

As with other research resources an index must be employed to sort through the thousands of records. For more in-depth information on locating *Side Sewer Cards* see **Appendix 4**. See the *How to Read a SS Card* in **Appendix 3, Figure 10.**

Side Sewer as-built records were previously recorded on *Side Sewer Cards* but are no longer available. Instead, this information will soon be available on *GIS*.

3.7 Gas Maps

Gas maps are a secondary source of information and are mostly used *for reference only* when creating base maps. On occasion, when the *franchise utility books* are confusing, gas maps can be used to resolve conflicting or unclear information. Typically, they are ordered for every project when collecting research. See **Appendix 3, Figure 17 and Appendix 4** for information on ordering gas maps.

Tips: Conducting and Organizing Research

- Thoroughly conducting and organizing research is well worth it. Having the information in hand before production saves hours on down the line.
- Use Planform and its supporting process to start and organize your research.
- Keep research organized into a research folder. Make folders within a main folder for larger projects. For example, *Side Sewer Cards* and utility book copies may each require their own folder.
- For almost every primary research resource, a secondary source document supports it. Secondary sources are not used, however, unless a conflict or lack of information exists.

Example: Every Primary Source has a Secondary Source

Vault plans	→	Inspectors books
Utility books	→	Utility Permits
Side Sewer Cards	→	Sewer Permits

Section 4
USING TOPOGRAPHICAL SURVEY

Section 4 Objectives

After you complete this section, you should be able to:

- Use and refine survey data
- Understand how survey requests vary by project
- Quality check a survey product
- Interpret survey point database and field book notes
- Apply survey products to ACAD drawings

4.1 Standard Items in SPU Survey ACAD Drawing Files

Surveyors provide detail on topography—aboveground features. Survey data also yields legal information such as ROW, street names and site specifics. See **Appendix 3, Figure 11** for the electronic SPU Survey/Base Map Request Form.

A topographical survey is requested at the beginning of a project to provide an accurate record of both topography and other physical features in the project area.

Certain items are standard for every survey ordered. Other items are requested or omitted based on the specific project. When the survey package is passed to the Base Map group, the following items should be included:

- Survey's ACAD drawing. See **Appendix 2, Figures 12A and C**.
- Survey's *point database*. See **Appendix 3, Figure 13**.

The following is a list of standard items in SPU's Survey group ACAD drawing files:

A) CONTROL

Control points, control Lines, ROW, street names, stationing and legal lines are the backbone of a base map. These items are the skeleton upon which *survey points* are hung. They relate map features to the location. See **Appendix 2, Figures 12 A,C.**

B) DATUM BLOCK

The Survey group fills out the *Datum Block* form and it is added to each ACAD drawing. The form states the history of the survey and how it was created. See **Appendix 2, Figure 12I.**

C) SPU STANDARD SYMBOLS

For SPU Standard Symbols see

*** **SPU CADD Standards Core Elements**

This information will be available soon in 2 forms. One form will be access through our software under “Help,” “SPU Help.” The other form will be as a hardcopy document. For more information on this transition, contact **Dean Noble 206-684-5137**.

D) SPU STANDARD SYMBOL FOR CASTINGS

The survey will include a point for every casting visible. In some cases, castings may not be located at the center of the structure underneath. If so, survey provides a shot, sketch, or note indicating location of the structure’s center. This information is be used later in the process to draw the structure, thereby showing its relationship to the casting on top.

E) TOPOGRAPHY

The survey will include enough *survey points* to describe the contour of the ground. It is important for the designer to know where the high and low elevations are and where the ground changes grade. These shots will not need to be drawn on the final base map product unless they define the limits of a feature or a paving surface. See **Appendix 2, Figure 12A.**

4.2 Survey Request Can Vary by Project

An SPU base map is created to serve design needs of a specific type of improvement or combination of improvements. The survey request for each may vary slightly.

EXAMPLE: SURVEY REQUESTS VARY

Most sewer/drainage design survey requests include invert elevations for all the sewer and drainage structures along with survey points for all castings. Comparatively, a water design project may only request survey points for the castings. Conversely, a water design project may request all street name signs and mail boxes while a sewer/drainage design project will not. See **Appendix 2, Figure 2H.**

4.3 Quality-Checking the Survey Product

*** SPU's survey group is in the midst of implementing a quality-checking (QC) system of their product before delivery to the Base Map group. In the interim, the QC system described below should be utilized.

Certain portions of the survey product must be inspected for accuracy upon receipt and before proceeding with the map. These items are the foundation of the base map and are listed below. To proceed and discover errors later on often cause delays and increase costs. **It is imperative that the QC process is complete before proceeding with the base map**. Notify your supervisor or lead if any of the components listed below are not included or are incorrect:

A) CONTROL POINTS

The *control points* (survey markers) provided in the survey drawing were either shot in the field as *topography points* or calculated from historic records, usually a combination of both. Determine which method was used for each *control point* by viewing the *point database* and/or the *Datum Block*. See **Section 4.5**. The distance between the *control points* provided in the survey drawing should be verified by comparing that information to a City of Seattle quarter section map (See **Appendix 4**) or other historical survey data. The distance should not vary by more than 0.2'. If the survey and the *quarter section* location differ by more than 0.2' note the difference and notify your supervisor or lead. See **Appendix 2, Figures 12A,C.**

B) CONTROL LINES

The *control lines* are drawn between the *control points*. Verify the survey drawing to see that the *control lines* are included throughout the project area. The *City of Seattle quarter section maps* (See **Appendix 4**) along with other historical survey data may be used. See **Appendix 2, Figures 12A,C.**

C) RIGHT-OF-WAY

Compare the ROW lines on the City of Seattle quarter section maps (see **Appendix 4**) with the survey drawing. Verify that all lines are included. This includes alleys and ordinances owned by the City. Take care to notice utility easements on private property directly adjacent to the project area. The City may own utilities on private property affected by the project.

Compare offset distances of the ROW lines on the quarter section map to the survey product. See **Appendix 2, Figure 12C**.

D) STREET NAMES AND NORTH ARROWS

Confirm that street names, their prefixes, or suffixes match the *quarter section map*. See **Appendix 2, Figures 12A,C.**

E) STATIONING

Stationing is the assignment of a linear measurement from a *control point* (survey marker) to a *control point* along a *control line*. Typically *control points* are *monuments* and the *control lines* are the *centerline* of a street. *Stationing* is provided in the format of 0+00.

EXAMPLE: MONUMENTS

If a monument is assigned 0+00, then 100 feet from 0+00 would be shown as 1+00 and 200 feet from 0+00 would be shown as 2+00. Also, 1236.22 feet from 0+00 is shown as 12+36.22. See **Appendix 2, Figure 3K.**

Stationing is used to locate existing and proposed features in relationship to *control points* and *control lines*.

EXAMPLE: STATIONING

A maintenance hole is located at 2+36.45, 32.88 feet left. This means the maintenance hole is located 236.45 feet from 0+00 and is 32.88 feet left of the *control line*. The left and right distances are always measured perpendicular to the *control line* when facing towards the next higher station number, also known as "up-station."

F) DATUM BLOCK

A fully completed *datum block* not only specifies the City of Seattle's datum, but also contains information concerning the type and nature of the data used in the survey. It should be filled out completely. See **Appendix 2, Figure 12I.**

G) COORDINATE SYSTEM AND VERTICAL DATUM

The City has an official standard for the coordinate system and datum used in its projects. This information should be provided by the Survey group in the datum block. See **Appendix 2, Figure 12I**.

i) Checking the Coordinate System

The City of Seattle's official coordinate system for horizontal *control* is "**NAD 83/91**." The term is derived from *North American Datum of 1983, 1991 adjustment Washington State Plane Coordinates, Lambert Conformal Projection, Washington North Zone.* A range of numbers characterizes the NAD 83/91 coordinate system:

1. The "eastings" or **X coordinate** occur in a range of 1,200,000 to 1,300,000.

2. The "northings" or **Y coordinate** range from approximately 200,000 to 300,000.

II) Checking the Vertical Datum

The City of Seattle's official vertical *control* is "**NAVD88** (North American Vertical Datum)." Unlike horizontal coordinates, it is difficult to use a range of numbers to check. Check the Datum Block contained in the survey drawing. It should specify "NAVD88." If in doubt, seek additional help.

H) POINT DATA

Make certain the *point data* is available for viewing in LDT (SPU's civil software). Check also that point data is located in the correct directory according to SPU file naming conventions.

I) INVERT ELEVATIONS

Determine if *invert elevations* are included in the survey request. If so, make certain the data is available.

Invert Elevations

Invert elevations are a measurement taken at the inside bottom of a pipe or structure that a pipe enters. The surveyor measures from the rim of a structure down to the invert of the pipe. This distance is called a *measure down*. The surveyor will then convert the *measure down* to an actual elevation by subtracting it from the known elevation of the rim.

Make sure the *measure down* calculation has been reduced to an actual elevation. An invert elevation of the maintenance

*** Recently, SPU's Survey group began providing *invert elevations* as part of the point database. Prior to this, they were provided as field book notes and then transferred to the base map as reference notes.

J) SURVEY REQUEST SATISFIED

The SPU Survey Request Form for the project will specify the items requested. Verify the survey satisfies the survey request. See **Appendix 3, Figure 11.**

4.4 Changing Control and ROW to SPU Presentation Standard

In the preceding step, the control, ROW, street names, north arrow, stationing, and the datum block were items quality checked for accuracy. Their accuracy is the foundation for quality control of any base map.

In addition to accuracy, the presentation of these items is crucial. Check for correct SPU standard layers, linetypes, text sizes, labels, and symbols for the items listed below. See **Appendix 2, Figure 3A**.

A) CONTROL POINTS AND CONTROL LINES

Each control line should be labeled with a text symbol. There is a different text symbol for each one of the 3 following descriptions:

i) Center Line

A centerline is a survey line that can be found in the center of the ROW.

ii) Monument Line

A monument line is a survey line that is not located in the center of the ROW and connects between monuments.

iii) Survey Line

A survey line is a line that does not fall into either of the 2 descriptions above.

B) RIGHT-OF-WAY

Be certain to distinguish between ROW, vacation ordinance, and easement line types.

C) STREET NAMES AND NORTH ARROWS

Use the correct presentation standard for side streets and main streets. Place the north arrow near the main street name labels.

D) STATIONING

Follow the SPU presentation standard for placement of stationing of the following items.

- Increments of every 100'.
- Survey control points such as monuments.
- PCs (points of curvature) and PTs (points of tangency) along control lines. See **Appendix 2, Figure 3C**.

E) DATUM BLOCK

We do not change content of the datum block. We do, however, reposition or size it differently so that it fits into the base map presentation when plotted.

4.5 Interpreting the Survey Point Database

The survey point database is an integral part of the survey drawing provided by the Survey group. Survey's *point database* contains the survey point data in a specific format. For each survey point, the database provides the point number, the *northing* coordinate, the *easting* coordinate, the elevation, and a description of the point, better known as a *descriptor*. See **Appendix 3, Figure 13.**

A) POINT NUMBERS

Point numbers are usually assigned sequentially as the survey progresses. Typically point numbers 1-999 are used as control points and 1000 and up are used for topography. For organizational purposes, a large survey might be divided into point ranges.

EXAMPLE: POINT NUMBERS

The survey of Greenwood Ave N from 85th to 87th is assigned point numbers 2000-3999, while 87th to 90th is assigned point numbers 4000-5999. The last point shot on the 85th to 87th portion was point number 3856. Point numbers 3857 through 3999 would then be left unused. This would allow additional surveying of the 85th to 87th if needed at a later time, while still maintaining the point numbering system as assigned. It is acceptable, even inevitable, that some point numbers will not be used, so it's common to find gaps in the point numbering.

B) NORTHINGS AND EASTINGS

The coordinate system used in surveys for SPU base maps is from the City of Seattle's GIS database. This coordinate system is based on a north/south (northing) number and an east/west (easting) number to locate a point horizontally or on the horizontal plane within the area.

C) ELEVATIONS

Elevations are the relative distance above or below the City's datum elevation, NAVD 88.

D) DESCRIPTORS

Each point in the survey is given a description known as a descriptor. The descriptor serves 2 purposes. First is to give meaning to the point. And second is to take advantage of tools in surveying software that will automatically insert SPU standard symbols, along with the point, into the ACAD drawing.

4.6 Interpreting Survey Field Book Notes

In the not so distant past, a survey field book contained detailed information corresponding to every survey point shot. However, advances in technology have eliminated that need. An electronic *point database* is created instead. See **Section 4.5**. Still, each survey has a field book associated with it that contains, at the very least, a location sketch of the area surveyed, the date, crewmembers, and other pertinent notes.

A) VARYING CONTENT

The content of a survey field book will vary per project for several reasons:

- specific needs of the project.
- advances in survey software.
- varying styles of the survey crews.

B) SKETCHES

A survey field book may contain sketches of particularly complex conditions.

i) Sewer/Drainage Maintenance Holes (MH).

A sketch may show the inside of a MH structure, direction and flow of incoming and outgoing pipes, channel, or anything else inside the MH.

ii) Other Conditions

Some conditions are very complex and require a sketch.

C) SURVEY NOTES OF INVERT ELEVATIONS OR DEPTH INFORMATION

Currently, *invert elevations* of pipes and depth information of structures are shot as electronic survey points and are a part of the point database. Before that time, these points were recorded as field book notes. Each *invert elevation* note corresponded to the survey point number of the casting of that structure.

4.7 Reusing Existing Manually-drawn Maps with New Survey

If a scanned manually-drawn base map is used, then it will need to be converted into an ACAD drawing file. The resulting ACAD drawing should be dimensionally accurate and aligned into the same c*oordinate system* and *control* as the survey.

When comparing surveyed points to the reused base map, expect slight discrepancies in placement of topographical items. The catch is to incorporate both the reused base map and the new survey. The location of features located by the new survey is the correct one. The first task is to "tweak" or match the symbols from the reused map to the surveyed points. See your lead or supervisor for assistance.

Why Use a Reused Base Map and a New Survey?

A manually-drawn, reused base map carries no elevation data with it. Neither does the resulting ACAD drawing. Most designers and engineers need elevation data.

The manually-drawn base map will contain many underground utilities that will not have to be redrawn.

4.8 Applying the Survey Product to the ACAD Drawing

As survey technology advances, the ACAD drawing from the Survey group likewise provides more graphic entities for the base map. Currently, however, the survey product must be refined to achieve SPU's base map presentation standard.

The following tasks should be performed simultaneously, as-you-go.

A) BROWSE THE SURVEY POINTS

Browse through the survey in numerical order. See that what is drawn matches the *descriptor* for a point or series of points. For a key of descriptor abbreviations, see the **SPU *Inter-Departmental CADD Standards Core Elements***.

i) Scan the Point Database.

Certain shots related to ground elevations may be eliminated from this inspection. These points are almost always used for design purposes. Their *descriptors* are as follows:

- BOC
- CHK

- CR
- FL (Can disregard almost always)
- FOG
- GB
- GND
- Swale (Can disregard almost always)
- Toe (Depends on what is being described)
- Top (Depends on what is being described)

ii) Scan the Survey Field Book

Scan the survey field book for sketches associated with corresponding survey points. Reflect that information on the map—if pertinent.

B) CHANGE TO SPU PRESENTATION STANDARD

By this phase, the *control points*, *control lines*, ROW, street names, and *stationing* should be in SPU presentation standard. Change any items in the survey drawing that still need it to SPU presentation standard.

i) Line Work

See that line work from the survey is the correct SPU standard layers and line type.

ii) Orientation of Standard Symbols

Current survey technology places all standard symbols facing north in their final ACAD drawing. This is due to limitations of the technology. However, most structures are not built pointing north. Rather, they are built parallel or perpendicular relative to the roadway they are on. Therefore, those symbols must be rotated or reinserted in the drawing. See **Appendix 2, Figure 2A.**

iii) Place Standard Labels on Standard Symbols

Some standard symbols have standard text labels. Some do not. Those that are labeled have them because that item could be mistaken for another. The exception is water and gas valves. If the water or gas valve is in direct proximity to its mainline, it is not labeled. If the valve is isolated from the mainline because it is a service line, then it is labeled. Typically we do not show service lines. See **Appendix 2, Figure 2B** and ***Inter-Departmental CADD Standards Core Elements*.**

C) DEVELOPING FIELD CHECK QUESTIONS

The process of going through surveyed points almost always brings up questions. It takes a *field check* to resolve them. Record your *field check* question on the base map. The question should be short, yet allow others to interpret it. Use the method shown in **Appendix 2, Figure 10A.**

D) ELIMINATE INCOMPLETE LINE ENDINGS

Any surface shown on the base map—like landscaping or paving—should have the lines closed unless the surface is on the edge of the map area. Often small gaps in the survey points or line work need to be completed. See **Appendix 2, Figure 11C.** Sometimes a *field check* is required to resolve the incomplete line.

E) *** RECORD SURVEY DEPTH

Record invert elevations and any other depth information noted in the survey field book. Please note this procedure is in transition and may not be needed. See **Appendix 2, Figure 7B.**

F) LABEL TOPOGRAPHIC FEATURES AS YOU PROCEED THROUGH POINTS

Do not wait. It will be overwhelming later. Determining which items need labeling and which do not will come with base-mapping experience. Browse **Appendix 2** and the City of Seattle ***Standard Plans*** **numbers 003a to 003o** for examples. For examples of callout leaders, See **Appendix 2, Figure 8A.**

4.9 More Survey Point Applications

A) MAINTENANCE HOLES

For MHs, use the casting symbol. Do not use the MH symbol. This application will come later. This does not apply to inlets and catch basins. See **Appendix 2, Figure 121E**.

B) OTHER VAULT STRUCTURES

For any other type of vault structures, use the casting symbol. Do not use the vault symbol. This application will come later.

C) ENDS OF CULVERTS

Survey will locate the ends of culverts by shooting a point. The elevation given in the point database is its *IE* (invert elevation). Survey designates which end of the culvert (east, west, north, or south) it shoots. Draw the entire culvert if both ends are given. If only one end, then draw a portion and add a FC *(field check)* note. See **Appendix 2, Figure 5G**.

D) SMALL DITCHES

Survey shoots the centerline of small ditches, 1' wide or less. This type of ditch is shown by drawing one line at the center line location. See **Appendix 2, Figure 5D**.

E) LARGE DITCHES

For large ditches, more than 1' wide or more, survey will shoot the *toe* and *top* and possibly centerline as well. See **Appendix 2, Figure 5D**.

F) GUTTERS

The *Gutter* descriptor means the front of curb. Use these points to define the curb location. See **Appendix 2, Figure 3M.**

G) CURBS

Do not use the points survey defines as *BOC* (*Back of Curb)* to define curb location. Use *Gutter* to define curb instead. See **Appendix 2, Figure 3M.**

H) FIRE HYDRANT VALVES

Do not show the valves survey picks up adjacent to fire hydrants. It is assumed that every fire hydrant has a valve.

I) TREES

- For trees with a trunk size less than 1-foot diameter, use the standard tree symbol. See **Appendix 2, Figure 2G**.

- For trees with a trunk size of 1-foot diameter or more, the trunk and canopy are drawn to scale. For the trunk, insert the trunk symbol to scale. Do the same with the canopy, except that a field check is needed to determine size. See **Appendix 2, Figure 2G.**

J) FENCES

For fences, the survey will specify type: wood or metal. There is a line type for each. See **Appendix 2, Figure 2E.**

Tips: Using Topographical Survey

- Gather the following 3 items before proceeding.
  1. survey field book (copy) for the project research file
  2. CAD drawing
  3. point database.
- *Quality Check* the survey product before proceeding.
- Bring the elements of the survey drawing to SPU's presentation standard when necessary.
- Scan through the field book and *point database*.
- Develop *field check* questions when necessary.
- Complete drawing, labeling, and adding *field check* notes as-you-go.

Section 5
INTERPRETING RESEARCH

If someone else has conducted the research, It's a good idea to confirm that all the plans and utility books needed are listed on the Planform

Section 5 Objectives

Section 5 provides basic guidelines for interpreting research. Specifics on how to apply research are presented in Section 6. In practice, interpreting and applying research happen simultaneously. For training purposes, we present interpretation basics in this section.

After you complete Section 5, you should be able to:

- Understand the need to interpret research chronologically
- Follow guidelines for using existing conditions shown on as-builts
- Add research reference labels properly
- Look for key information when you interpret your research resources

5.1 Before Starting

Before starting the work outlined here in Section 5, the tasks described in Sections 2 through 4 should be complete. As you'll recall, base-mapping requires researching primary and secondary documents.

Primary research documents are applied first and secondary documents used for the following:

- supplement missing information
- confirm the content applied from primary information
- resolve conflicting information
- help decide whether an item is unresolved in a final map.

The appropriate secondary information should be available in the research file.

Do not go backwards. Go from the past to the present when reviewing plans

5.2 Proceed Chronologically

Proceed chronologically from the plan list and review each plan. We recommend this method over that of seeking out all plans of one type (all sewer plans or all paving). By reviewing each plan in this manner, progressions in improvements will make sense and the likelihood of omitting items is reduced.

5.3 If Using Existing Base Maps

If an existing map is reused, then some portion of the utilities will already be drawn. In this case, conduct the research as usual by following the procedures listed below, but act as if the map is being checked rather than drawn. Make corrections or additions as necessary.

5.4 Add Research Reference Labels

A research reference is a label attached to underground utility callouts. They can consist of plan numbers, utility book numbers, or identification of various research documents used in base-mapping. See **Appendix 2, Figure 7C.** This step should be completed as each feature is added—not later. The Base Map group has created a custom tool called “Etag” to make this process easier. See **Appendix 3, Figure 4** for instructions.

Once the base map has been created, research references can have many uses:

- creating profile views
- checking maps
- assisting engineers and designers with the design process
- tracking base map research if utility conflicts arise during construction.

Getting existing conditions from the as-built improvement document is discouraged unless no other information is available.

5.5 Do NOT Use Existing Conditions Shown on As-Builts

The as-built improvement is the only information from the vault plan or utility book that should be applied to the base map.

Almost every SPU Records Vault plan—and sometimes utility books—show existing conditions at the time of as-built improvements. Vault plans from the 1970s onward may even contain their own base map to reflect existing conditions at that time. It’s important to distinguish which portion of an as-built document reflects the improvement and which portion reflects existing conditions at the time.

A) WHAT IS THE BEST WAY TO DEPICT AN IMPROVEMENT?

The optimum method for depicting an improvement is to use its source document: the plan that built it.

The source document will give detailed information about placement of the improvement.

B) WHAT IF . . . AN EXISTING CONDITION IS SHOWN ON AS-BUILT, BUT NOT ON BASE MAP SO FAR?

- Make certain that no *vault plans* or *utility books* from earlier years are missing from the research.
- Check to see if the next 1 or 2 subsequent plans added the missing item(s).
- Look closely to see if the feature is shown as "proposed." It may have never been built or it may be found on subsequent plans.
- Check the secondary research resource.

EXAMPLE: CHECK SECONDARY RESEARCH RESOURCE

If a gas main is missing, then check the gas maps.

- If a water main plan is missing, then check the Engineering Records Index plan database of water improvements. **See Appendix 1 and Appendix 3, Figure 18**.

C) WHAT IF . . . DRAWING EXISTING CONDITIONS SHOWN ON AS-BUILTS AND STEPS ABOVE ARE EXHAUSTED?

- Draw the item. Scale relative distances off the as-built plan for placement of the existing item.
- Always add the phrase "as ex" (as existing) to the research reference. This means the item drawn was from the *as-built* document that showed the feature as existing, rather than the plan that built it. See **Appendix 2, Figure 7D.**

EXAMPLE: ADD "AS EX" TO RESEARCH REFERENCE

An 8-inch water main is shown on plan 862-9 as existing yet no as-built plan can be located. The research reference should say: "862-9(AS EX)".

5.6 Look for Key Information

As each plan or utility is viewed, consider the following key information:

A) OBLIGATION TO DRAW "WORST-CASE"

It is our obligation to draw the "worst case." In this instance worst-case means to draw items at their largest, if there's a question of size.

"Worst-Case" also means showing every item encountered if there's a possibility it's still in the ground. This includes abandoned utilities. See **Appendix 2, Figure 5F**.

B) RE-CREATE CONTROL

Draw the improvement by recreating the same *control* used on the *as-built* document.

EXAMPLE: RE-CREATE CONTROL

A gas main is shown to be offset 12 feet west of the curb on the west side of the street. Therefore that curb line is the control for that improvement. Determine where the curb was the year the gas main was built and offset the gas line that distance from that curb.

C) DRAW PIPES THE CORRECT SIZE

Pipes under 12-inch diameter are shown as a single line.

Pipes 12-inch diameter or greater are drawn as a double lines. Pipe sizes noted on plans are the inside diameter of the pipe, but it is the outside diameter that must be drawn.

EXAMPLE: CORRECT SIZE PIPES

A 12-inch sewer pipe has an outside diameter of 1.33 feet. The outside diameters of concrete and steel/iron pipes are available on a pipe chart. See **Appendix 3, Figure 16.**

D) DRAW PIPE BENDS

Pipe bends (joints) for gas and water mains are shown with an SPU standard symbol. See **Appendix 2, Figure 1A.**

E) DRAW PIPE ENDS

Pipe ends are shown several ways:

- A plug symbol means an existing pipe was plugged during an improvement.
- A tilde symbol means the pipe continues on but this is where the Base Map stops showing it.
- A tic symbol is used to represent the actual end of a pipe.

See **Appendix 2, Figure 1B**.

F) ADD CALLOUTS

Callouts should be added for each improvement as it is applied, not later. This is another common cause of errors and delays. The following is a list for labeling underground utilities: See **Appendix 2, Figure 5H**.

- Callouts should be placed in white space whenever possible.
- Callouts should repeat often enough for easy identification. About every 200' or 10" on the paper. For complex areas, callouts should be placed closer together.
- Stair stepped callouts. This technique is practiced when there are several parallel utilities and their callouts are being repeated
- Place a callout on each side of maintenance holes, vaults, structures, and bends.
- "Etag" is a block with hidden attributes used to add research references to callouts. It places the reference on the correct layer and if the callout is moved the reference will follow even if it is frozen. See **Appendix 3, Figure 4**.

G) ADD PIPE CALLOUTS

At a minimum, pipe size and pipe use are called out every time. Callouts can include, but are not limited to the following information:

- Research Resource Reference. See **Appendix 2, Figure 7C**.
- Pipe Size (Callout inside diameter, but draw outside diameter). See **Appendix 2, Figure 5H**.
- Pipe Use (water, sewer, and more). See **Appendix 2, Figure 5H**.
- Pipe Material generally only for project pipes.

EXAMPLE: **PIPE CALLOUTS**

Usually pipe materials are called out only for the type of pipes that the project is building. The base map is being created for a water project, so call out the pipe material of water pipes only. See **Appendix 2, Figure 5H.**

- Pipe Status. If the pipe was no longer in use it would be labeled as abandoned. See **Appendix 2, Figure 5F**.
- Disclaimers. A disclaimer may be used when information is unclear or unavailable. See **Appendix 2, Figure 5A**.

EXAMPLE: **DISCLAIMERS**

If it's not certain the pipe has been abandoned or not, then label the pipe: ABAN? The following is a list of some the more common disclaimers found on a base map:

LOC?

ABAN?

SIZE APPROX

REM?

- Pipe callouts have loop leaders. See **Appendix 2, Figure 8**.
- Pipe callouts for pipes 12"diameter or greater are broken loop leader callouts. See **Appendix 2, Figure 8**.

5.7 Use Secondary Research Resources to Check Map

By this point, all the primary research resources have been reviewed and applied to the base map. Now the secondary research resources should be used as a last check and confirmation. See **Section 3.1B.** If following sources are used, add a research reference to the callout:

- gas maps
- water book
- sewer drainage maps.

5.8 Resolve Questions and Conflicting Information

It's a rare occasion when questions and conflicts don't arise when interpreting research resources. As questionable items are encountered, note them a "Zquestion" layer. The following are a few methods that may be helpful:

A) MISSING RESEARCH

- If *as-built* plans show an improvement as existing, that situation may indicate a missing research document. See **Sections 5.5B,C**.
- In a few cases where no records are available, it may be due to:
    - A utility crew performed work and created no record.
    - A private party built an improvement illegally or with no permit.
    - The improvement was built before the area became part of the City of Seattle.

B) SURVEY DATA WINS

Survey data (almost) always prevails over all other sources. This is especially true for placement of a feature.

C) DISCLAIMERS

Some things may never be resolved. It is very important to note these with a disclaimer. See **Section 5.6G**.

D) WHAT HAPPENS WHEN AN ABOVEGROUND FEATURE IS SHOWN ON AS-BUILT, BUT NOT FOUND BY SURVEY?

This could be due to a number of things:

- A plan or utility book from an earlier date is missing from research.
- The item was built, but it's buried.
- The item was built, but there is no plan for it.
- The item was built, but is gone now.
- The item was never built.

Follow through by making an field check (FC) note. The FC note should include either the plan or utility book number.

EXAMPLE: ABOVEGROUND FEATURES NOT FOUND BY SURVEY

A plan shows a maintenance hole but the survey did not pick it up. Point the *field check* note to the location and add a *field check* note. It should read something like:" MH from 774-78. Buried?" See **Appendix 2, Figure 10A** .

Tips: Interpreting Research

- Do not draw features on a base map from a plan that shows the feature as existing . . . unless that plan is the only source of information available.
- Always give a research resource reference.
- Proceed chronologically.
- Keep track of unresolved issues on a Z layer.
- Finish drawing each item before moving on. This helps resolve interpretation issues as they occur.
- Get help for unresolved items after going through all the research resources.

Section 6
APPLYING RESEARCH

Section 6 Objectives

This section is an in-depth guide for applying 11 types of research resources:

- Vault plans
- Older SPU Vault plans
- Utility books
- Grading plans
- Paving plans
- Sewer and drainage plans
- Side sewer cards
- Water main plans
- Electrical, signal, lighting and communications plans
- Bridges and structures
- Landscaping

Appendix 4 provides details for accessing these and other research references.

6.1 Vault Plans Versus Utility Books

It is important to be aware that both *vault plans* and *utility books* contain varying styles of drafting. This variance is due to technological advances, alternate drafting standards, and drafters.

6.2 Helpful Hints for Vault Plans

Vault plans can have multiple types of improvements occurring on a single sheet. Water mains and sewer improvements can be found on the same sheet. Installation of a water main and a sewer together may also be found. Follow these steps:

- Look over each plan carefully.
- Scan the cover, index, and notes sheets. Look for special notes, cross-references to other sheets, supplemental sheets, keys, legends, details, sections, inspector's book number, and other pertinent information.
- Reference City of Seattle *Standard Plans*. Certain features are built over and over again (maintenance holes, catch basins and inlets). Rather than show details of building the same features, reference the City of Seattle *Standard Plans*. Many items are assigned Standard Plan numbers. This highly useful information is not often used.

EXAMPLE: STANDARD PLAN NUMBER CHANGES ON OLDER PLANS

Many editions of the *Standard Plans* have been published over the years. Numbers assigned to specific *Standard Plans* have changed. If the Standard Plan needs to be researched, then look in the edition that correlates with the as-built date of the improvement. : In the 1991 edition, Standard Plan Number 130 is a maintenance hole. In the 1967 *Standard Plans* edition it is an extruded curb.

- Was the plan ever built? Most were, but not all.
- Was a portion canceled or crossed out?
- Distinguish what the plan is building from the entities it shows as existing.
- What *control* is used to locate the improvement? Is it a *centerline*, ROW line, or another feature?
- Find every portion of the plan that applies to the project area.
- Pay careful attention to red colored *as-built* notes.

6.3 Helpful Hints for Older SPU Vault Plans

Many older plans sets are inked on linen and stored rolled-up. Older plans sets have been divided into and assigned more than one plan number to enable their fit into plan storage tubes. Usually, plan indexes will reveal all the plan numbers.

EXAMPLE: PLANS WITH MORE THAN ONE NUMBER

A sewer plan number 78-29 may also include plan numbers 78-28 and 78-30.

The 78-29 number is the plan view of the sewer. It provides detailed as-built information, including the location of the improvement in relationship to the control.

Number 78-30 is the profile of the sewer. Besides furnishing elevation information, it provides detailed information on the type of maintenance holes used and the as-built length of pipe runs.

Number 78-28 refers to the LID (Local Improvement District) map. It shows the improvement location and how landowners were assigned fees for work based on amount of property owned. This information can be ignored. Still, it is a good idea to scan the sheet to see if it contains other useful information.

- *** Parts of older plan sheets may be deteriorated, especially around the edges. In some cases this can be remedied by viewing its microfilm copy. The plan may have been microfilmed prior to the deterioration. At present many older plans are being repaired and then scanned for viewing through the SPU Virtual Vault.
- Older plans often include references to standard plan numbers for standard features built. These can be ignored in most cases.
- Pay careful attention to light pencil notes on older plans. These notes were usually done as an afterthought by others conducting research. They can include things like updating a street name changed by crossing out the old one and adding the new one or adding stationing to a control line. These are not official notes (like as-built notes) but may be helpful.
- Significance of the Inspector's Book Reference. An inspector's book is a report assembled by the project's inspector during construction to record design changes that occurred in the field, among other things. In turn, the design change information from the inspector's book is then used to transform the plan set to an as-built drawing. Therefore, the inspector's book is considered a secondary research document and it is not routinely utilized. It is used on occasion to supplement incomplete or confusing as-built plan information.

6.4 Helpful Hints for Utility Books

Just like the SPU *Records Vault plans*, *utility books* can contain varying degrees of information:

- Look over each book carefully.
- Make sure you have a copy of the first page of the permit, known as the "permit page."
- Note any legends or keys.
- Note references to other utility books.
- Make sure all pages needed for the project area are copied, labeled and available. Keep pursuing those books that were not available during initial research. The supervisor or lead can advise for missing books.
- **Control Used to Locate the Improvements in Franchise Utility Books.** The *control* used by the Street Use inspectors can vary greatly. They have been known to use *monument lines* (we hope), existing features, a combination of items, or no *control* at all. If an existing feature like a maintenance hole is used for *control* then it should be determined:
    a. Is the feature still there?
    b. Is a similar feature nearby that could be mistaken for it?

- **Significance of the Permit Number Listed on the Permit Page.** Just like the inspector's book for vault plans, the permit number listed on the permit page is a secondary research resource for Franchise Utility Books.
- **Unusual Bends in Pipes.** Unusual bends in franchise utilities usually indicate that the utility is maneuvering around an existing object.
- **Depth Information from Utility Books**. The depth of the utility being built is commonly provided in *utility books*. Some *utility books* will go a step further and provide the depths of existing utilities encountered during the work as well as the new improvement. During design, this information is especially useful in creating *profile* views of existing conditions. See **Appendix 2, Figure 7B**.

6.5 Grading Plans

Grading plans are often the first improvement to an area. Even though the actual grading (cut and fill) will not need to be reflected on the base map, other items in the grading plan may be useful. The direction of slope and/or the percent grade of the new grade will be given. Grading plans may also contain drainage structures and their connections to the mainline as well as curb and sidewalk improvements. See **Appendix 2, Figure 6K**.

6.6 Paving Plans

The design process requires the need to know specific information pertaining to paving features in a project area. Even though survey points and line-work provide certain current paving conditions, more is needed. That additional paving information can be found in the *as-built* paving improvement plans.

A) REQUIRED PAVING FEATURES FOR SPU BASE MAPS:

i) Current Curb Edge From Survey

The current curb edge is provided by survey data. See **Appendix 2, Figure 6M**.

ii) Curb Edge Per Plan

The curb edge should be drawn on a construction layer per plan. See **Appendix 2, Figure 6M**.

iii) Limits of Each Type of Paving

Multiple improvements may have led to varied paving surfaces and subsurfaces. The limits are either pointed out with a callout or are defined by a dimension string. Most often, both methods are used. See **Appendix 2, Figure 6E**.

Iv) Paving Material

Multiple paving improvements also contribute to varying paving materials. Some are apparent and show on the surface, while others are subsurfaces and can only be found on *as-built* paving plans. See A**ppendix 2, Figure 6E**.

v) Paving Thickness

This information can only be found through research of as-built paving plans. Paving thickness is given for concrete only. Asphalt surfaces are called out, but no thickness is given. See **Appendix 2, Figure 6G**.

vi) Subsurfaces

This information can only be found through research of *as-built* paving plans. It's common for multiple concrete paving improvements in adjacent locations and of varying thickness to be covered by a single asphalt surface. In this case, a dashed line on the base map shows the subsurface. See **Appendix 2, Figure 6E.**

vii) Brick, Sandstone, or Concrete Gutters

Gutters in this case, refer to a thin strip of pavement located between the curb and the roadway. Gutters are built of a material different than that of the pavement directly adjacent to it. Survey data may state that the entire roadway including the gutter area is covered with asphalt, yet there may still be a brick, sandstone, or concrete gutter underneath. If so, an *as-built* plan will indicate it and show its limits (where it starts and ends) and dimension (width). See **Appendix 2, Figure 6G**.

viii) Slopes

Slopes are given in percent grade and can be found on grading and paving plans. For asphalt surfaces, show the direction of slope only. For concrete surfaces, show *both* the percent grade and direction of slope including asphalt covered concrete surfaces. Slope may change slightly after initial grading of the area. Be certain to use only the most current slope information. See **Appendix 2, Figure 6K**.

Ix) Curb Ramps

Plans are not needed for curb ramps. Survey provides this information. If not, they can be verified by a *field check*. See **Appendix 2, Figure 6J**.

x) Granite Curbs

Granite curbs require special care during construction so we show the limits. Limits should be verified by *field check*. See **Appendix 2, Figure 6C**.

xi Former Street Car Railway Areas

Until the 1940s, many Seattle arterials had streetcar railway systems. These areas were left with unique paving conditions. Rails were removed but ties left in place. The gaps were filled with concrete paving of varying depths—estimated at an average of 18”. For this situation, the limits of the area are defined on the base map and the area given a special callout. See **Appendix 2, Figure 6F**.

xii) Walks

Walks are usually provided by survey points. As-built plans can fill in gaps of information survey may miss. See **Appendix 2, Figure 6A**.

xiii) Driveways

Use survey or field data for driveway locations. Do not use plans. See **Appendix 2, Figure 6J**.

Table 6-1 summarizes the paving items required, their source, and if they require line-work and or callouts.

Table 6-1. Paving Features to Incorporate into SPU Base Maps

Feature	*From Survey*	*From Plans*	*Line-work*	*Callout*
Current Curb	Yes	No	* Yes	No
Curb per Plan	No	Yes	Construction lines only	No
Limits of Paving Improvement	Surface only	Yes	* Yes	Yes
Material	Surface only	Yes	No	Yes
	No	Yes	No	Yes
Subsurface	No	Yes	* Limits	Yes
Gutters	Surface only	Yes	* Yes	Yes
Slope	No	Yes	No	Symbol
Curb Ramps	Yes	No	Symbol	No
Granite Curbs	Maybe	Yes	Limits	Yes
Former Street Railway Area	No	Yes	* Limits	Yes
Walks	Yes	Yes	* Limits	Yes
Driveways	Yes	No	Yes	Yes
Tree Cut-outs	Yes	No	Yes	No
Rails	Yes	No	Yes	No

* = Include in a dimension string. See **Appendix 2, Figures 9A, B, C, D, E, F.**

B) PAVING FEATURES NOT REQUIRED FOR SPU BASE MAPS:

- Every paving improvement plan usually shows or notes stabilizing material underneath it such as aggregate, gravel, or sand. It is not necessary to call out these materials.
- Backs of curbs are not shown on SPU base maps. Only the front edge is required.
- Do not call out paving thickness of walks.

- Do not call out paving thickness of asphalt.
- Do not give percent grade of asphalt surfaces. Show the direction of grade only.

C) PAVING CALLOUTS

At a minimum, paving callouts include paving thickness, materials, research resource references, and curved leaders pointing to the limits of each.

i) Thickness

Include the thickness of concrete material only.

ii) Material

Paving materials most commonly called out are concrete, brick, and asphalt.

iii) Multiple Layers of Paving

When multiple layers of paving are present, it is customary to start with the top layer first.

EXAMPLE: LAYERS OF PAVING

"Asph/6"Conc/Brick" means asphalt over 6" concrete over brick.

Iv) Slopes

Slopes are called out with an SPU standard symbol. The percent grade may or may not be included, depending on the paving surface and/or sub-surface.

v) Dimension Strings

The dimension string defines the limits of paving features visible on the surface as well those that are not. It will also define the distance of the survey control line to the ROW and other paving features. See **Appendix 2, Figures 9A, B, C, D, E, F**.

- Dimension strings include the total distance from one side of the ROW to the other.
- Dimension strings do not include asphalt edges, only rigid surfaces like concrete are provided.
- They can also include distances that relate to the control lines.
- Gutters are a separate dimension string placed near the main one.

There can be varying circumstances that will affect the content of a dimension string. Not every case can be covered here.

vi) Granite Curbs

Granite curbs should be called out.

vii) Ends of curbs

Occasionally, the curb will end abruptly and its limits will need to be shown and called out by saying “EOC” for end of curb.

viii) Disclaimers

A disclaimer may be used when information is unclear or unavailable.

EXAMPLE: DISCLAIMER

It may be certain that the surface is concrete but the plan may not have been clear on the thickness. Call out as: ?”CONC. This means unknown inches thick of concrete.

D) CHALLENGE OF DRAWING PAVING FEATURES FROM PLANS

Drawing paving features from plans can be a challenge for projects in busy parts of the city. Paving alignments change often over the years. Streets get widened; curb radius’ change, and paving thickness goes up and down. Paving alignment and features provided by survey may differ from those shown on earlier *as-built* paving plans. Despite those differences, the past *as-built* paving plans contain required base map information.

Some of the paving information applied from the *as-built* plans will appear as line-work in the final base map. Other information must be drawn as construction lines for reference only.

E) WHY INCLUDE CURB AND PAVING ALIGNMENTS FROM PAST IMPROVEMENTS?

Paving and curb alignments from the past are a valuable resource for the following reasons:

- These lines can be used to define the limits of various paving surfaces and subsurfaces.
- These lines can be used to define the *control* for subsequent improvements.

EXAMPLE: PAST IMPROVEMENTS

An older gas line was measured off an old curb alignment that no longer exists because the street has been widened.

F) WHY DRAW CURRENT CURB LINE PER PLAN IF SURVEY PROVIDES IT?

Draw the current curb line according to the plan. Place it on its designated construction layer. When an *as-built* plan uses the curb line as its *control line* to locate an improvement, the construction line is offset to the given distance. The current survey curb line does not work that way. No matter how straight it looks, the survey curb line is lumpy due to natural phenomenon and human limitations.

G) STEPS FOR DRAWING PAST PAVING IMPROVEMENTS

The best method for capturing paving features is to use chronological order to draw improvements from every *as-built* paving plan. Do so even if you do not match current survey conditions. Certain paving features required on SPU base maps can **only** be found from past paving plans.

If paving is very complex (3 or more *as-built* paving plans per city block), consider placing information from each paving plan on an individual construction layer. This keeps data organized. Each individual layer name may contain the plan number and as-built year. Each construction layer can then be distinguished by color.

As each subsequent improvement is added, some lines may transition from construction lines to SPU standard paving lines. Some construction lines may need to be erased. Table 6-2 shows 6 steps for reviewing paving plans chronologically:

After each plan has been reviewed chronologically, the paving conditions reflected on the base map should appear as they were at that time.

Table 6-2. How to Draw Past Paving Improvements

Step	Activity
1.	Pretend paving points and lines from Survey are not there until you've finished reviewing all paving plans. Lines can be frozen temporarily
2.	Draw the paving alignment shown on the plan
3.	Include the other paving features shown on the plan
4.	Move on to the next plan
5.	Do not re-draw a paving alignment that is identical to what has been reflected on previous plans
6.	Determine which lines to place on an SPU standard paving layer. Erase or put on a construction layer. Imagine how plan meshes with prior paving improvements. Ask these questions: • Does new paving plan remove paving from prior improvement? • Does new paving plan add paving in addition to paving from prior plans? • Does the curb radius change? • Does paving thickness differ from previous plan?

6.7 Sewer and Drainage Plans

Several types of information are derived from sewer/drainage plans as each plan is reviewed. The plan indicates the type and size of MH symbol to use and its placement in relationship to the casting. Then the pipe is drawn and labeled. The final task is to add the side connections. The following items describe in detail how to apply sewer and drainage research:

A) CASTING AND MAINTENANCE HOLE (MH) SYMBOLS

Survey provides a casting symbol and survey point for each MH. Base-mappers, however, add the MH symbol from their research of *as-built* plans. The casting symbol represents the casting (lid) that covers MHs. The "MH" symbol represents the outside wall of the MH structure underground. Most MHs are built concentrically, with the casting centered over the MH structure, but not always. Survey may give you a field book note to indicate if a casting is offset from center of the MH structure. The *as-built* sewer/drainage plans give the precise information. See **Appendix 2, Figure 3I**.

B) CORRECT SIZE AND PLACEMENT OF MH

MHs drawn on Base Maps should reflect the outside diameter of the MH structure and its placement in relationship to the MH casting. Sewer/drainage plans may indicate this information in several ways. The profile portion of the plan may give a Standard Plan number to indicate the MH type or give a reference to a detail that describes a non-standard maintenance hole. In any case, the outside diameter and correct placement of the MH symbol can be determined by viewing the *Standard Plan*, profile, or detail.

C) OUTSIDE DIAMETER OF MH

Often the outside diameter of an MH structure is non-issue. Most MHs are built from a Standard Plan type that matches the size of the most frequently used SPU MH symbol. If this is not the case, then resize MH symbol or draw it to scale. To find the outside diameter of the MH structure, refer to the plan that built it.

D) SEWER/ DRAINAGE PLANS AND *STANDARD PLAN* REFERENCES

Sewer and drainage plans often refer to City of Seattle *Standard Plan* numbers to indicate the type of MH built for a project. Most MHs—unless customized—are built according to a *Standard Plan* number. *Standard Plan* numbers vary from edition to

edition. Therefore, when researching *Standard Plans,* use the edition published when the plan was *as-built* (or just before) to determine MH types and sizes.

E) DETERMINING STANDARD PLAN MH TYPES FROM PLANS

In most cases a plan will designate the Standard Plan number of the MHs by a note or a callout at each MH. This information may be found in the plan view, a profile view, or in a note. A callout may say "MH Type 104". That is the same as saying *Standard Plan* number 104.

NOTE: DOUBLE NUMBERS FOR AS-BUILT PLANS

MH callouts on *as-built* plans may use 2 sets of numbers. One is the MH Type. The other is a design number. It is important not to confuse these. See **Appendix 2, Figure 11D**.

F) DRAWING SEWER/DRAINAGE PIPES FROM PLANS AND SURVEY

Before proceeding with this step, the center of the MH structures should be established from survey data, and *as-built* plan research when necessary. Draw the sewer/drainage pipes from the center of the MH structure to center of the connecting MH structure unless otherwise noted on the plan.

After the pipes are drawn, most likely the pipe location will differ slightly from the *as-built* plan.

EXAMPLE: PIPE LOCATIONS THAT DIFFER

The plan indicates that the pipe and MH structures are located directly over the centerline of a street. However, after following the procedure above, the pipe and MHs are not located there. In this case the survey data will dictate the location of the pipes and MHs. See **Appendix 2, Figure 11C**.

If the pipe is 12-inch diameter or larger then draw a single construction line and then offset the distance to the pipe's outside diameter. See **Appendix 3, Figure 16** for the pipe chart.

G) OFFSET PIPES IN MH

Pipes nearly always align from the center of one MH structure to the center of another. On occasion, pipes and castings can be offset from the center of a MH structure. Survey may have given an indication in their field book notes, but the

sewer/drainage plan is needed to give detailed information and exact offset distances. See **Appendix 2, Figure 3I**.

H) TYPES OF SEWER AND DRAINAGE MAINLINES

- PS (Pipe Sewer). This type of sewer allows sewage and storm water to flow into its lines. For this reason it is also known as a "combined" sewer.
- PSD (Pipe Storm Drain). This type of mainline allows storm water only.
- PSS (Pipe Sanitary Sewer). This type of sewer allows only sewage to flow into its lines. Storm water is not allowed. Many PSSs were PSs in the past. In the late 1960s through the 1970s, many "sewer separation" projects built PSD systems near PS systems. Once the PSD systems were built, the former PS systems were then designated "PSS" systems.

I) DRAWING CULVERTS FROM PLANS

Most times culverts will have already been drawn by this phase because survey points will have picked up their end points. This is not always the case. Occasionally there will be culverts shown on the plans with no corresponding survey points. Draw the culvert and include the phrase "REM?" and "ABAN?" with its callout. See **Appendix 2, Figure 5G**.

J) SEWER/DRAINAGE CALLOUTS

At a minimum, sewer/drainage callouts include pipe size, use, research resource reference, and loop leader wrapping around the pipe. The following are label designations:

- PS
- PSD
- PSS.

6.8 Side Sewer Cards

*** The *side sewer card* system is in transition. *Side sewer as-built* records were previously recorded on *side sewer cards* but unavailable since May 2001. This information will soon be available on *GIS*. In the interim, use the *side sewer cards*. A temporary disclaimer note is available and should be applied to each base map until the situation is resolved. See **Appendix 3, Figure 5**.

Before proceeding read “How to Read a Side Sewer Card.” See **Appendix 3, Figure 10**.

A) OFFSET DISTANCE OF SIDE CONNECTIONS

Start by drawing a construction line perpendicular to the MH. Use the line for offsetting the distance given to the side connection along the sewer or drainage mainline. If the side connection is not perpendicular to the mainline, but is angled, an offset distance is required for the point at which a side connection crosses the property line. If the distance is not given on the *side sewer card,* then scale it.

B) THREE TYPES OF SIDE CONNECTIONS

2. SS (Side Sewer). An SS is a side connection of a PS.
3. SD (Service Drain). SDs have storm water flowing through them. A PSD can only have an SD as a side connection. However, a PS can have SDs as side connections, too. Rarely, a PSS may have an SD as a side connection as well. The way to determine what qualifies as an SD is to view the *side sewer card*. If the source of the connection comes from catch basin, roof drain, or a ditch/culvert system, it is an SD.
4. SSS (Sanitary Side Sewer). An SSS is a side connection of a PSS.

C) LABEL DESIGNATION FOR SIDE CONNECTIONS:

The following labels designate side sewers and service drains:

- SS
- SD
- SSS.

D) LABEL PLACEMENT

- Place label just inside the private property line and end the line with a tilde.
- If the side connection is very long, label it with a loop leader along its run.
- Provide depth information on the Zref layer.

6. 9 Water Main Plans

Drawing water mains from plans is fairly straightforward. Once in a while, a water improvement can be found in a utility book rather than a vault plan. Sometimes research will indicate a water main plan is missing. Either can happen from a record-keeping glitch because SPU recently had a separate water department. A database has been assembled to help find water improvement plans. See **Appendix 2, Figure 18 and Appendix 4**. The following are steps for applying water main research:

- Draw the water main per plan.
- Water Valves. Water valves are part of every water main and are picked up by survey. Unlike sewer/drainage MHs, water valves do not dictate where the water main will be drawn. In addition, water valves near fire hydrants are not shown. It is assumed every fire hydrant assembly has one.
- Elevations Notes on Water Mains from Plans. Water plans sometimes offer the elevations at the top of the water main at or near hydrants. This type of note appears as a number in a circle. Include that information to the Base Map by placing it on a reference layer and note as “El @ top of main = 102’.
- Connect the hydrant to the main.
- Add pipe joints
- Give research resource reference.

6.10 Electrical, Signal, Lighting, & Communications

Electrical, signal, lighting, and communications improvements are grouped here because they are treated similarly in base-mapping. These improvements can be found in both SPU *Records Vault plans* and *franchise utility books*.

A) UTILITY VAULTS AND MHS

Utility vaults and MHs are treated like sewer/drainage MHs. Survey provides a casting symbol or point and research will show the outside dimension of the vault or MH structure in relationship to the casting. However, unlike sewer/drainage MHs, survey usually does not provide information about the inside of these structures. Typically, this information comes from the vault plan or utility books that built it.

B) CONDUIT, DUCT, AND DIRECT BURIAL CABLE

The terms *conduit*, *duct*, and *direct burial cable* should be defined before proceeding. At times, the utility books use these terms in a different manner than the SPU standard. A utility book may call a *conduit* a *duct* and *duct* a *conduit.* However, the SPU standard for base maps is as follows:

i) Conduit

A plastic or metal pipe to used to contain wires inside.

ii) Duct Banks

A structure enclosing and supporting many evenly spaced conduits usually made of concrete.

ii) Direct Burial Cable

Cable buried directly in the ground without being inside a conduit.

C) SHARED TRENCHES AND DUCT BANKS

It is not unusual for electrical, signal, lighting, and communications improvements to share a trench or duct bank. As similar improvements are added, they, too, can be placed in the same trench.

D) CONSOLIDATION OF LINES FOR MULTIPLE UTILITIES IN SAME TRENCH

For clarity, when various types of utilities share the same trench the lines may be consolidated. If ductwork is present, its line-work will be drawn. Otherwise, for all those items less than 12-inch diameter, a single line may be drawn.

E) LABELS AND CALLOUTS

At a minimum, electrical, signal, lighting, and communications call- outs include size, usage, research resource references, and loop leaders. See the ***Standard Plan* No. 003a and 003c** for the specific callout types for electrical, signal, lighting, and communications.

F) STACKED CALLOUTS MULTIPLE UTILITIES IN THE SAME TRENCH

A stacked callout may be used when calling out multiple utilities in the same trench. See **Appendix 2, Figure 5B**.

G) CALLOUTS FOR DUCT BANKS

Ducts are square or rectangular. Their size is called out by giving width by depth.

EXAMPLE: DUCTBANK CALLOUTS

24 inch x 18 inch TD means that this is a 24-inch wide by 18-inch- deep telephone duct. In many instances, the *as-built* document will not give the dimensions (width and depth) of the duct bank. An educated guess can be made. In that case the duct is drawn the width that is guessed but the callout will say 16 inch x 8 inch ED (SIZE APPROX). See **Appendix 2, Figure 5B.**

H) VAULTS WITH DRAINS

Some vaults have drains connected to sewer or drainage lines. This scenario is usually found on the as-built document, but sometimes can be found only on the side s*ewer card*.

I) WESTERN UNION TO WORLDCOM

Western Union used to occupy certain conduit runs in the downtown area. WorldCom has taken over their system. If a Western Union conduit run appears on an as-built document, draw it, but do not label “ABAN.” WorldCom lines are active.

6.11 Bridges & Structures

Most portions of bridge and structure *as-built* documents are not needed for base maps. However a few items can be useful. See **Appendix 2, Figure 3N**.

A) PIERS

Typically survey will pick up bridge piers because they are visible, but bridge footings must also be shown. That information is in the *as-built* plans.

On occasion a plan may show that a bridge or trestle has been cut off leaving its piers buried. In this case the piers and their footings should be drawn per *as-built* plan, paying special attention to their placement and spacing.

B) RETAINING WALLS

Treat large structural type retaining walls (not rock face walls) as if they were piers. Survey will pick up points along the wall but the *as-built* document will reveal information about the footing. Sometimes older vault plans give little or no footing information for street retaining walls. Whenever possible, draw the footing outline if it is given.

C) BRIDGE ABUTMENTS

Survey will likely pick up points along the top of an abutment. Once in a while, the underside of the abutment may be needed and can be found on the *as-built* plans.

6.12 Landscaping

Irrigation lines are the only item to show from landscaping plans. They are shown as waterlines. Survey data may give locations of sprinkler heads or irrigation items, but there is no need to show these items per plan.

Tips: Applying Research

- Vault plans and utility books contain varied styles of drafting
- The design process requires that we know specific information about paving features
- Sewer and drainage plans are the source of several types of information
- Water main plans are straightforward—but record-keeping can be inconsistent based on recent reorganization of SPU's divisions
- Electrical, signal, lighting and communication are treated similarly in base-mapping.

Section 7
FIELD CHECKING

Section 7 Objectives

After you complete this section, you should be able to:

- Prepare a field check
- Prepare a field check print
- Understand field location techniques
- Conduct a field check

7.1 Preparing for a Field Check

A field check is conducted after the surveyed features and underground utilities are applied to the base map. The purpose of a field check is to:

- Verify existence and location of topographical features provided by survey.
- Resolve field check (FC) questions.
- Locate features that survey does not typically provide.

We conduct field checks after topographical features and underground utilities are placed on the map.

The following preparations should be made before the field check:

A) RESERVE CAR

Preferably the day before it's needed, especially if the weather is expected to be clear and dry.

B) FIND A PARTNER

We highly recommend that no one goes into the field alone. Ask the supervisor or lead to recommend someone according to workload.

C) GEAR UP

Take the following gear:

- Shoes. A pair of sturdy closed toe shoes should be worn. Sturdy boots may be needed for unimproved areas. On some occasions rain boots may be needed. The City can supply rain boots.

- Fluorescent Outerwear. Either a fluorescent vest or raingear should be worn. The City can provide both.
- City ID and Business Cards. Always wear your City ID and take a few business cards if you have them.
- Cell Phone. Take a cell phone if possible.

D) CHECK SUPPLIES

Gather the following supplies:

- Clip board. To hold field check (FC) prints
- Small engineer's scale (optional). When many items need to be field located, a small engineer's scale can be useful for drawing items on the field check print.
- Field check (FC) prints. A print of the base map containing the FC questions.
- Large rubber band (optional). Holds field check print down on the clipboard.
- A 25' and 100' engineers tape
- Colored pencils and pens
- Lumberman's Crayon
- Digital Camera. Take pictures of those features that are complicated or confusing.

EXAMPLE: PHOTOS OF COMPLICATED FEATURES

It is difficult for survey to describe a retaining wall with a chain link fence embedded in it.

7.2 Preparing a Field Check Print

A FC print should be prepared so it is of optimum use in the field and afterwards. **See Appendix 2, Figure 10A**. The following is a list of items that should be included on a field check print:

1. **Survey Point Symbol and Point Numbers**. The survey point symbol and point number should be included on the field check print. This helps get oriented in the field. This information can also be used to locate or clarify features relative to surveyed points.
2. **FC symbol and its corresponding question**.
3. **Initials of person conducting the field check and the date**. This should be hand written in large print, preferably in the bottom right corner.

4. **North arrow and street names**.
5. Freeze unnecessary layers, as reference, construction, and question layers. These items can make field check notes difficult to read.

7.3 Field Location Techniques

Different features require field locating techniques depending on the accuracy required. Some methods, such as photography, merely clarify features. Other methods, such as measuring features in relationship to other surveyed points, provide more accurate location.

EXAMPLE: LOCATION TECHNIQUES VARY

A missed inlet requires a more accurate field location technique than a missed WCR.

Use the following techniques to complete a base map:

A) TRIANGULATION

This is a method that locates a feature relative to 2 surveyed points. A measurement is taken from each survey point to the feature to be located. The distance measured is to the nearest 0.1'. After the field check has been conducted, a circle is drawn with each survey point at its center. The radius of each circle is the distance measured in the field from that survey point to the feature being located. The feature is located at the point where the 2 circles intersect. See **Appendix 2, Figure 10C**.

The 2 survey points chosen should meet the following criteria:

- The 2 points and the feature being located should form an imaginary triangle.
- The points should be easily identified.

EXAMPLE: SURVEY POINT CRITERIA

A catch basin survey point is preferred over a pavement survey point.

- The points should be located no further than 100' away from the feature being located.

B) STATIONING LINE FROM A KNOWN POINT

This method involves establishing a known point along a known alignment as the base line. It requires 2 people to take measurements. Use this only when:

- Many features are to be located
- Very few or no survey points within 100' of feature(s) are to be located.

To correctly use this method, the known point and alignment must be established.

EXAMPLE: STATIONING LINE FROM KNOWN POINT

At a street corner the walks may intersect. The intersecting corner located on the back edge of concrete walk (CW) is a preferred "known" point because it is usually located either by survey or by the plan that built it. In this manner, the front or back edge of the CW will then become the "known alignment" because it has been defined by survey or by the plan that built it . All items to be located can then be measured off this "known alignment".

The known point is then assigned 0+00 and should be noted on the field check print. Then a 100' survey tape is pulled along the known alignment. Mark the 100' line as 1+00 on both the field check print and the concrete walk (CW). The CW may be marked using a lumberman's crayon.

Keep the 100' survey tape in place on the CW. Hold the starting end of a 25' engineer's tape from the feature to be located. Another person will walk the 25' tape to the 100' tape at a right angle. First, note the distance from 0+00 on the 100' tape where the 25' tape crosses the 100' tape. Second, note the distance measured on the 25' tape from the feature to the 100' tape. Next, draw the feature and label with a station and offset distance. See **Appendix 2, Figure 10D**.

C) VISUALLY LOCATING OBJECTS

This method is used for features that do not require exact locations.

EXAMPLE: VISUALLY LOCATING OBJECTS THAT DO NOT NEED EXACT LOCATION

Survey missed a WCR. Its exact location is not required. All that needs to be known is that it exists and its approximate location. Record it on the field check print by sketching the WCR where it is seen.

Some features may be located visually in relation to other objects. See **Appendix 2, Figure 10E**.

EXAMPLE: VISUALLY LOCATING FEATURES IN RELATION TO OTHER OBJECTS

Survey missed a WM (water meter) that is located in the parking strip adjacent to the front edge of the CW. Most CWs have score marks that are 2' squares. This feature makes it easy to locate this object visually. Count the number of squares from the closest known survey point—like a driveway or private walk—and multiply by 2 for the number of feet. Next, draw the WM symbol on the field check print.

D) SHADING PAVING SURFACES

Use various colored pencils to shade the limits of complicated or varied pavement surfaces. Although this is not a true method for locating paving features, it works to clarify confusing paving surfaces. Use different colors to shade each surface. See **Appendix 2, Figure 10F**.

E) TAKING PHOTOS

Taking photos is not a true location method. But it, too, is useful for clarifying confusing or complicated features. Sketch a camera symbol on the FC print. Place it where you were standing while taking the photo. The camera symbol should be pointing towards the features being photographed.

Usually more than one photograph is taken per field check. Thus, it's a good idea to number or name each symbol to cross references the number or name of its corresponding photograph. See **Appendix 2, Figure 10G**.

7.4 Conducting a Field Check

The following tasks are carried out on every field check:

A) VERIFY EXISTENCE AND LOCATION OF TOPOGRAPHICAL FEATURES PROVIDED BY SURVEY

i) Utility Topographical Features

Verify the existence and location of utility related topographical features such as fire hydrants, power poles, valves, and maintenance holes by drawing a small check mark next to each item verified on the FC print.

ii) Non-Utility Topographical Features

Visually verify the existence and location of non-utility related topographical features such as curbs, driveways, and paving surfaces. You do not need to draw a checkmark for these items.

B) RESOLVE FIELD CHECK QUESTIONS.

Typically, several FC questions arise in the process of creating the base map. The table below contains examples of typical FC questions and recommended field location techniques. Table 7-1 shows these issues.

Table 7-1. Typical Field Check Questions

Description	Info Required	Location Technique	Comments
Unfinished lines in base map area	Limits of surfaces	Visual/shading recommended	Continue surface lines to the edge of the base map area.
Ditches	Flow direction and width if not provided	Visual	
Catch basin or inlet lid details structure nonstandard or survey's description does not match symbol or research	A sketch of the lid	Visual	Draw large enough to see detail on the FC print. Note the location of inlet or outlet pipes if necessary.

C) LOCATE FEATURES THAT SURVEY MAY NOT PROVIDE.

The content of every survey provided varies slightly. Table 7-2 lists typical items located on a field check.

EXAMPLE: LOCATING FEATURES SURVEY DOES NOT PROVIDE

Some surveys will provide a note that states the orientation of the luminaries and others will not. Regardless, this information is still needed for the base map.

Some information that is needed to complete the base map is never provided by survey but should be recorded for every field check.

EXAMPLE: CHECKING FEATURES SURVEY DOES NOT PROVIDE

The heights of fences and retaining wall should be noted on every field check.

Table 7-2. Items to Locate on a Field Check*

Item	Info Required	Technique	Comments
Granite curbs	Limits	Visual	Usually located on PC or PT of curb
CW and driveways	Does CW cross driveway? Does driveway cross CW?	Visual /shading recmn'd	
Monuments	Verify location	Visual	Look at intersections. Draw checkmark if provided. Sketch if not.
Survey markers	Verify location	Visual	Look at intersections. Draw checkmark if provided. Sketch if not.
Addresses	Numbers. Note orientation of building. Place # s in front.	Visual	Get info only when #s are easy to read.
Wheel chair ramps	Verify	Visual	No need give exact location or size.
Fence	Height and material	Visual	If varies, FC note "4' to 6'HI"
Rockery	Height	Visual	If varies, FC note "6' to 8'HI"
Retaining Walls	Height and material	Visual	If varies, FC note "2' to 4'HI"
Luminaries or lights	Orientation	Visual	Sketch
Tree canopy	Size	Visual	Sketch. Look at curb line for relative distances. Use building lines, other features.
Aerial or underground electricity		Visual	Aerial wires run pole to pole?
Conduit Risers on Poles	Location/size. More than 1, how many?	Visual	Sketch small circle next to pole. Note diameter of conduit
Landscaping	Limits	Visual	Note only if landscaping
Gravel	Limits	Visual	Only when it is a driveway
WCR	Location	Visual	Sketch symbol
Area under construction	Limits	Visual	Sketch approx limits and note.

*These are items that survey might not note.

7.5 Field Check Notes Readability

FC notes should be legible because this information needs to be readable to others.

7.6 The Public

The scope of the work should be known for possible questions people might ask. City of Seattle ID should always be worn where visible. Carry business cards as well as the name and phone number of the project manager.

7.7 Time in the Field Versus In-house

Spend no more than 4 hours at a time in the field before transferring the FC information to the base map. More time that that can result in loss of valuable information.

Section 8
SELF-CHECKING

Section 8 Objectives

After you complete this section, you should be able to self-check your base map. The benefits of self-checking are:

- Increase quality
- Creates learning opportunity by looking at map through checker's perspective
- Provides a sense of accomplishment and ownership
- Builds goodwill between base map creator and lead or supervisor who checks the work

8.1 Document Unresolved Questions

Self-checking is an inspection you do before you send the base map to the lead or supervisor.

Self-checking means inspecting a first draft base map before submitting it to the lead or supervisor. Leads and supervisors are responsible for checking maps.

Occasionally, questions arise when creating a base map that cannot be easily resolved. If that's the case, it is very crucial at this stage to document any remaining unresolved questions. The best place to store this information is on the Zquestion layer. Briefly, note the unresolved question and list the steps taken so far to resolve it. Make sure the wording makes sense to others beside yourself.

Self-checking is a chance to resolve questions

More than likely, a thorough check will have to be done before arriving at a solution. It helps during self-checking if there is a clear trail of information to follow. If no documentation of unresolved questions is provided, the lead or supervisor may think the base map drafter just ignored it.

8.2 Using Compilation Research Documents

There is no reason to go over **every** survey point or research document to perform a good self-check. However, use of "compilation" (secondary) research documents helps streamline self-checking. The following is a list of most commonly used compilation research documents: Side Sewer Cards, gas maps and utility maps. See **Section 3.1B**.

8.3 Check the Control and ROW

Compare the control and ROW one last time to the quarter section map to check for omissions or errors. Check to see that stationing labels at control points are orientated correctly. Check also that the distances between control points are correct compared to the survey data and the quarter section map.

8.4 Look Over the Field Check Notes

It's a good idea to see that everything from the field check was added.

8.5 Review Most Recent As-Built Documents

Look over the latest as-built construction documents. They may be used as a reference tool to check the base map for completeness. A good quality and easy to read set of plans will show the existing utilities.

8.6 Conduct Last Check for Street Use Utility Permits

Give one last check to see if there have been any Street Use utility permits issued or completed recently in the area, especially if it has been months since the base map was first assigned.

8.7 Review Base Map Checklist

The Base Map Checklist is very helpful for a self-check. Simply check off items on the list.

8.8 Update the Planform

This is a very important step. Sometimes along the way research documents will be found that were not added to the research list from the start. Others will have no way of knowing additional information was found if the research list is not updated.

8.9 Provide Check Print for the Checker

The check print for the checker should look like a final print. All "Z" layers should be frozen, all line-types should be standard, and all the survey point data should be turned off.

8.10 Provide SPU Records Vault Plans for the Checker

Give the checker all the SPU Records Vault plans. Try to have them assembled as neatly as possible.

8.11 Assemble Research File for the Checker

Finally, assemble your research materials neatly in the research folder. Fold larger documents to fit the folder. Organize the materials and make sure that all hardcopy documents pertaining to the research are in the folder. This also saves time for the checker. Include the following items:

- quarter section map of project area
- scope (if provided)
- Survey Request form (if provided)
- print-out of survey point database
- copy of Survey field book notes
- field check prints
- current Planform
- copies of the Utility Book Map Index
- copies of the utility books
- newer utility permits (if any)
- Side Sewer Cards
- gas maps
- microfilm copies of any SPU Vault plans that are not available.
- significant correspondence and emails
- miscellaneous research documents.

Section 9
CHECKING A BASE MAP

Section 9 Objectives

After you complete this section, you should be able to:

- Quickly become familiar with the project
- See that all materials needed for checking are provided
- Quality check the survey
- Review research records
- Record any errors, omissions, questions or comments

9.1 Become Familiar with the Project

Checking a base map is part of the process for producing this complicated product

A finished base map is a complex product containing many features. Even the most experienced base-mapper is likely to have omitted information or made an occasional error.

As each base map differs depending on the project, so can depth and extent of checking. The checking process also varies according to experience level of the base-mapper. The base map checker must gain experience with the checking process to make this determination.

The primary objective of checking is to assure accuracy and adherence to SPU presentation standard for base maps

It is important to be aware of any significant issues that pertain to the project:

- Briefly Review **Section 2**.
- Check the base map calendar date deadline.
- Read through any correspondence in the research file or project directory.
- Were there any significant problems encountered during creation of the base map?
- Examine the project directory. See that the SPU file naming conventions have been used and that all files needed are available. At a minimum, the base map drawing file should be found in the directory. The following is a list of additional files that are commonly found in the project directory along with the base map:

  Planform

  Estimate

  *** Survey request

9.2 Have a Complete Research File in Hand

The research file must contain all the documents needed for checking before starting the checking process. Review **Section 8.11** for the materials needed for the checking process.

9.3 Use Base Map Checklist

To check a base map, the checker needs to retrace many of the procedures laid out in this manual. Sometimes check takes less detail—other times the same level of detail. Use the Base Map Checklist for this purpose. See **Appendix 1**.

9.4 Planform Must be Current

Verify that all the research documents used during the creation of the base map have been entered on the Planform. Be sure to include any that were encountered after the initial research. Check to see that the “Base Map Info” portion of Planform has been filled out as well.

9.5 Quality Check the Survey Product

It is imperative that this step be completed before proceeding further. Follow the procedures in **Sections 4.3 and 4.4**.

9.6 Check Topography Using Survey Product and Field Check Print

See that the surveyed points have been interpreted correctly and there are no omissions on the base map. Follow the steps in **Sections 4.5 through 4.10**:

1. Open the base map in LDTr3 and go over the point database. It is helpful to have a point printout handy. After a sampling, proceed in detail (or not), depending on the quality encountered so far. Always check significant points for sewer/drainage or water structures, depending on the design use.
2. If you find errors, write down the point number on the check print and comment if necessary. General comments may be added if the same errors occur repeatedly.

3. Check any survey depth information that has been recorded on a “Z” layer. Check to see that all information from the field book (e.g. invert elevations and detail sketches) have been added to the map.

4. Examine the field check print to check that the items noted in the field have been added to the base map.

9.7 Initial Check of the Utility Systems

Perform an initial check of the underground utilities by looking at each one as a system.

EXAMPLE: INTIAL CHECK OF UTILITY SYSTEMS

View all drainage features as a system. Do all the inlets and catch basins show their connections? Are all the catch basins connected to a mainline? Does each building have a side sewer connection?

SPU’s ACAD customization contains a routine that will allow the operator to view each system in one color on the screen while the rest of the base map line work will retain its screened back colors. This is an excellent checking tool.

9.8 In-depth Check of Research Documents

The primary purpose of going through each plan is to check that the elements in **Section 5** have been applied to the base map.

Using Planform as a checklist, review each plan. Then review the side sewer information and all secondary research documents utilized for the base map.

9.9 Creating a Check Print

The notations made on a check print are the primary tool used to communicate with the base map creator, who, most often, makes the corrections. The base map creator should submit a plot suitable for use as a check print. See **Section 8.9**.

If the base map area is simple and the base-mapper experienced, then likely 1 check print will suffice. On many occasions, however, it is necessary to create more than 1 check print. Sometimes, this is due to project complexity or number of comments returned by a checker.

9. 10 Checking in Phases with Multiple Check Prints

If the process outlined here is followed, the checker will have checked the base map in 3 phases:

1. QC the survey product. This phase includes control and ROW.
2. Check the topography and the field check print.
3. Check the underground utilities.

A) MULTIPLE CHECK PRINTS

Multiple check prints can make the correction process easier for the inexperienced base-mapper and for checking complex areas. Comments don't seem so overwhelming if delivered on separate sheets.

The multiple-check-print method also enforces the concept of completing each phase of base map creation before proceeding to the next. It can illustrate how accuracy early on helps prevent multiple errors later.

B) HOW MANY CHECK PRINTS ARE ENOUGH?

It is very typical to create 2 check prints but more can be made if necessary, especially for very complex areas or new base mappers:

	COMMENTS
Check Print #1	control ROW topography • SPU presentation standard of the above items
Check Print #2	• Primary Research Documents • Secondary Research Document • City of Seattle *Standard Plan* references

C) MULTIPLE CHECK PRINTS CAN SAVE TIME

Corrections can be being made to a first check print while a second check print is being produced.

9.11 Color Coding Check Prints

It is traditional to use the color red to indicate errors and blue for comments. Blue may also be used to note an unimportant error that does not need to be changed, but rather remembered for next time. Use any color, as long as you indicate what it means.

9.12 General Comments

When certain errors are found repeatedly, it is a good idea to write a general comment rather than pointing out the same error over and over.

9.13 Labeling

Initial and date every check print on the bottom right. If multiple check prints are used, label the phases contained on each check print as well.

9.14 Final Check

After the corrections have been completed the check prints will be returned for a final check. If multiple check prints are used then label them “Sheet 1 of __” and “Sheet 2 of ___” and so on. Then staple them together on the left edge. If new check prints are generated for final corrections, then label and staple them as well.

9.15 The Intent of Corrections on Check Prints

The tone of the corrections made by the checker is educational. The checker should be careful not to scold. Corrections should give just enough information so the person performing the work knows how to proceed, without doing the work for them. When in doubt, pose corrections and comments as questions rather than directions.

The comments directed to an inexperienced base-mapper would be different than those directed towards the more experienced base-mapper.

EXAMPLE: INTENT OF CORRECTIONS

A horizontal bend in a gas main is drawn at the wrong location. For the experienced base-mapper, all that may be necessary is a comment pointing to the incorrect bend saying, “See utility book 271-45 pg. 45.” Yet the inexperienced base-mapper may need a sketch of the correction along with the comment.

Section 10
CORRECTING CHECK PRINTS

Section 10 Objectives

After you complete this section, you should be able to:

- Identify the 3 basic types of corrections
- Color code check prints
- Understand differences of opinion
- Highlight your questions to a comment

10.1 Types of Corrections Found on Check Prints

Corrections are part of producing a highly detailed product

Base maps are detailed and complex. Some corrections will always be needed after a check. The checker's primary focus is accuracy and SPU presentation standard. The checker's primary form of communication is a set of check prints that contain comments, questions, omissions, and corrections. Read over the check print and ask questions that may arise.

The following are the 3 types of correction found on check prints:

1. Redrawn Correctly. Some corrections may show an item that needs to be redrawn due to errors in research or deviation from the SPU Presentation Standard.
2. General Error Note. If an error or omission is repeated throughout the base map the checker may make a general error note rather than pointing it out repeatedly.
3. Comments/Questions. The checker may pose questions or make comments.

10.2 Color Coding Check Prints

The checker may have used various colors as a communication tool. The meaning of the colors should be clear. If not, ask. For example, it is traditional to use red to indicate errors and blue for comments. Blue may also be used to note an unimportant error that does not need to be changed.

10.3 Difference of Opinion

During the correction process these differences of opinion can arise:

- Some research records are ambiguous or contradictory.
- In some instances, the checker may not be able to resolve an issue and may be suggesting more research is required.
- It is possible that the checker may have made errors.

The base-mapper should highlight each question or comment a she or he revises the map

If the check print contains corrections with which the base-mapper disagrees, it is strongly encouraged and very important the issue be discussed. A questionable correction on a check print should never be carried forward without dialogue. A discussion between base-mapper and checker/supervisor should resolve it.

10.4 Highlight Completed Items

The base-mapper should highlight each question or comment as the base map is revised. If there is a response to a checker's comment, it should be noted on the check print. Proceed with the corrections, marking out each one with a highlighter pen as they are completed.

10.5 Sign and Date

The drafter should sign and date the check print on completion of corrections to the base map.

Section 11
ARCHIVING

Section 11 Objectives

After you complete this section, you should be able to:

- Archive a completed base map into the correct database
- Store research files properly

11.1 Archived Base Maps and Their Database

*** *Archiving* a completed base map is critical. A*rchiving* ensures that base maps are available for future use. The *archiving* process is in transition. More details will come.

Material in research folders can be used for many purposes.

Each base map is archived as an ACAD file. Besides creating an ACAD file information is added to a data base as well. This information is very useful if the base map is to be reused.

The following are examples of the database information for each base map:

- narrative of the geographical location
- base map history
  - scanned manually-created base map?
  - reused ACAD file?
  - full base map?
- survey history
- creation date.

See **Appendix 3, Figure 6** for archiving instructions.

11.2 Why Archive the Research File?

The information contained in the research folders can be used for several purposes and are kept for our protection. For information on the content of a research folder See **Section 8.11**.

A) CONSTRUCTION

During the construction phase of a project, problems may arise with the existing conditions reflected in the base map.

EXAMPLE: HOW RESEARCH FOLDERS ARE USED

A *side sewer* may be revealed by trenching but not be shown on the base map. This *side sewer* may necessitate a design change mid-construction, a costly delay. We may be asked to trace our research to see if this was due to a research error.

B) PROFILES

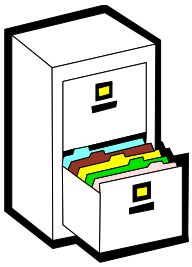
The information contained in a research folder oftentimes is used to create profiles for that project.

C) EXPANSION OF SCOPE

The *scope* of a project can change at any time during the design or pre-construction. If an expansion of the area is required, then the research file will not have to be recreated.

D) DESIGN QUESTIONS

At any time during the design and construction, questions may arise that can only be answered by having the research file available.



11.3 Storage of the Research Files

The research files are stored in filing cabinets located in the Base Map group area. Several tasks should be performed for correct storage:

A) STORE FILES ALPHA NUMERICALLY

These files should be stored alpha numerically, by job number.

EXAMPLE: HOW ALPHA NUMERICAL FILING WORKS

C3AA402 will be filed before C399406.

B) DELETE UNNECESSARY HARD-COPY ITEMS

Items such as the plan list or estimate are stored electronically in the Base Map group's project directory. They do not need to be stored in the hardcopy research folder.

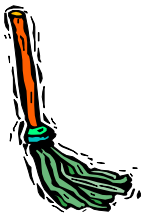
C) COMPACT STORAGE

The file itself should be neatened up for compact storage. Larger items such as *field check* prints should be trimmed smaller. Eliminate paper rings and paper clips. Use a heavy-duty stapler if needed instead.

D) FILE FOLDERS

Depending on the size of the project, one or more folders may be needed for storage. Assemble a hanging folder with a tabular label noting the job number. Place the research folder inside. This process may be repeated to accommodate larger projects.

When construction is complete and the project has been *as-built*, the research folders can be thrown away.



11.4 Cleaning up Project Directory

As a final step, inspect the project directory and eliminate any intermediary files you may have created during the base map creation process.

11.5 Return Research Materials

Return all checked out original research materials to their places. This is an important step to keeping good working relations with those groups we depend on for information. If the item is not from the SPU *records vault*, make a copy before returning it.

Section 12
CUTTING PROFILES

Section 12 Objectives

After you complete this section, you should understand:

- Cutting profiles is an non-routine request
- SPU presentation standards apply to profiles
- Layers and line types for profiles are the same as those for base maps
- How to prepare profiles

12.1 Profile Request

A profile is an elevation view of a designated alignment contained within a base map. Profiles are created only when a designer or engineer requests one to aid with their design process. Profiles provide elevations of the existing grade and utilities near a proposed alignment. The role of the Base Map group in profile creation is to help the designer reflect existing conditions in a profile view. See **Appendix 2, Figure 14A.**

Before the designer can request a profile, they must know the location of their proposed alignment. The completed base map can influence that decision because the base map may reveal potential utility conflicts with the proposed design.

SPU's Presentation Standards are critical to profiles.

12.2 Presentation Standard

Some may say there is no presentation standard for profiles because we have yet to develop SPU CAD/Civil Software customization for this process. Nevertheless, there is an SPU Presentation Standard for profiles. It is modeled after the presentation style used in manual profile drawings of the past and is directly related to the current SPU Presentation Standard for base maps.

12.3 Layers and Line Types

The layers and line types used to represent the existing utilities in profiles are the same as those used for base maps.

12.4 Symbols

There are no symbols available as blocks for profiles. However, there should be because certain items are used over and over again. In the interim, create your own blocks or reuse features from other profiles. Draw all structures to their outside, rather than inside, dimensions. Remember to draw each item to reflect the differential scale of the profile standard.

The following is a list of typical symbols needed in a profile. See **Appendix 2, Figure 14B.**

A) PIPE CROSSINGS

Pipe crossings are represented as ellipses. See **Section 12.16**.

B) MAINTENANCE HOLES

See the City of Seattle *Standard Plans* to determine the correct dimensions of MH structures.

i) Concentric

If a structure is concentric, then a cone shape is drawn to reflect the chimney.

ii) Non-concentric

If a structure is non-concentric, then the access chimney will need to be drawn in its correct location.

iii) Outside Bottom Elevations of MH Structures

Every MH structure's depth is determined by the invert elevations of the pipes that it contains. Therefore, this is not a dimension that can be found in City of Seattle *Standard Plans*. Given this limitation, the bottom outside elevation of MH structures is not shown exactly in profiles, but instead estimated. The usual procedure is to show the bottom elevation of the MH structure a minimum of 8 inches below the lowest invert elevation given.

C) VAULTS

Vaults are usually rectangular shaped structures. Some vaults have access chimneys like MHs.

A great deal of information about vaults is available in the franchise utility books. The books offer information such as headroom (distance from floor to ceiling) and inside dimensions of the vault along with the wall thickness. The depth of the chimney, from lid of the vault to the ceiling is sometimes also given.

D) HAND HOLES, CATCH BASINS, AND POWER POLE FOUNDATIONS

For dimensions see the City of Seattle *Standard Plans***.**

E) RAILROAD TRACKS

Draw each track as a section of an I-beam or borrow the railroad tracks drawn in another profile.

12.5 Using Existing Elevation Data to Create a Profile View

Special attention must be paid to the source and type of elevation data being used to create the profile view of existing conditions. This information comes from 2 primary sources: survey data and historical engineering documents.

Depth information is given 2 ways. One is given as a relative depth from a known elevation. The other is an actual elevation.

A) RELATIVE DEPTHS

Relative depths are given in relation to a known feature, mostly the depth under the existing grade. Existing utility research records provide most of the relative depth information. The most common form of relative depth information comes from notes found on as-built research records that have encountered existing utilities during construction.

Relative depth information can also be given as the distance below or above another existing utility or feature.

i) Below

Most relative depth information is given as a distance below a known feature.

EXAMPLE: RELATIVE DEPTH

A telephone franchise utility book states that the telephone conduit is buried 4.5 deep below the existing grade.

ii) Above

Occasionally relative depth information can be given as the distance above a known feature.

EXAMPLE: USING EXISTING ELEVATION DATA

A water main as-built plan shows that a service drain was encountered 1.5' above the proposed water main.

B) ACTUAL ELEVATIONS

An actual elevation is an elevation given in reference to a known datum. Actual elevations come from survey data and as-built research records.

BEWARE: ACTUAL ELEVATION

If depth information is given in the form of an actual elevation from research records, it is highly likely that it will not be in the same datum as our survey data. A datum conversion will be necessary to place the crossing utility at the correct elevation on the profile.

12.6 When is Datum Conversion Necessary?

Due to technological advances in satellite technology, SPU's survey group has made a progressive switch from City of Seattle Datum to NAVD88 Datum (North American Vertical Datum) as recently as 2001. Therefore, when using actual elevations from historical as-built records to create profiles it becomes necessary to perform a datum conversion to NAVD88.

12.7 Datum Conversion Factors

There are over 100 years of historical as-built research records in SPU's Records Vault and most of those exist in other datum besides NAVD88. In fact, very few as-built plan records will be in NAVD88 because the switch to that datum was so recent. Of course, that will change as time passes and more CIP are completed.

A) CONVERSION FROM CITY OF SEATTLE DATUM TO NAVD88

No generic number is used to convert City of Seattle Datum to NAVD88. This is due to the precise information provided by satellite technology. City datum and NAVD88 vary by several inches. Thus they are localized conversion factors for various areas within the city.

SPU's survey group will provide a localized conversion factor along with their survey data. This factor is found in the Datum Block included with each base map. If no localized conversion factor is provided in the Datum Block, then contact SPU's survey manager. Do not use the 'generic' conversion factor provided in the City of Seattle *Standard Plans* for datum conversion from City of Seattle Datum to NAVD88 unless no other information is available. However, an average difference is from 9.6' to 9.7'.

B) CONVERSION FROM KING COUNTY AND METRO DATUM TO NAVD88.

Presently, most as-built research records in SPU's Records Vault are in City of Seattle Datum. However, there is the occasional research record encountered that is in King County or Metro Datum.

If one of those records is to be used to create the profile, then it is necessary to convert their datum to City of Seattle Datum before proceeding. This can be done by referring to the conversion table found in the City of Seattle *Standard Plans,* Plan No. 001.

Once the King County or Metro Datum has been converted to City of Seattle Datum then follow the step described above and converts from City of Seattle Datum to NAVD88.

12.8 Using Invert Elevation Data

Invert elevations are measurements given at the bottom inside lip of a pipe as it enters or exits a MH or other structure. It is the most common method for expressing the elevation of sewer and drainage mainlines. Invert elevation data can come from either survey data or as-built plans. Always choose current survey data over plan information. Invert elevations are usually given as actual elevations by either survey or the plan that built it. However, occasionally they are given as relative depths from the current survey, and are called 'measure downs', the distance from the MH rim to the invert elevation.

A) INVERT ELEVATIONS FROM SURVEY DATA

When survey crews gather invert elevation data, they start out with a relative depth. A measurement is taken from the MH lid on the surface down to the bottom inside of the pipe, better known as a "measure down."

The measure downs are then converted to actual elevations. The only time invert elevations are given to the Base Map group as relative depths is when the Survey group has not reduced their data to actual elevations.

B) INVERT ELEVATIONS FROM AS-BUILT RECORDS

As-built records give invert elevations as actual elevations.

12.9 Portraying Invert Elevation Data in Profiles

An invert elevation is a measurement taken from the bottom inside wall of a pipe. It is necessary to determine where that point is in relationship to the existing utilities as they are drawn. The urge may be to place the bottom of existing utility on that point. That is not correct. To accomplish correct placement of existing utilities at invert elevations, see **Appendix 2, Figure 14C.**

12.10 Where to Look for all Types of Elevation Data

The following section describes where to find elevation data:

A) SURVEY POINTS DESCRIBED AS "IE"

B) "Z" LAYERS ON BASE MAPS

The most expedient method of obtaining depth information is by accessing the "Z" layers of the base map where depth information has been recorded. When the Z layer(s) are thawed, the depth information can be found in proximity of the object in question.

ZREF is a layer that contains reference information from research records. That information typically includes a plan or utility book number along with depth or elevations data.

C) STANDARD DEPTHS

If both the survey and research records do not yield the depth information needed, then draw the crossing utility at its standard depth. See ***Standard Plan* No 030.**

12.11 Parts of an Existing Profile

Existing profile drawings consist of several parts. See **Appendix 2, Figures 14D,G.**

A) EXISTING GRADE

Every profile will show the existing grade. This is the elevation of the ground above the proposed alignment.

B) EXISTING UTILITIES

Existing utilities are shown as crossing or parallel to the proposed alignment. Even though these existing utilities may not be exact perpendicular crossings or exactly parallel to the proposed alignment, they are still portrayed either one way or the other. The 2 methods may also be combined to show a utility running parallel and then turning to cross the proposed alignment.

In addition, the elevation of each existing utility is shown.

C) CALLOUTS

There are several types of callouts that label the existing features in a profile:

i) Parallel Utilities

The parallel utilities are labeled similarly to those on a base map.

ii) Utility Crossings

The utility crossings are labeled on a vertically drawn line with the lower end located just above existing grade at the point the utility crosses the

proposed alignment. The text is always on the left side of the line and is facing left.

iii) Existing Invert Elevations

The existing invert elevations of any pipes in the profile area are called out. The callout looks similar to the utility crossing callout, but extends down from the existing maintenance hole structure, not up from the existing grade.

Most invert elevations are given by survey. For those that are not, the invert elevation is given per plan and should be labeled "PER PLAN."

iv) Monument and center lines along with the street name

v) Street Margins (ROW Lines)

vi) Disclaimers

Just as in a base map, a profile can also contain disclaimers in its callouts. In fact, the disclaimers in callouts on the base map for the existing utilities should be copied onto the profile.

There is a disclaimer label that is unique to profiles and may be added to a callout along with other standard base map disclaimers. This unique disclaimer is "DEPTH?." It means that that all the research resources to determine the depth of the existing utility have been exhausted.

D) DIFFERENTIAL SCALE

The SPU Presentation Standard for a profile scale is normally 20' per inch horizontal and 10' per inch vertical. In rare instances, scale may change, but the horizontal scale will remain 2 times smaller than vertical scale **Appendix 2, Figure 14I**.

E) GRID

Each profile will have a grid to mark the horizontal and vertical distances.

F) ELEVATIONS

The horizontal lines of the grid indicate the elevation at that mark.

G) CONTROL

The vertical lines will mark the stationing along the proposed alignment.

H) TITLE

The profile has a title that indicates the following information:

- Location
- Orientation
- Scale..

See **Appendix 2, Figure 14I**.

12.12 Design Needs: What Can Vary?

Just as with base maps, the content of profiles may vary slightly depending on the needs of the project.

A) SPU DIVISION DESIGN EMPHASIS

SPU's Water Division will want water structures emphasized, while the Drainage, Wastewater and Solid Waste Division will expect the emphasis to be on their various existing sewer and drainage structures.

B) SCALE

Just as with base maps, the scale of profiles may vary on occasion.

C) CONTROL

Most commonly, sewer and drainage design will base their control on the street stationing, while water design will use pipeline stationing.

D) SIDE CONNECTIONS

Drainage/Wastewater and Solid Waste Design use a slightly different depiction of side connections than does Water Design.

i) For Sewer & Drainage Design

Sewer and drainage design chooses to depict side connections shown at their interpolated depth on the profile. The following disclaimer note should be attached to the profile: *"Side connection crossings are calculated and are shown at their approximate depth."*

ii) For Water Design

Water Design chooses to depict side connections at the depth of the connection near the property line. The following disclaimer note should be attached to the profile: "Side connection crossings are depicted at their depth at the property line and are approximate."

12.13 Label Known Locations

Project all street center and ROW lines that cross the proposed alignment into the profile, and then label each. See **Appendix 2, Figures 14 E**.

12.14 Generate the Profile Grid and Existing Grade

*** The process for generating the grid and existing grade is a complex process that is accomplished through use of SPU's civil engineering software. There is no formal process at this time.

12.15 Locate Utility Crossings by Projection

Use the following steps to project utility locations that cross a proposed alignment:

A) LABEL THE CROSSINGS

B) REDISTRIBUTE THE LABELS

Occasionally, there is a cluster of utilities crossings so close together that it makes labeling difficult. The labels may redistribute into a fan shape to accommodate the situation. See **Appendix 2, Figures 14 E,F**.

12.16 Draw Ellipses to Represent Utility Crossings

Most pipes are round, but utility crossings are drawn as elliptical rather than round shapes to reflect the differential scale of the profile.

EXAMPLE: ELLIPSES

In a 20 horizontal and 10 vertical scale profile, a pipe with 12 inches outside diameter is drawn as an ellipse that is 12-inches wide and 24 inches long.

12.17 Utilities Crossing Under 6-Inch Diameter

Utilities crossings under 6” in diameter may not show up clearly if drawn to their exact scale. Therefore, draw all the utility crossings under 6” as ellipses that are 6” wide and 12” high.

12.18 Utilities Crossings 6-Inch Diameter or Greater

Draw utilities crossings 6“ in diameter or greater as ellipses and to their correct outside diameter.

EXAMPLE: ELLIPSES FOR 6-INCH OR GREATER DIAMETER

A 12-inch sewer pipe has an outside diameter of 1.33 feet. Draw the ellipse 1.33 feet wide and 2.66 feet high.

12.19 Review Before Proceeding

The following steps should be complete at this point:

- The crossing utilities have been located on the profile by projection lines from the base map.
- The crossing utilities have been labeled.
- An ellipse has been drawn to represent the crossing utility and has been placed on its projection line.

12.20 Determine Depth or Elevation of Crossing Utility

The next step to creating a profile is to determine the depth of each crossing utility:

- Will depth information come from current survey or as-built plans?
- Is elevation data given as a relative depth?
- Is elevation data given as an actual elevation?

- Is elevation data given as an invert elevation?
- Standard depth may have to be determined in the absence of elevation information.

12.21 Placing Crossing Utility at Correct Elevation

Once the depth or elevation of the crossing utility has been determined, the ellipse must be moved up or down along the vertical projection line to its correct elevation on the profile grid.

There are three primary steps to placing a crossing utility at the correct elevation. This process will vary slightly, depending if the information given is a relative depth or an actual elevation, however the common steps are listed below:

A) ESTABLISH A BASELINE

This is accomplished by establishing a baseline at a know elevation and then offsetting the crossing utility to the desired elevation. The ellipse is then moved to the desired elevation.

B) OFFSET THE BASELINE TWICE THE DISTANCE

Due to the differential scale of the profile, every baseline offset must be moved two times the desired distance. It is very important to remember to perform this step every time a baseline is offset.

C) DETERMINE THE PROXIMITY OF THE ELLIPSE

The proximity of the ellipse to the offset base line must be determined. It will be placed either under, over, or at an invert elevation.

If the ellipse being moved is given as an invert elevation then special care must be taken.

12.22 Placing Crossing Utilities at Invert Elevations

An invert elevation is a measurement taken from the bottom inside wall of a pipe. It is necessary to determine where that point is in relationship to the ellipse as it is drawn. The urge may be to offset the base line to the invert elevation and then place the bottom of the ellipse on that line. That is not correct. To correctly place the ellipse follow these steps: **See Appendix 2, Figure 14C**.

- Offset the baseline to the invert elevation.
- Determine the wall thickness of the pipe. See Appendix III, Figure 16.
- Offset the invert elevation line downward the distance of the wall thickness of the pipe.
- Move the bottom of the ellipse to the lowest offset line.

12.23 Placing Crossing Utilities at Relative Depths

Establish the baseline by determining what object the relative depth is given from, usually the existing grade. Then draw a horizontal construction line at this elevation and offset it the appropriate distance.

Next decide if the ellipse should be placed above or below the offset base line. In almost every case, move the top of the ellipse to the offset baseline, because most relative depths are given as the depth under an object, not over.

12.24 Placing Crossing Utilities at Actual Elevations

The process for placing crossing utilities at actual elevations is slightly different than for relative depths.

Establish the baseline by assigning it to one of the horizontal grid lines on the profile. Each of the horizontal gridlines is located at a known elevation. Draw a construction line over the grid line if necessary and then offset the baseline the to the desired location.

12.25 Drawing Existing Parallel Utilities

It is very likely existing utilities are parallel or nearly parallel to the proposed alignment as reflected on the base map. Existing parallel utilities that are located within 10’ on either side of the proposed alignment need to be shown in profile view. Often, an existing parallel utility is the subject of the profile view.

EXAMPLE: EXISTING PARALLEL UTILITIES

The proposed alignment is over a sewer main line from MH to MH.

A) BASIC PROCEDURES

The basic procedures for drawing parallel utilities are very similar to those for drawing crossing utilities. The steps, however, are in a different order:

1. Establish the elevation.
2. Draw the parallel utility.
3. Offset 2 times the distance to reflect a differential scale.
4. Label the parallel utility.

B) PARALLEL UTILITY ELEVATIONS PROCEDURES

The following are steps for establishing the elevation of an existing parallel utility:

1. Establish a baseline to use for offsetting.
2. Determine if datum conversion necessary.
3. Determine if the elevation data is given as a relative depth?
4. Determine if the elevation data is given as an actual elevation?
5. Determine if the elevation data is given as an invert elevation? (See **Section 12.26**)
6. Standard depth may have to be determined in the absence of elevation information.

C) DRAW THE EXISTING PARALLEL UTILITIES

Most existing parallel utilities can be shown intermittently or as needed to avoid clutter in the drawing. If the parallel utility is the subject of the profile, then it must be shown entirely.

D) LABEL

Label the existing utility as if it were on a base map. If the depth is unknown, then label “DEPTH?”.

12.26 Drawing Existing Parallel Utilities with Invert Elevation

Take special care when using invert elevation data to draw existing parallel utilities. The urge may be to draw the bottom of the parallel utility at the same elevation of the invert elevation. This is incorrect. Instead:

1. Draw the parallel utility line from the invert elevation to the next invert elevation or at the correct slope.
2. Determine the wall thickness of the pipe.
3. Offset the line downward the distance of the wall thickness.
4. Offset the lowest line the distance of the outside diameter of the pipe.
5. Erase the first line drawn, which is the inside bottom wall of the pipe.

12.27 Additional Callouts for Existing Utilities

By now, each existing utility has been drawn in profile view and labeled. Some circumstances require additional callout information:

A) INVERT ELEVATIONS AT EXISTING MAINTENANCE HOLES

Existing MHs need to be labeled with their invert elevations. See **Appendix 2, Figure 14H**.

B) UNABLE TO DETERMINE THE DEPTH.

For those existing utilities where no depth information was available, label “DEPTH?”.

C) PIPE MATERIAL

Pipe material information, if available, should be added to an existing utility if it is the subject of the profile view.

12.28 Title the Profile View

In most cases, the profile view should be labeled with a title to allow a profile drawing to stand alone. The title should include alignment view and direction from which it is viewed. The scale should also be included. For lettering size and labeling presentation standard, see **Appendix 2, Figure 14I**.

12.29 Grid Standard

Designers who use profile view determine the final appearance of the grid. However, the automated process that produces the existing grade also produces a grid. Use the automated grid for now. Make certain it contains stationing of the proposed alignment and numbers marking the elevations (usually every 10').

Tips: Cutting Profiles

Do the following in order:

- Generate the existing grade.
- Mark centerlines and street margins.
- Label existing utility crossings.
- Draw existing utility crossings.
- Draw existing MHs or other structures along the proposed alignment.
- Draw existing parallel utilities.
- Label existing parallel utilities.
- Add extra callouts for invert elevation, pipe materials, and disclaimers.
- Make a title.

Appendix 1
Base Map Checklist

The Base Map Checklist is to be used by base map drafters and those interested in reviewing or building understanding of the base map process. This document is integral to the training function of this *Guide*. It is presented here as Appendix 1. A copy is also inserted into the inside cover of the *Guide*. And the checklist is included in Appendix 3, which is a collection of base map production support documents.

Base Map Checklist

Project Name:_____ **Job #:**

This checklist is a tool to help the base map drafter create more accurate maps. It follows the SPU process for base-mapping. Use it in tandem with the *Guide to SPU Base Map Production*.

Section 1: Fundamentals of Base Mapping
General review for base map drafters, leads and supervisors

Section 2: Starting a Base Map		**See**
• Meet with supervisor or lead	❑	2.1A
• Review survey/base map request	❑	2.1B
• Review project scope	❑	2.1C
• Do you need to visit the site?	❑	2.1D
• Are there any photos for the area?	❑	2.1E
• Start research folder. Include map of project area.	❑	2.1F
• Check for existing base maps? (Manual or AutoCAD)	❑	2.2A,B
• Plan base map presentation, orientation, and scale	❑	2.3
• Review or create estimate. Determine project deadline.	❑	2.4

Section 3: Conducting & Organizing Research		
• Start *Planform*	❑	3.3
• Research and check-out engineering plans from the SPU Records Vault or plot from Virtual Vault	❑	3.4
• Research & copy Franchise Utility Books	❑	3.5
• Copy side sewer cards	❑	3.6
• Order Gas maps	❑	3.8
Tips on research tasks	❑	*Tips*

Section 4: Using Topographical Survey		
Quality-Checking (QC) the Survey Product:		4.3
• Verify control points	❑	4.3A
• Verify & draw control lines if needed	❑	4.3B
• Verify accuracy of *right-of-way* lines	❑	4.3C
• Are there street names and North arrows in the drawing?	❑	4.3D
• Check for stationing in the drawing	❑	4.3E

Section 4: Using Topographical Survey (cont.)		
• Make sure the *datum block* is completely filled out	❑	4.3F
• Verify coordinate system and datum of the drawing	❑	4.3G
• Verify that the point data in LDT is available	❑	4.3H
• Verify that all the survey depth information (invert elevations) is in the drawing (sewer & drainage jobs only)	❑	4.3I
• Was survey/base map request satisfied?	❑	4.3J
Change Control & ROW to SPU Presentation Standard:		4. 4
• Add correct symbol to control points if missing	❑	4.4A
• Label control lines with correct text symbol	❑	4.4A
• Distinguish between *ROWs*, ordinances & easements by using correct line types	❑	4.4B
• Change street names to correct text height & place North arrows near main street names.	❑	4.4C
• Change stationing to SPU presentation standard	❑	4.4D
• Orient/resize the *datum block*	❑	4.4E
Apply the Survey Product to the AutoCAD Drawing:		4. 5A-D
• Browse through the survey points (see 4.5A-D to find out how to interpret the survey point database)	❑	4.8A
• Change Survey's line work and symbols to SPU presentation standard and add text labels to symbols as needed	❑	4.8B
• Develop and record field check questions	❑	4.8C
• Eliminate incomplete line endings	❑	4.8D
• Label topographic features with text	❑	4.8F
Tips on using Survey's data	❑	Tips

Section 5: Interpreting Research		
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• Proceed chronologically	❑	5.2
• If using existing base maps	❑	5.3
• Add research references	❑	5.4
• Do not use existing conditions shown on as-builts	❑	5.5
• Look for key information	❑	5.6
• *Tips for interpreting research*	❑	Tips

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• Helpful hints for older vault plans	❑	6.3
• Helpful hints for vault plans	❑	6.4

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• Paving plans	❑	6.6
• Sewer & drainage plans	❑	6.7
• Side sewer cards	❑	6.8
• Water main plans	❑	6.9
• Electrical, signal, lighting, & communications.	❑	6.10
• Bridges and structures	❑	6.11
• Landscaping Plans	❑	6.12
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• Using secondary resources as checking tool	❑	5.19
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Tips for Applying Research	❑	Tips

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Section 8: Self-Checking the Base Map		
• Document unresolved questions	❑	8.1
• Use compilation documents for self check	❑	8.2
• Review the control and right-of-way	❑	8.3
• Review field check notes	❑	8.4
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• Conduct last check for street use utility permits	❑	8.6
• Review base map checklist (this document)	❑	8.7
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• Have a complete research file	❑	9.2

Section 9: Checking a Base Map		
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Appendix 2
Presentation Standards and Examples

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14D	Parts of a Profile
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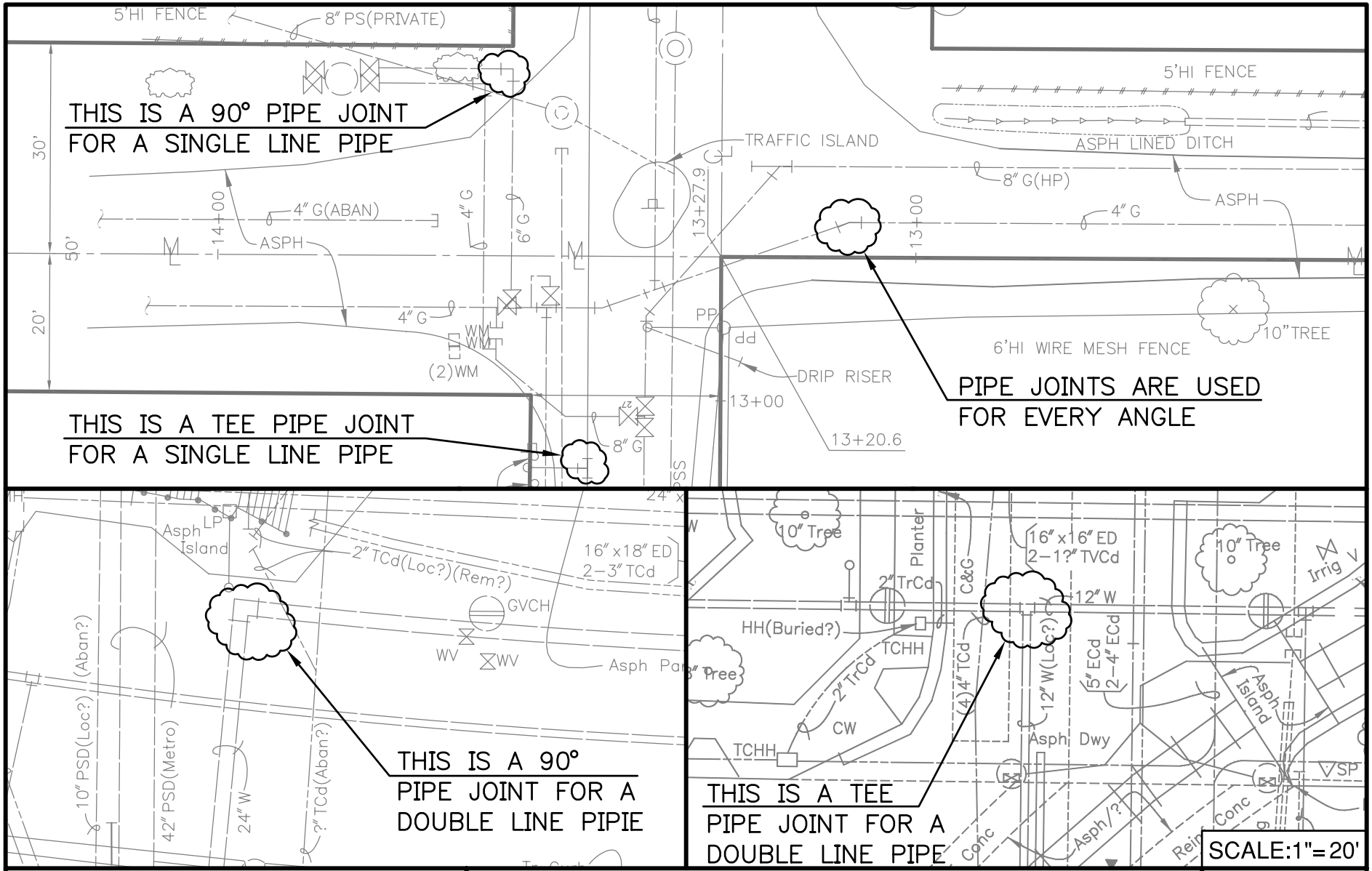

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PIPE JOINTS

FIGURE NO.
1A

SCALE:1"=20'

FIGURE NO. 1B

PIPE ENDS

SINGLE LINE PIPE

PIPE CONTINUES

DOUBLE LINE PIPE

PIPE CONTINUES

SINGLE LINE PIPE

PIPE ENDS

DOUBLE LINE PIPE

PIPE ENDS

SINGLE LINE PIPE

PIPE PLUGGED

DOUBLE LINE PIPE

PIPE PLUGGED

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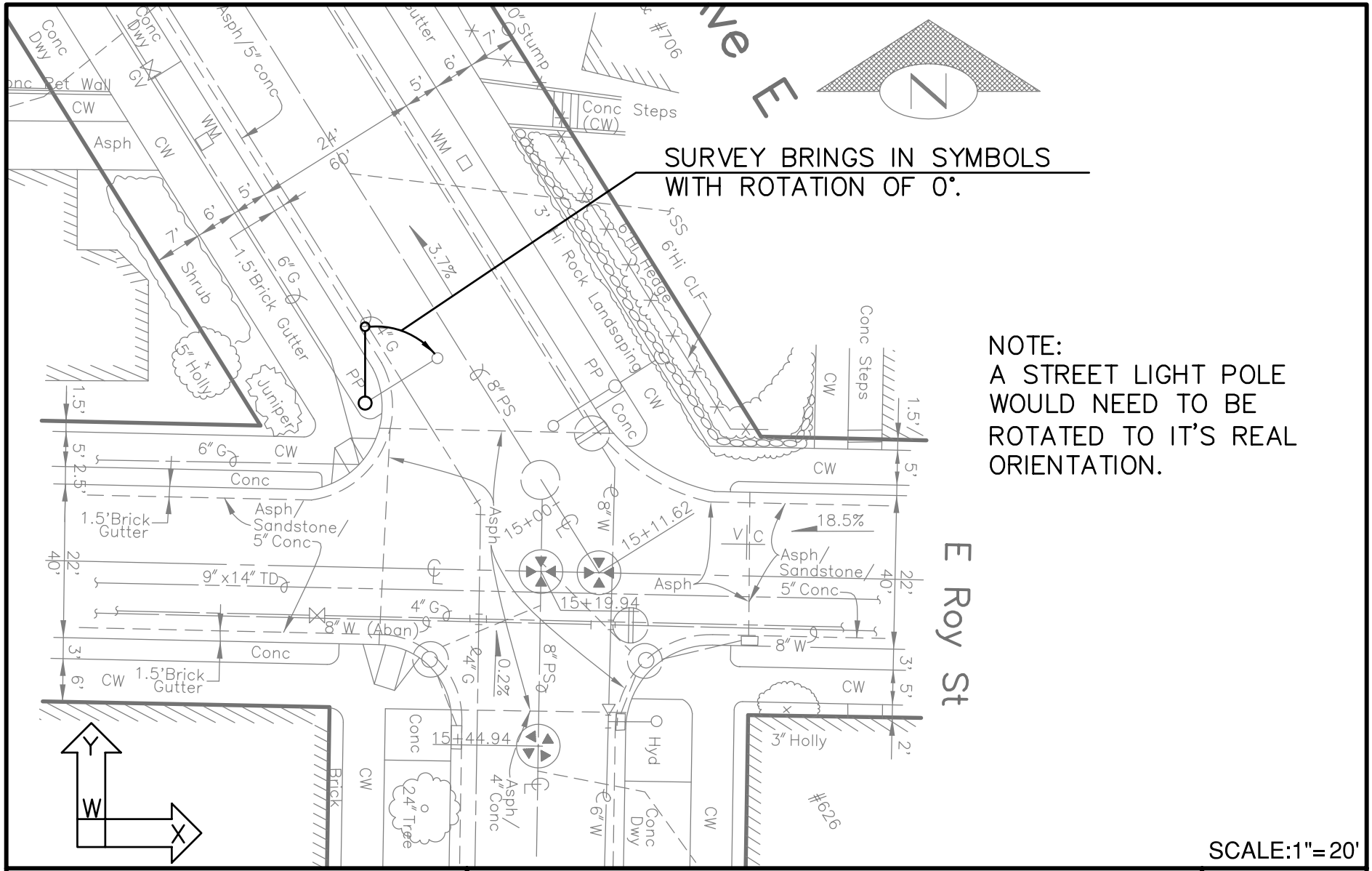

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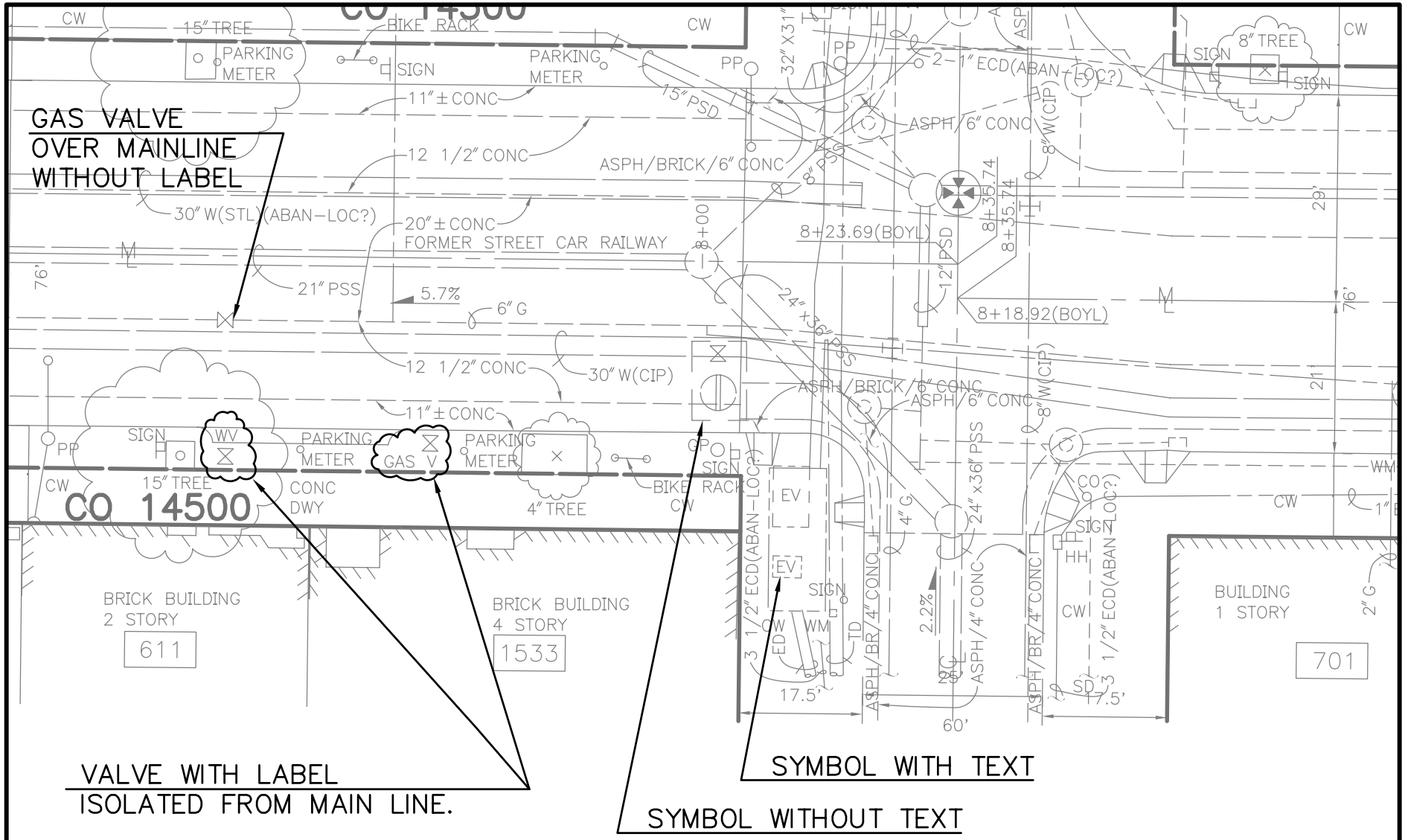
ORIENTATION OF SURVEY SYMBOLS

FIGURE NO.
2A



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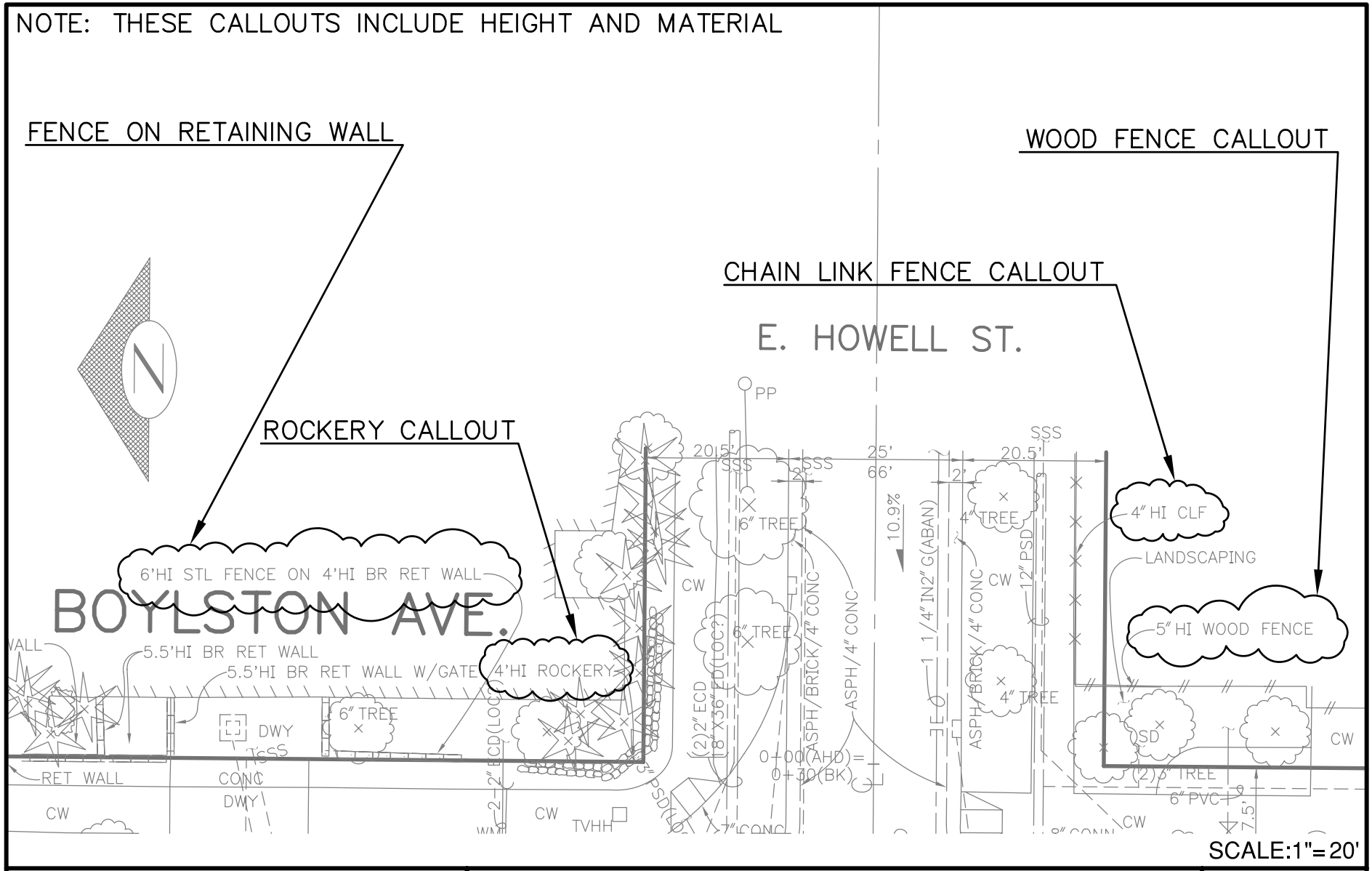
TEXT LABELS FOR SYMBOLS

FIGURE NO.
2B

NOTE: THESE CALLOUTS INCLUDE HEIGHT AND MATERIAL



SCALE:1"=20'

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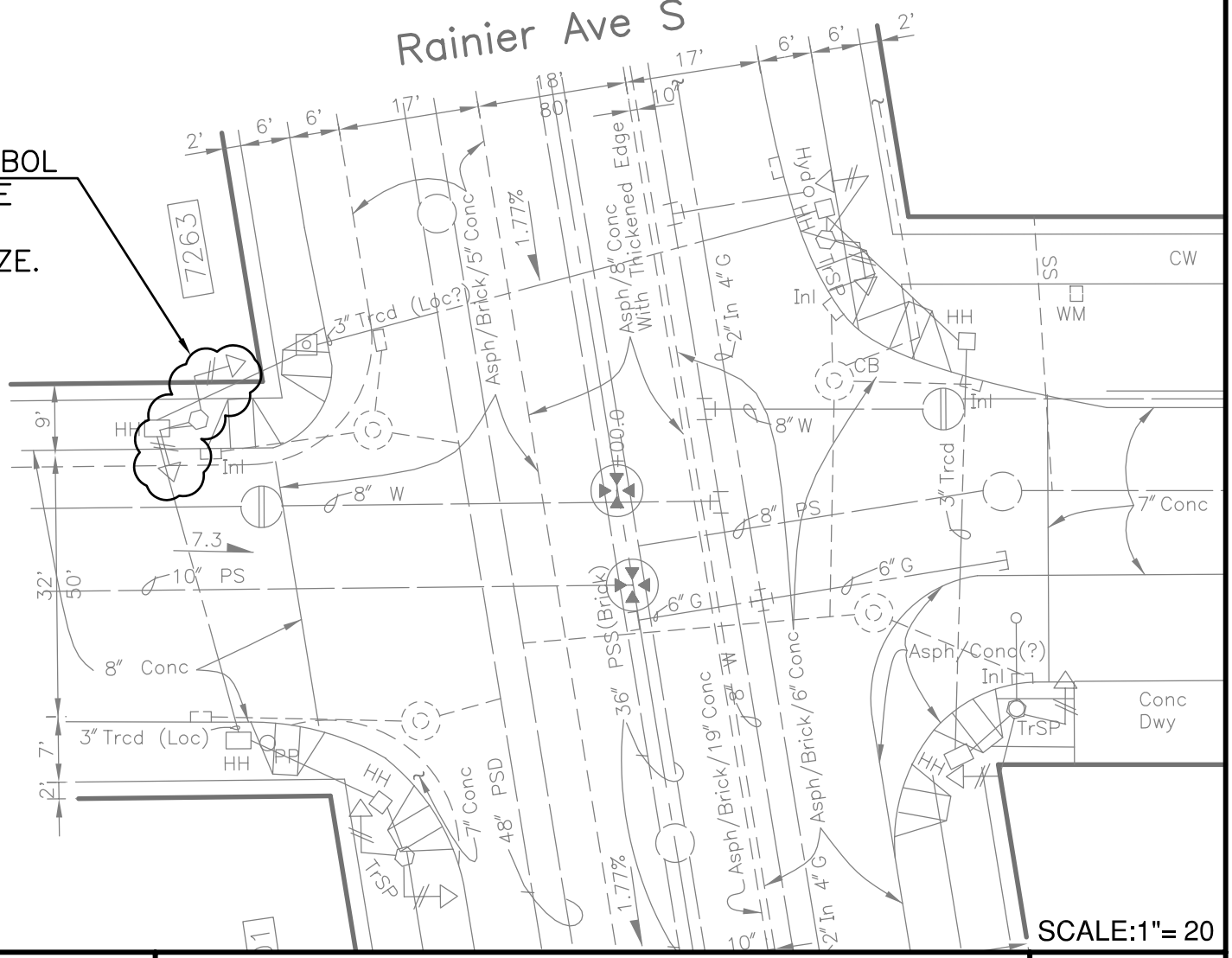
RETAINING WALLS, ROCKERIES, & FENCES

FIGURE NO.
2E

PEDESTRIAN LIGHT SYMBOL
SCHEMATIC BLOCKS ARE
DRAWN MUCH LARGER
THAN THIER ACTUAL SIZE.



SCALE:1"= 20

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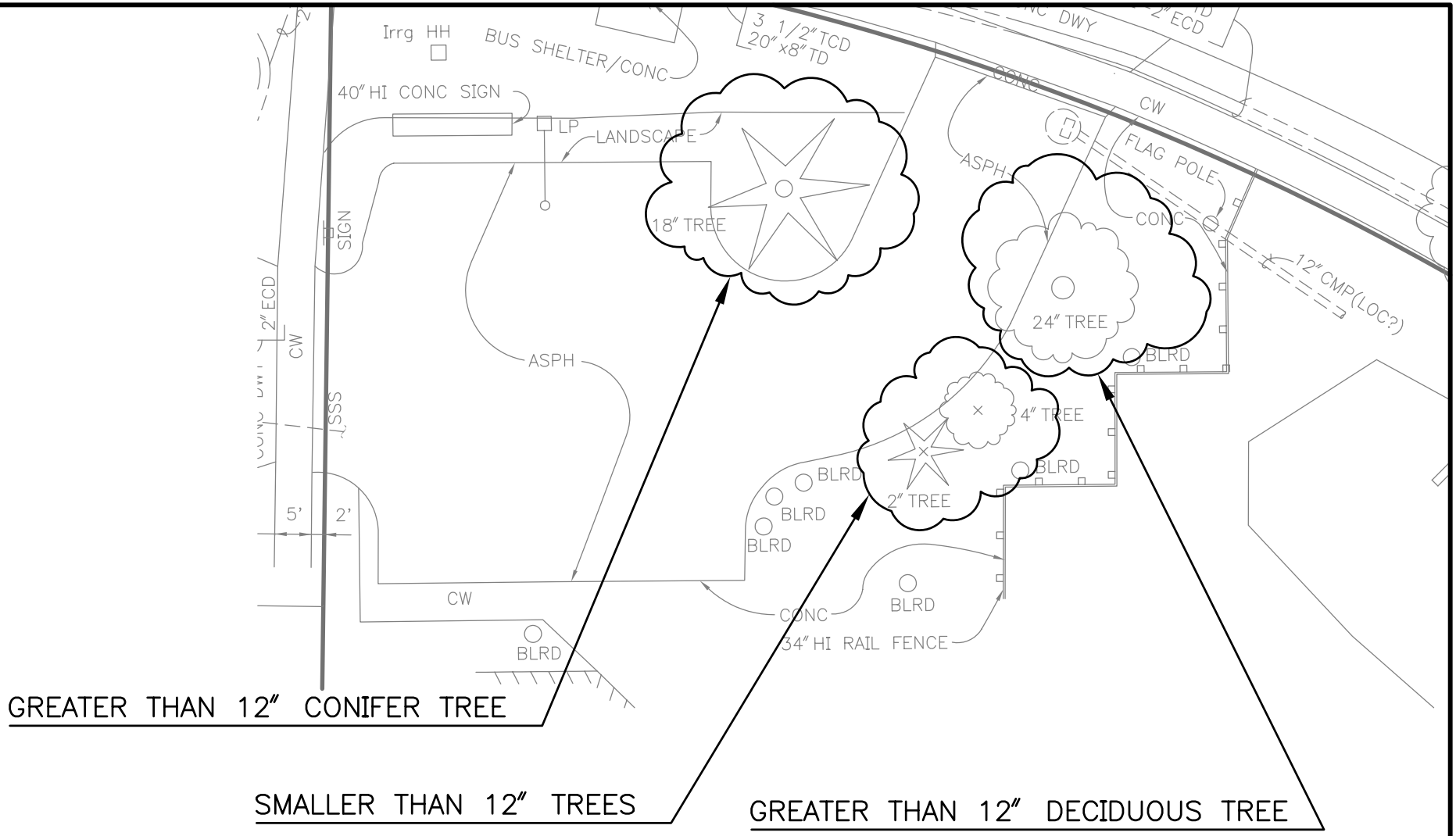
SCHEMATIC BLOCKS

FIGURE NO.
2F



SCALE:1"=20'

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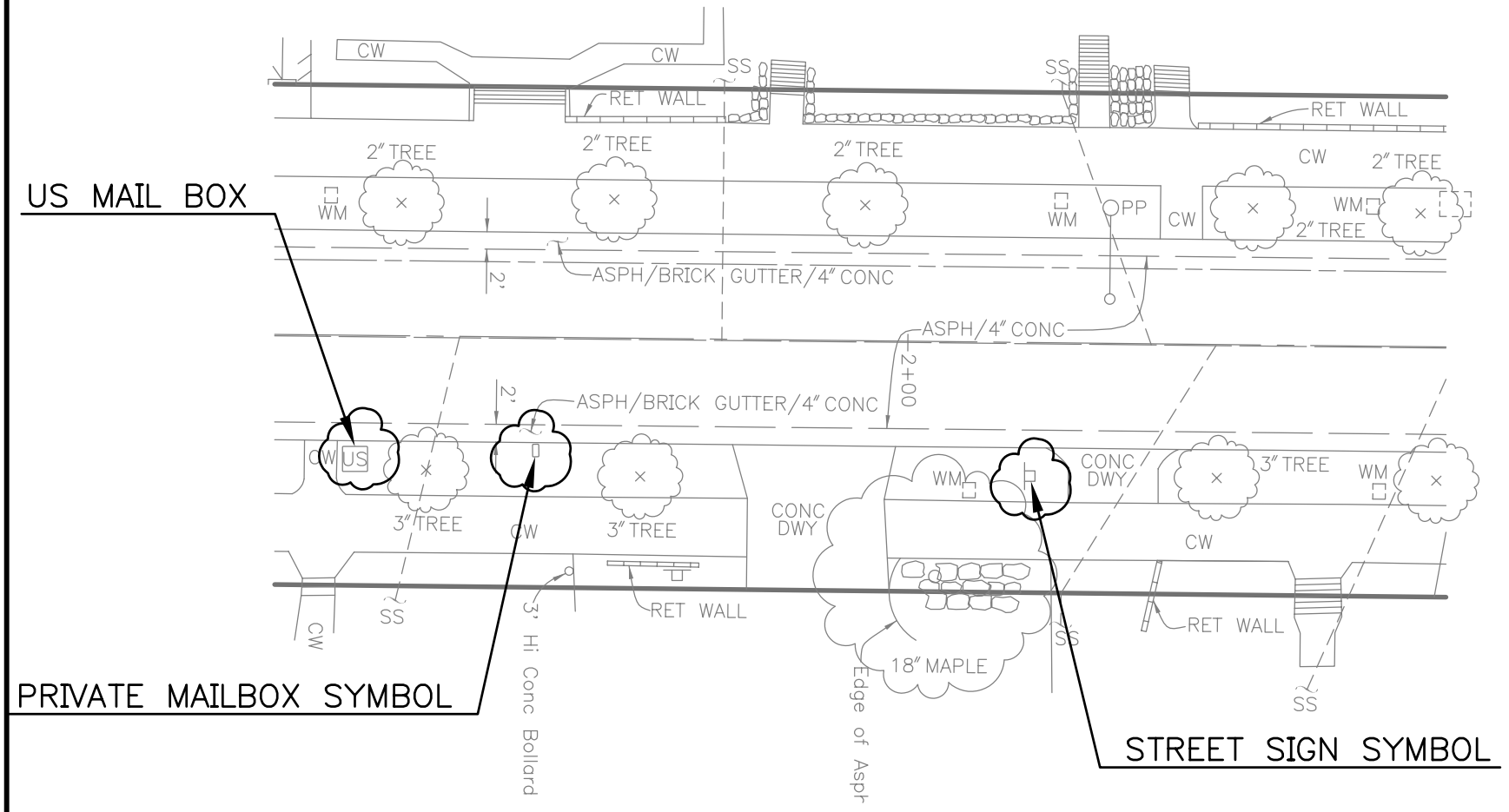
TREE SYMBOLS & CALLOUTS

FIGURE NO.
2G

BOYLSTON AVE



SCALE:1"=20'

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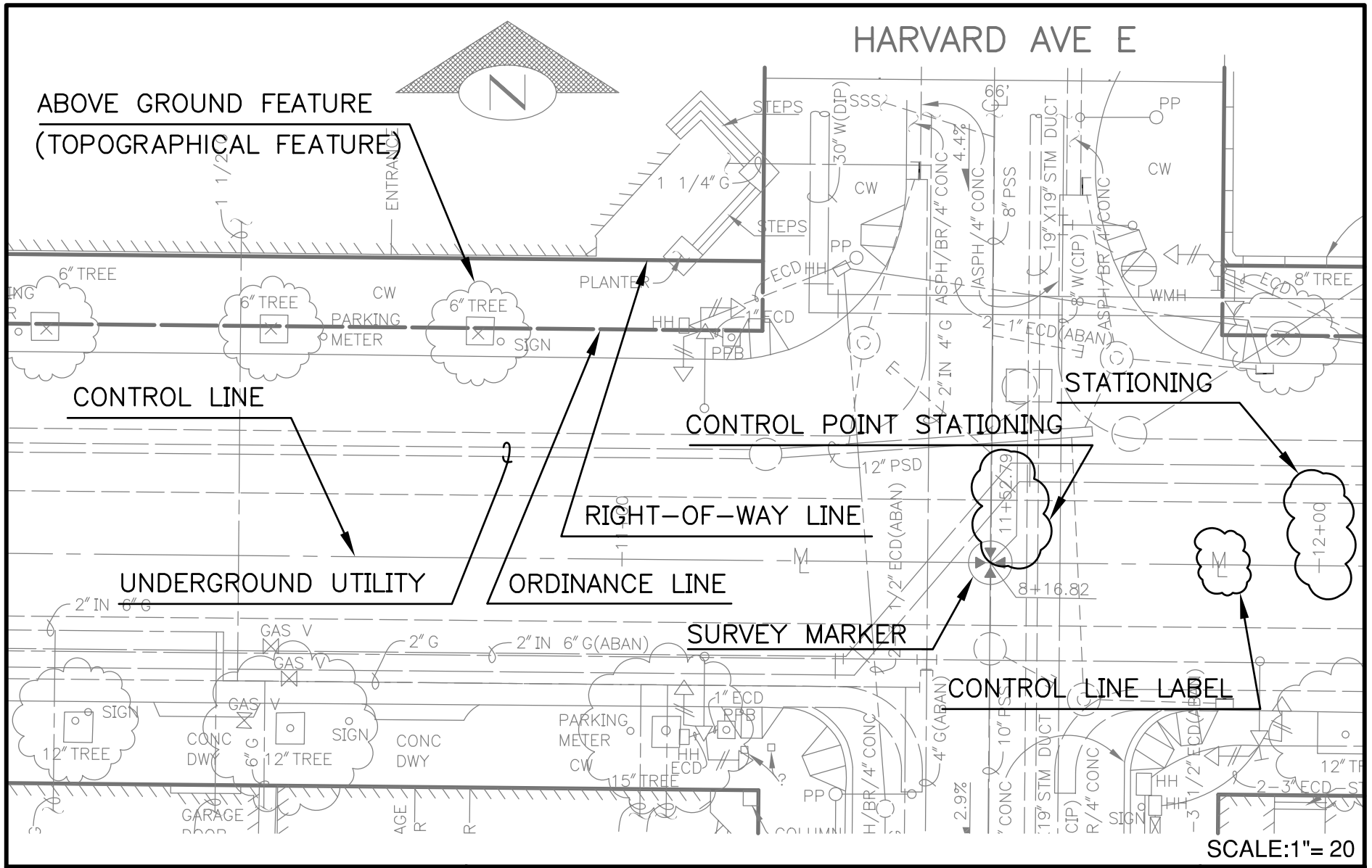
STREET SIGN &
MAILBOX SYMBOLS

FIGURE NO.
2H



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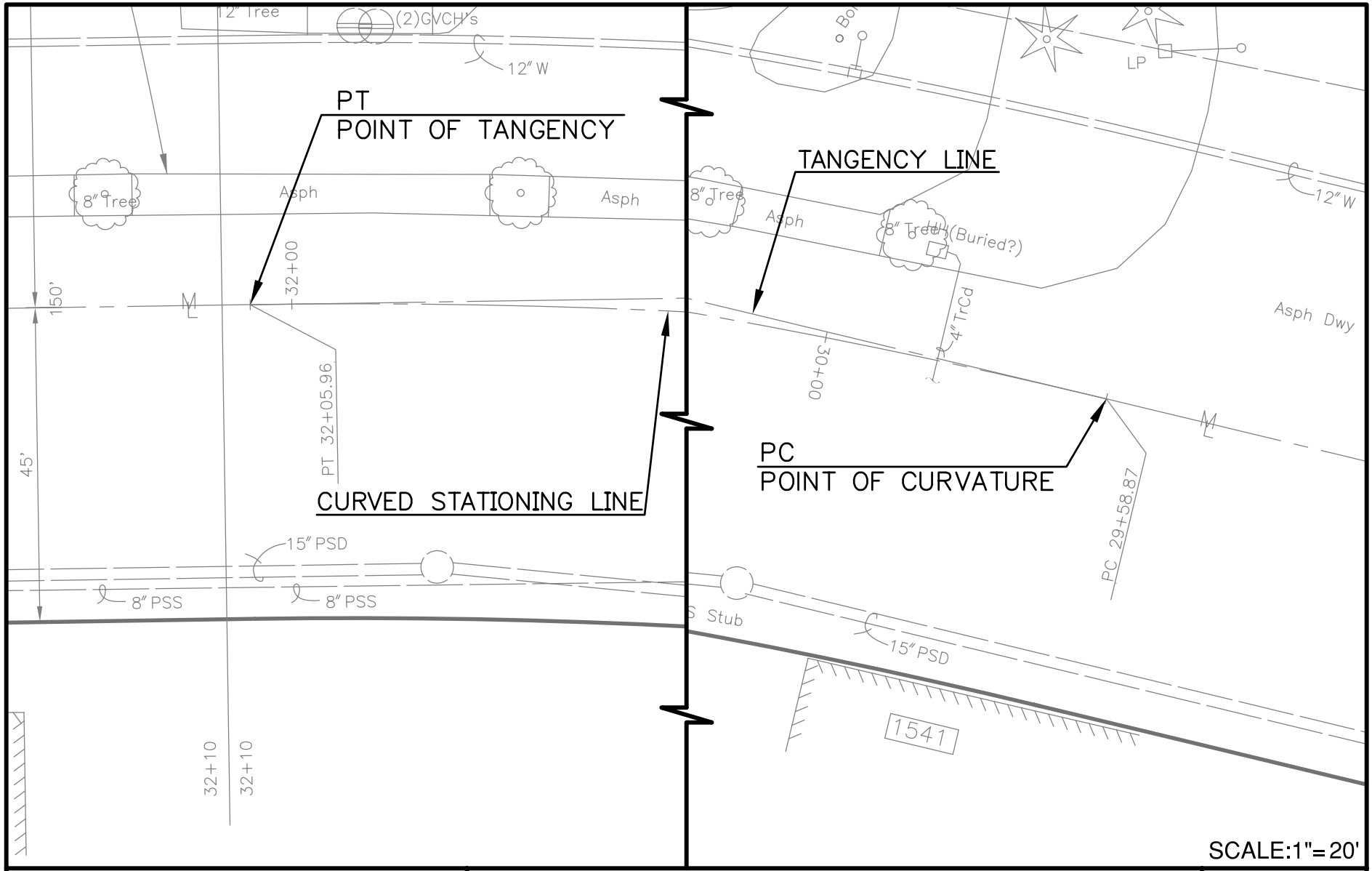
CONTROL LINES, RIGHT OF WAY, ABOVE GROUND FEATURES & UNDERGROUND UTIL.

FIGURE NO.
3A



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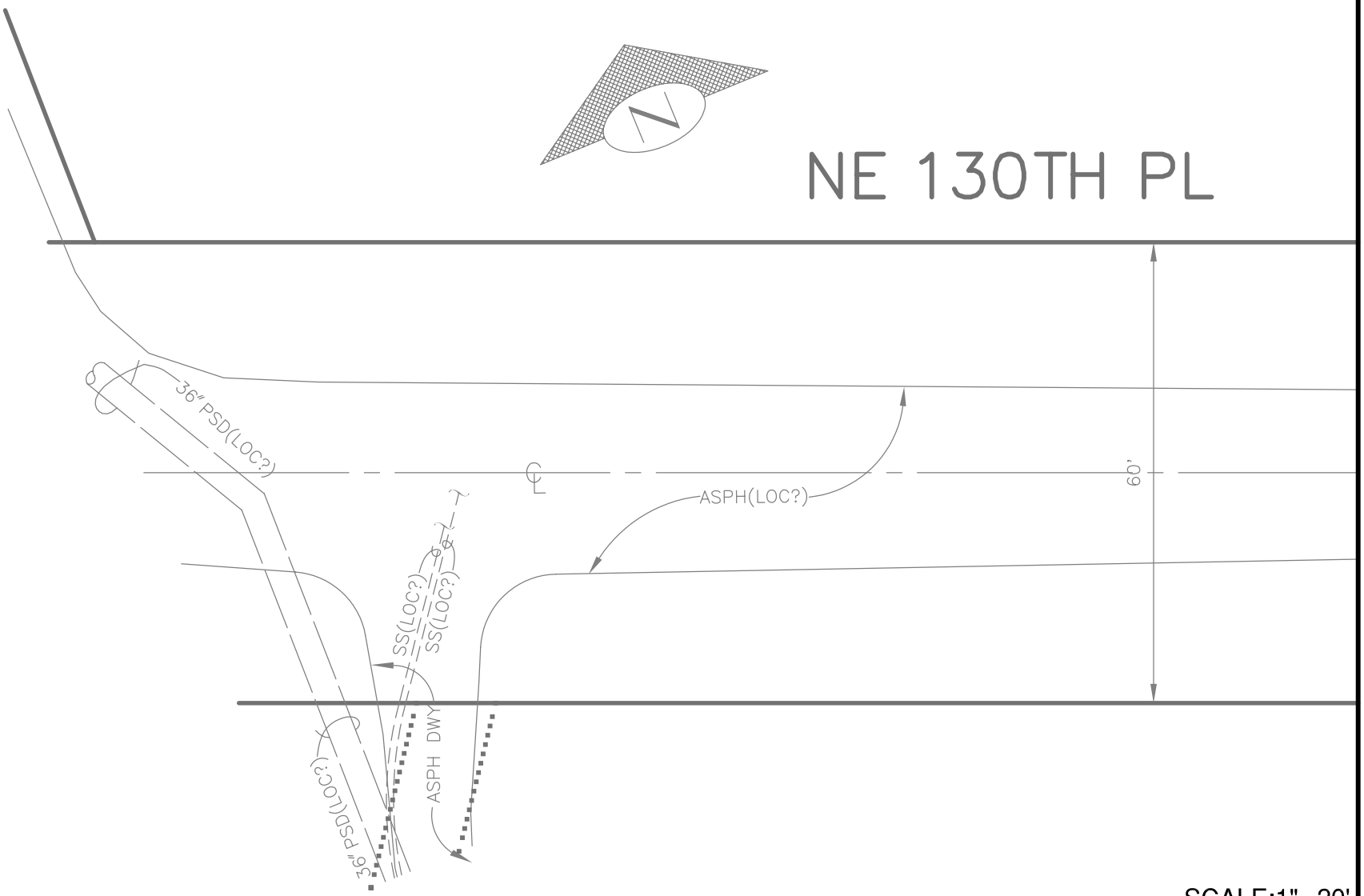
STATIONING A PC & PT ON A CONTROL LINE

FIGURE NO.
3C



SCALE:1"=20'

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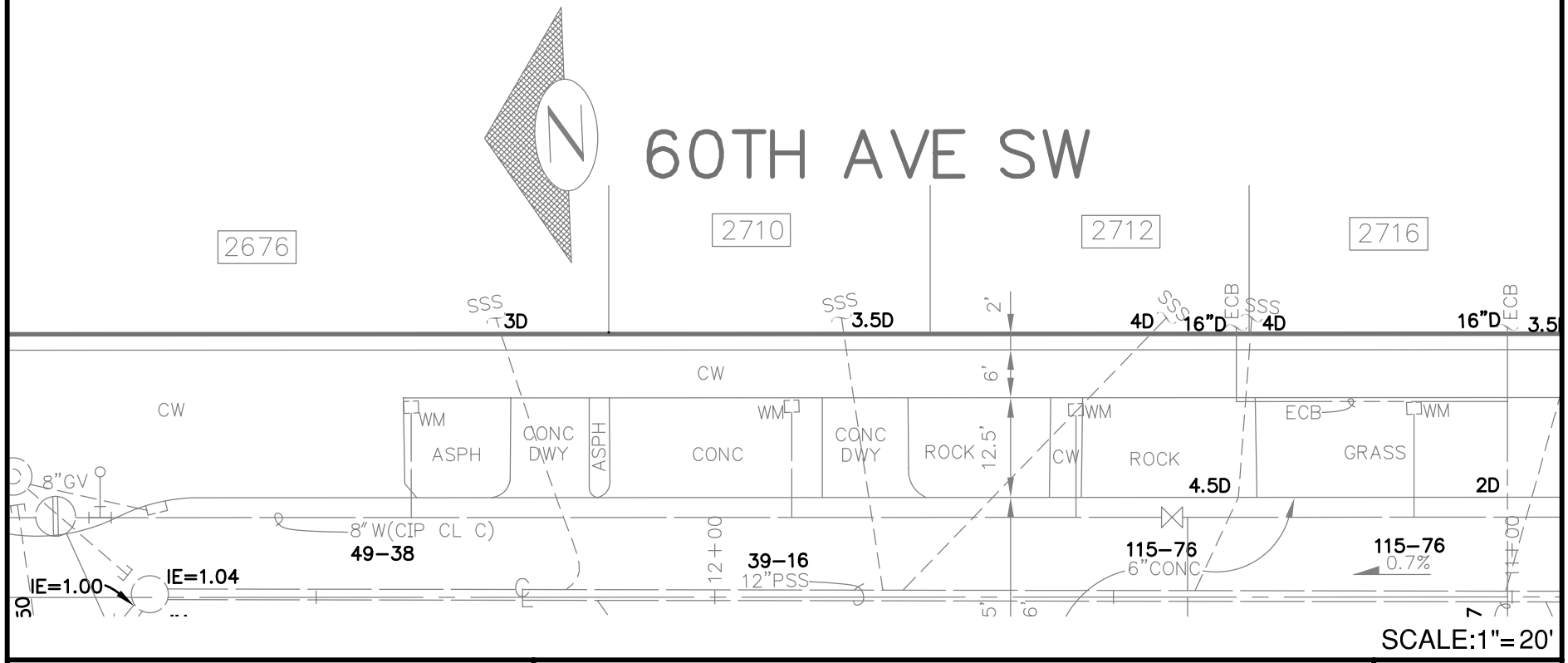
BASE MAP ORIENTATION
(NORTH ARROW POINTING UP)

FIGURE NO.
3D



SCALE:1"=20'

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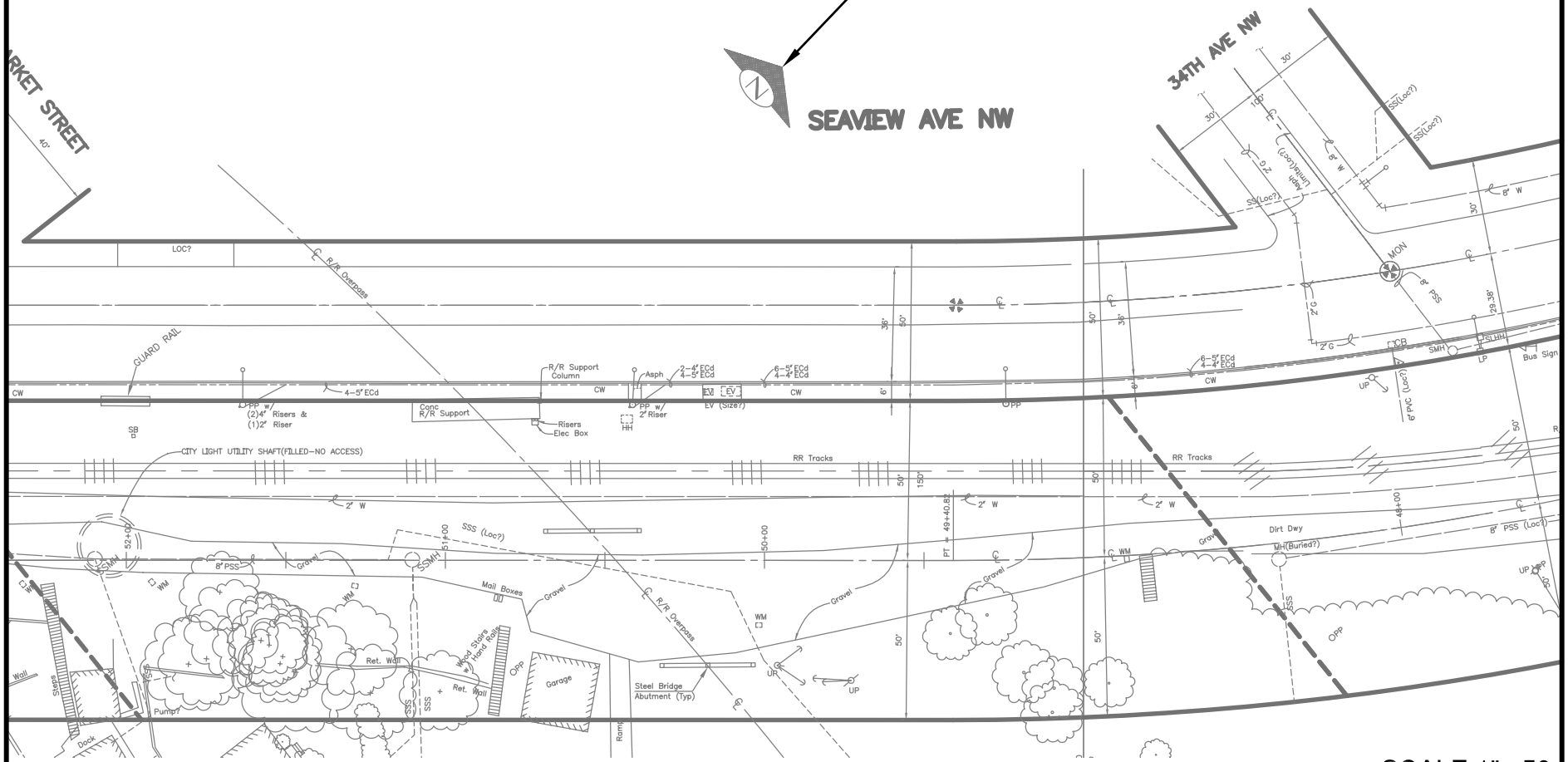
BASE MAP ORIENTATION (NORTH ARROW TO THE LEFT)

FIGURE NO.

3E

NORTH ARROW ORIENTATION
IS OUT OF THE ORDINARY.
THE NORTH ARROW DOES
NOT POINT UP OR TO THE LEFT

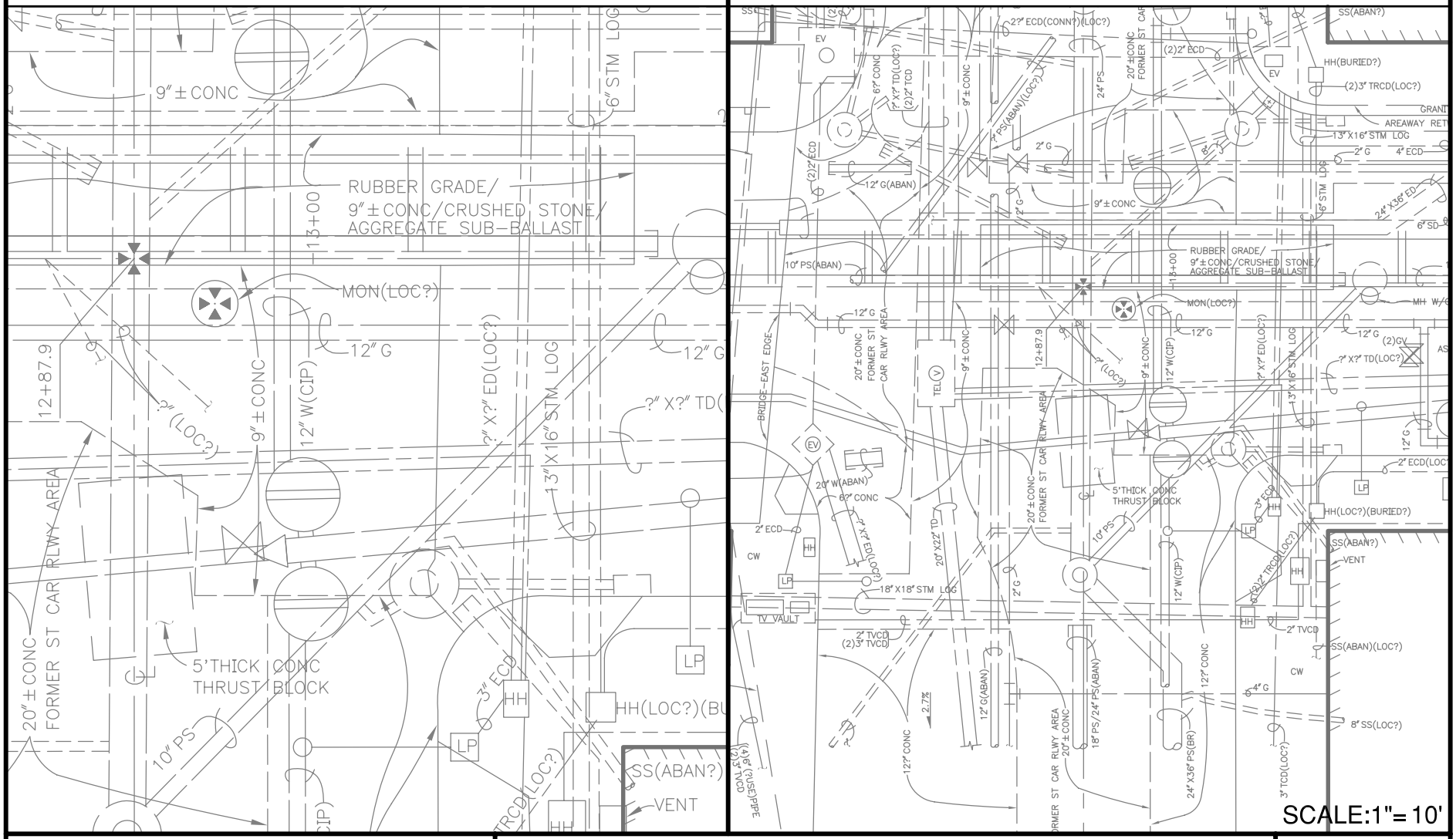


SCALE:1"= 50

City of Seattle *Seattle Public Utilities*	BASEMAP ORIENTATION (OUT OF THE ORDINARY)(BEST FIT)	FIGURE NO. 3F

NOTE: THE 10 SCALE PRESENTATION IS CLEAR

NOTE: THE 20 SCALE PRESENTATION IS TOO CROWDED



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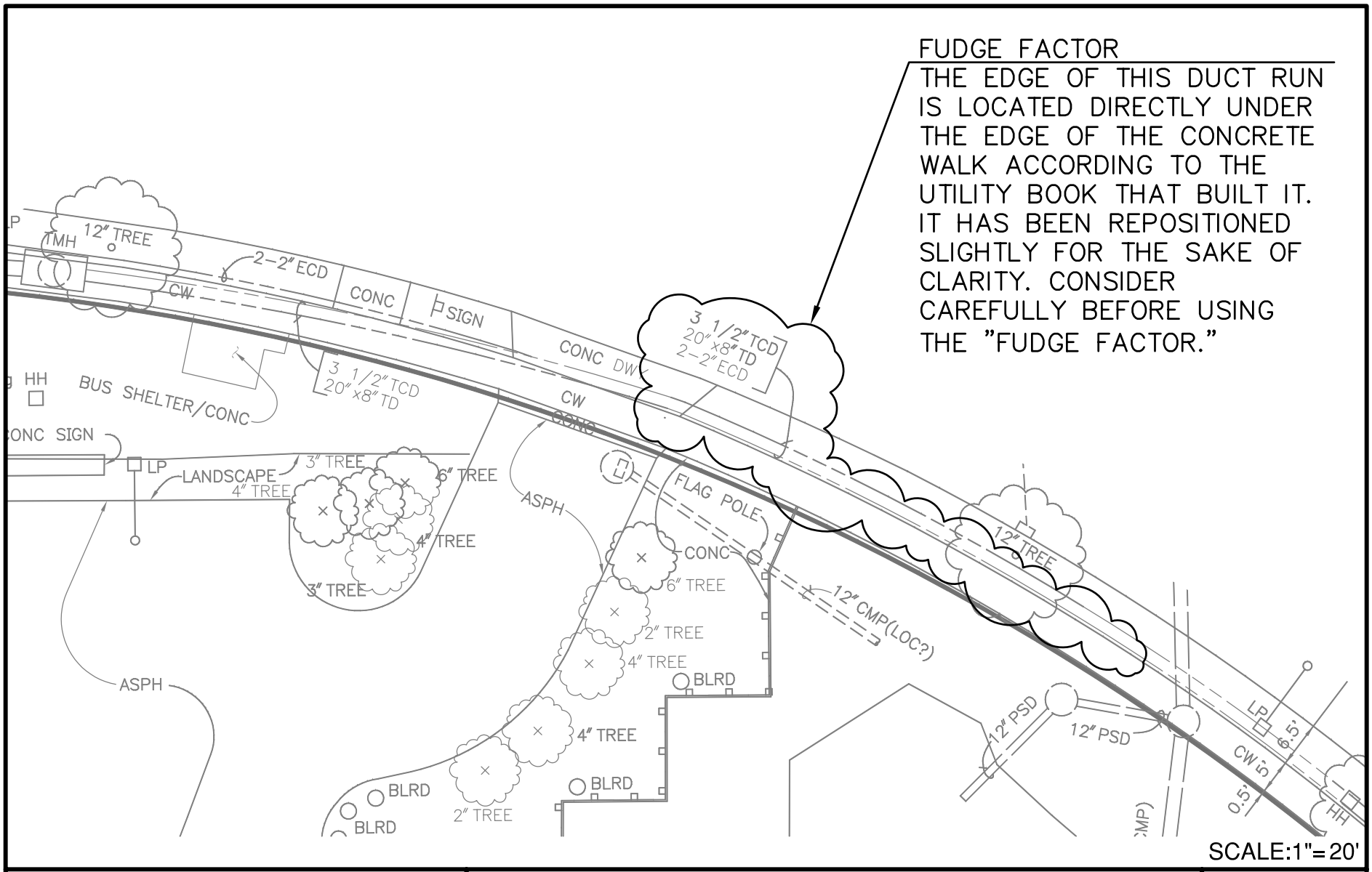
WHEN TO USE 10 SCALE PRESENTATION

FIGURE NO.

3G



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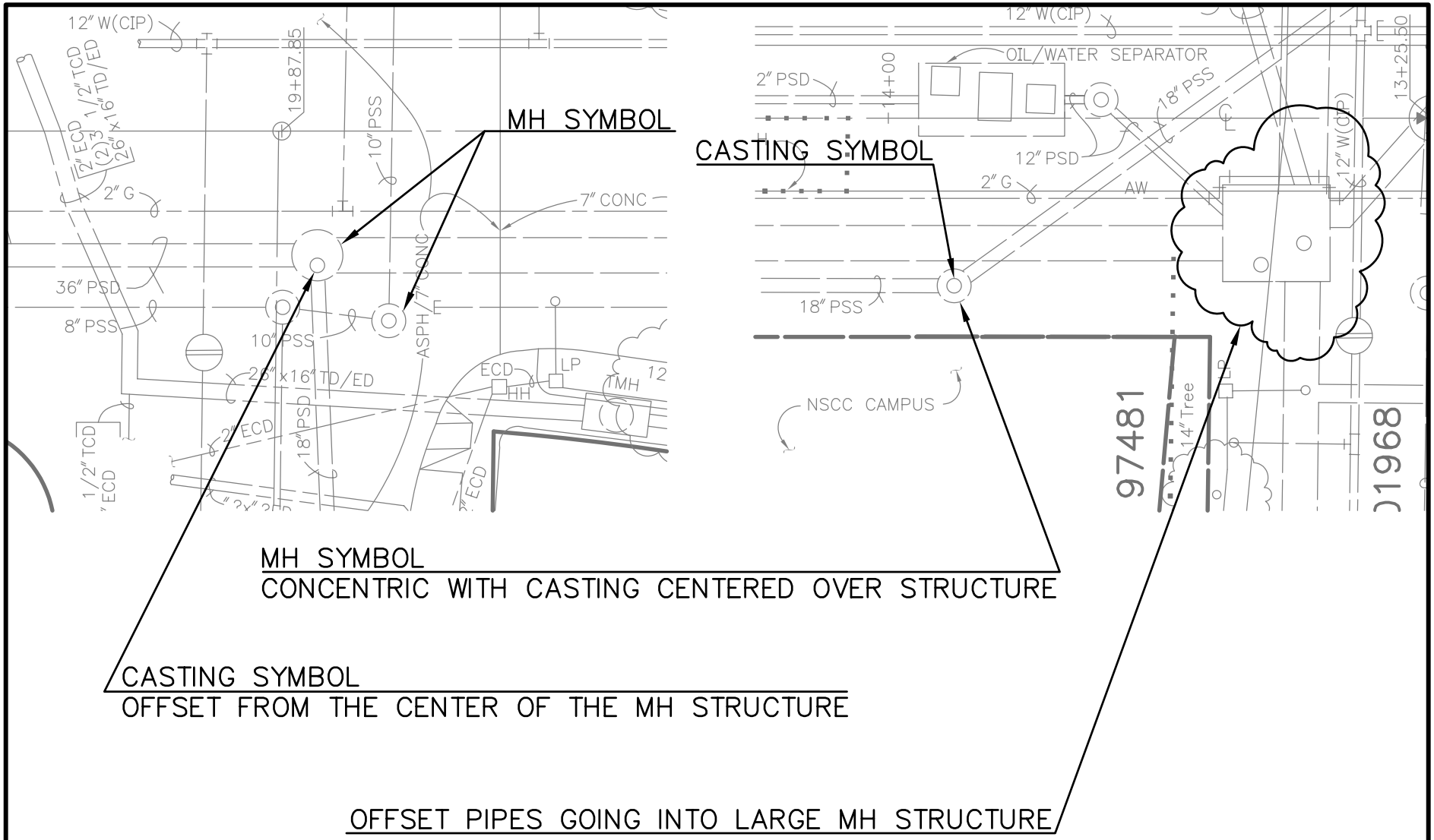
FUDGE FACTOR

FIGURE NO.
3H



SCALE:1"=20'

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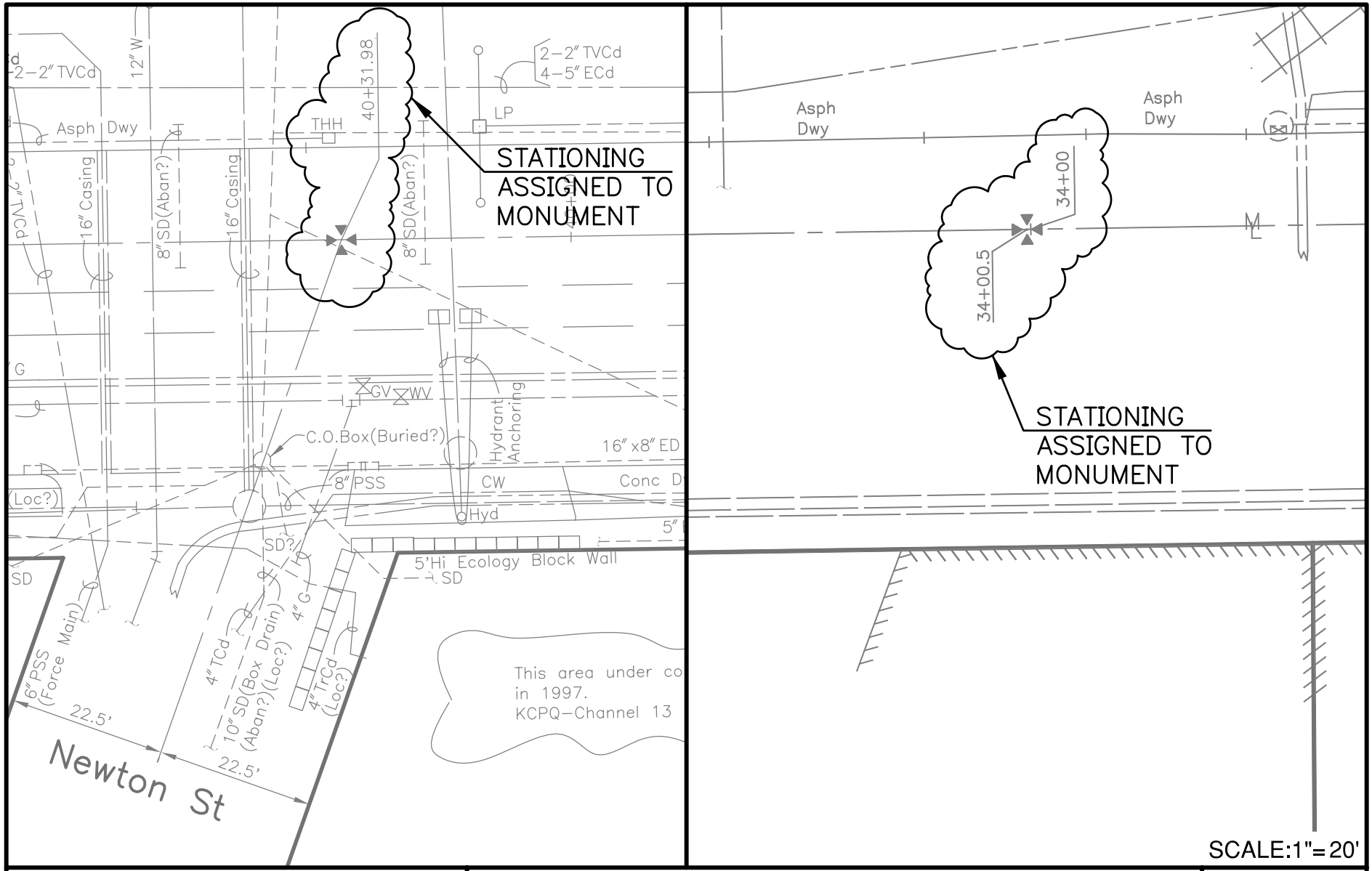
CASTINGS & STRUCTURES

FIGURE NO.
3I



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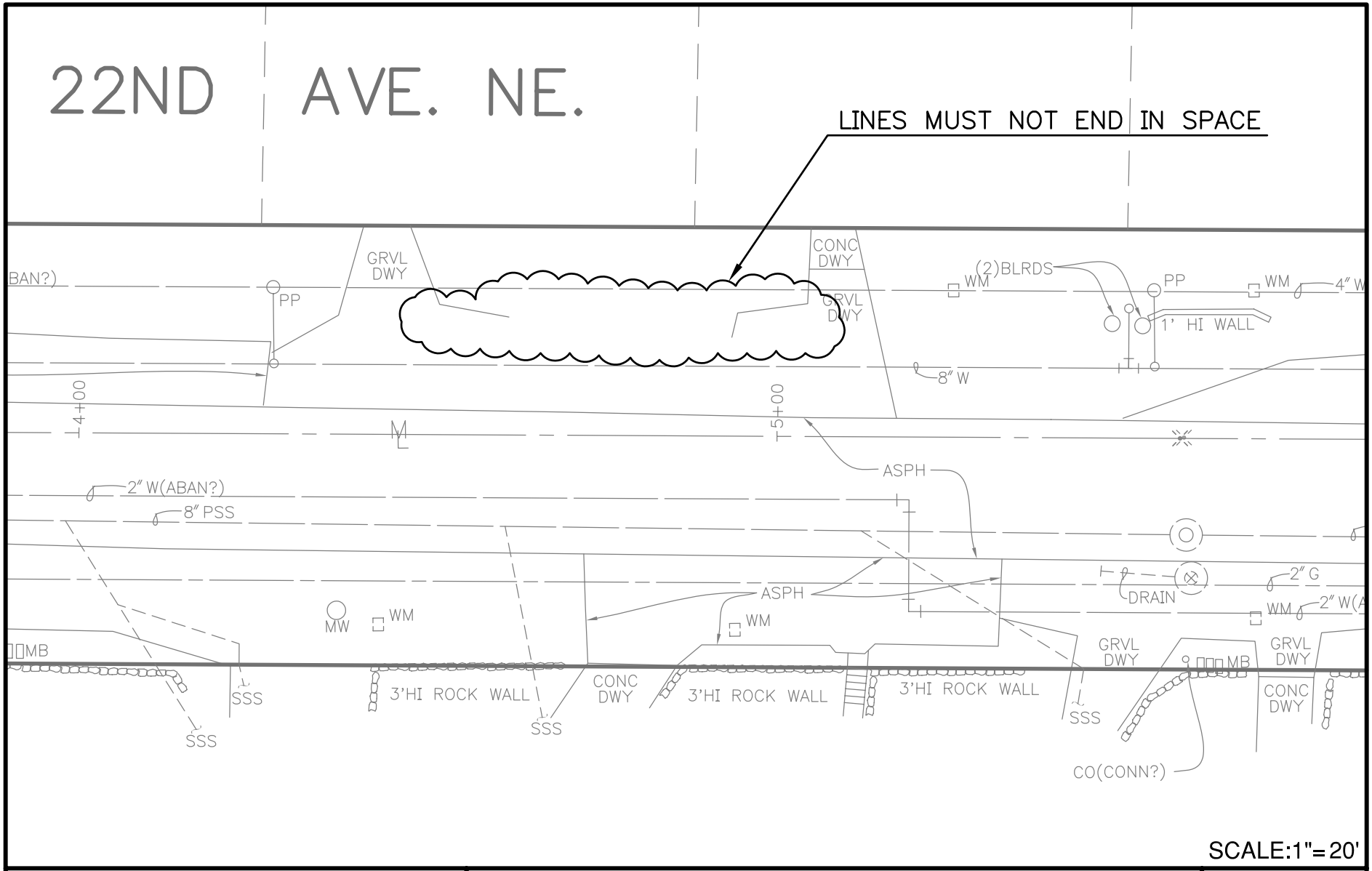
STATIONING ON MONUMENTS

FIGURE NO.
3K



SCALE:1"=20'

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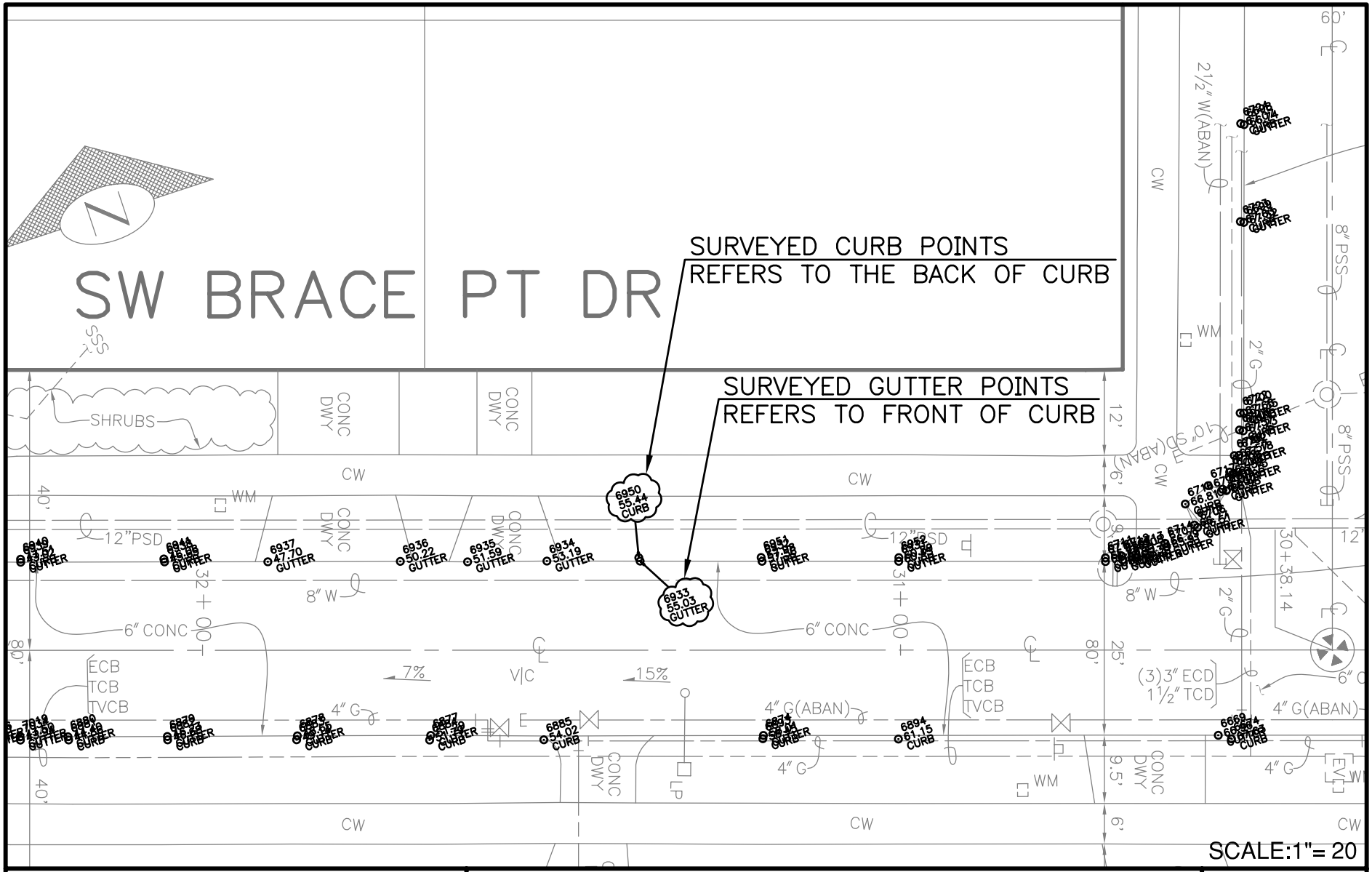
LINES MUST NOT END IN SPACE

FIGURE NO.
3L



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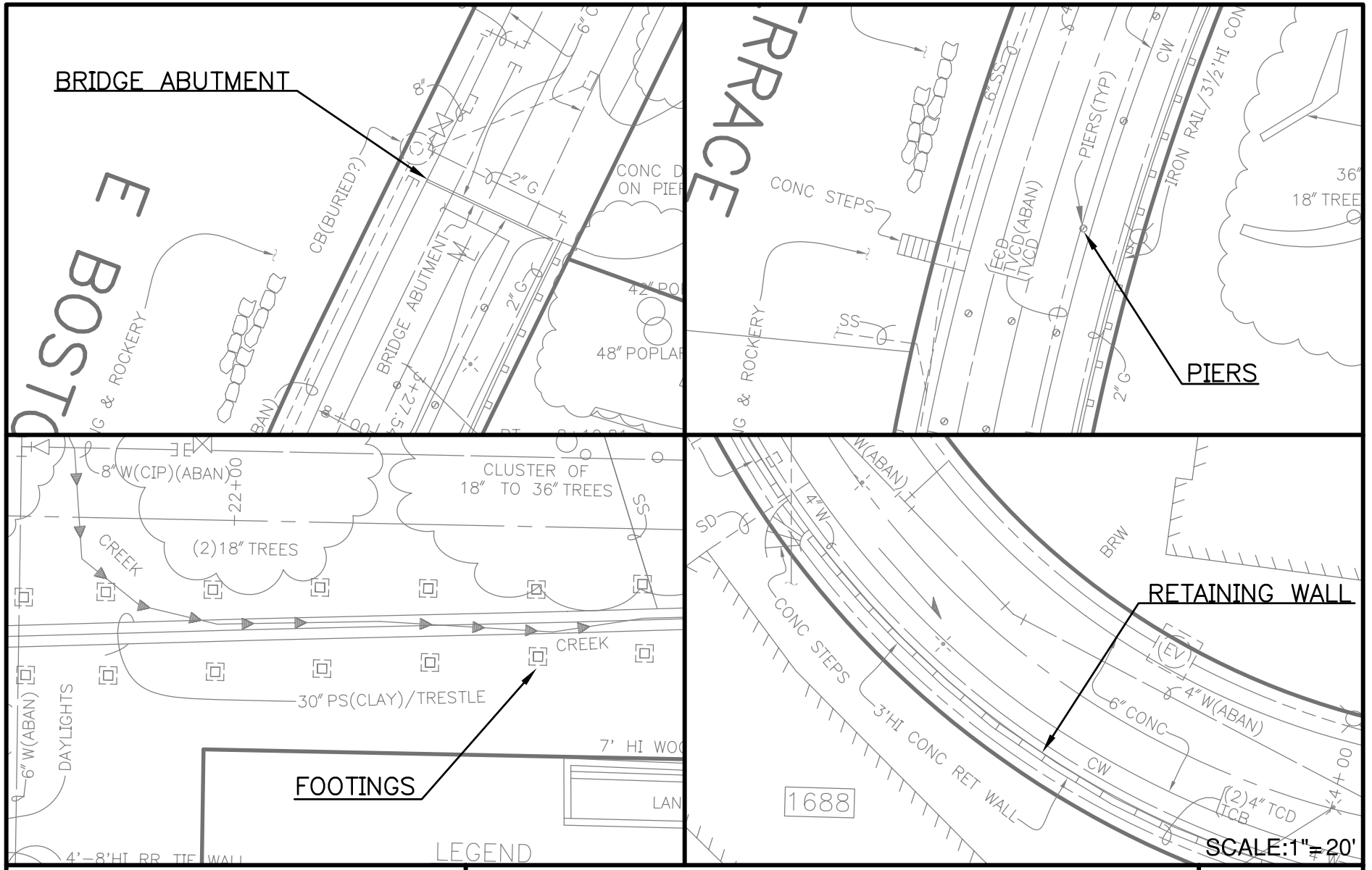
CURB & GUTTER POINTS

FIGURE NO.
3M



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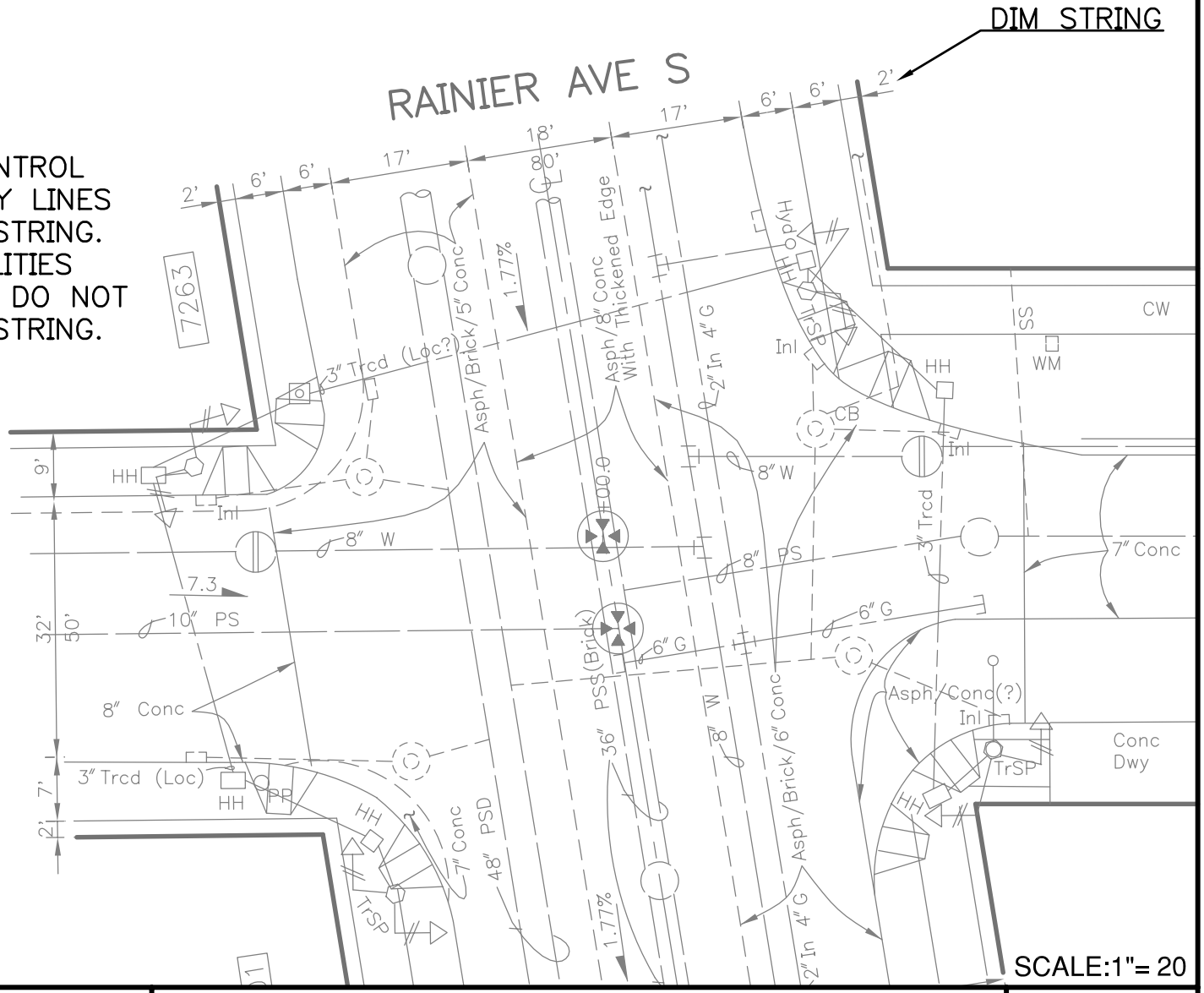
ABUTMENTS, PIERS, FOOTINGS & RETAINING WALLS

FIGURE NO.
3N

NOTE:
PAVING LIMIT LINES, CONTROL LINES, & RIGHT-OF-WAY LINES GO THROUGH THE DIM STRING. THE UNDERGROUND UTILITIES ARE STUBBED OUT AND DO NOT GO THROUGH THE DIM STRING.



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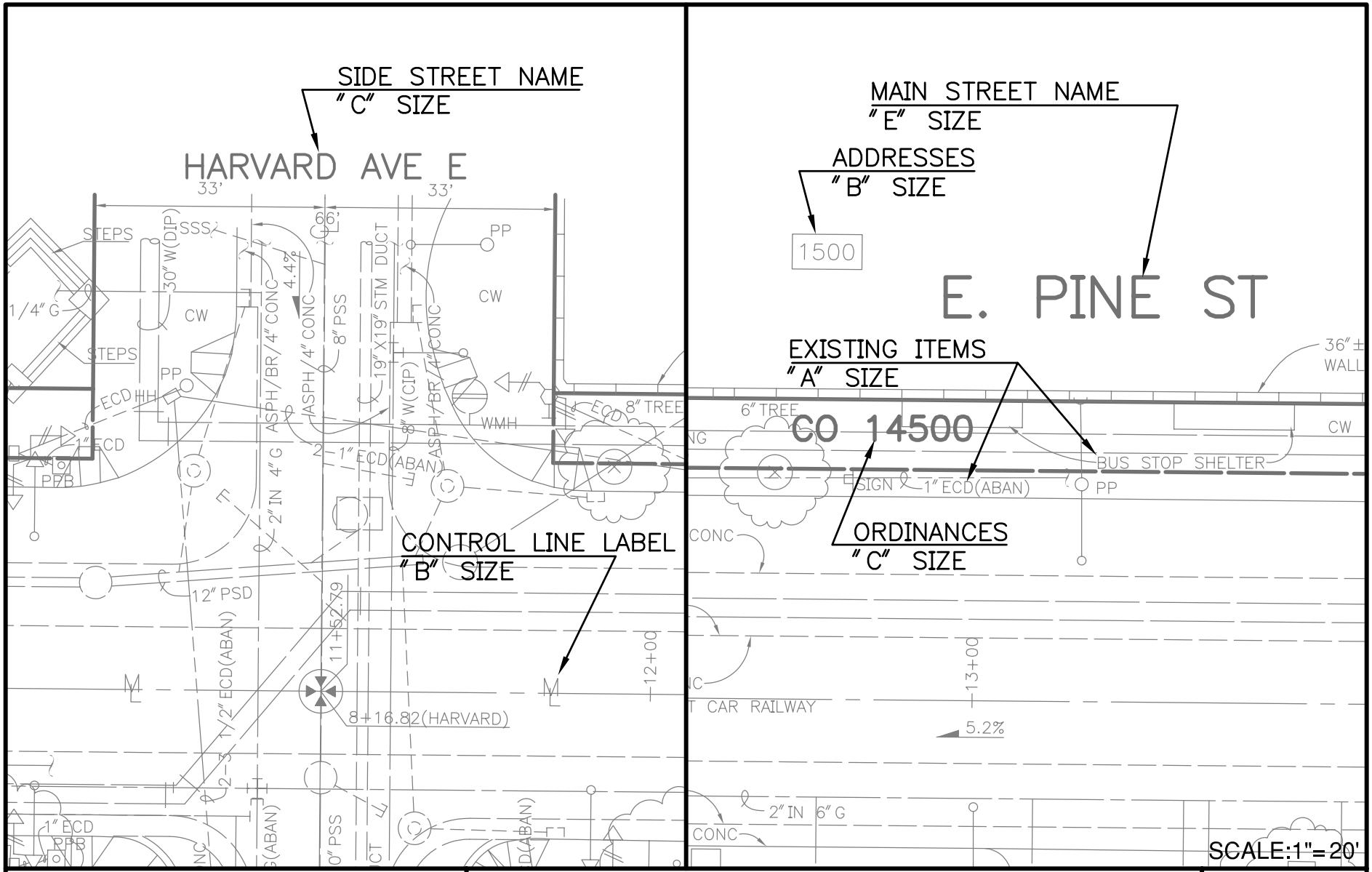
STREET END STUBS

FIGURE NO.
3O



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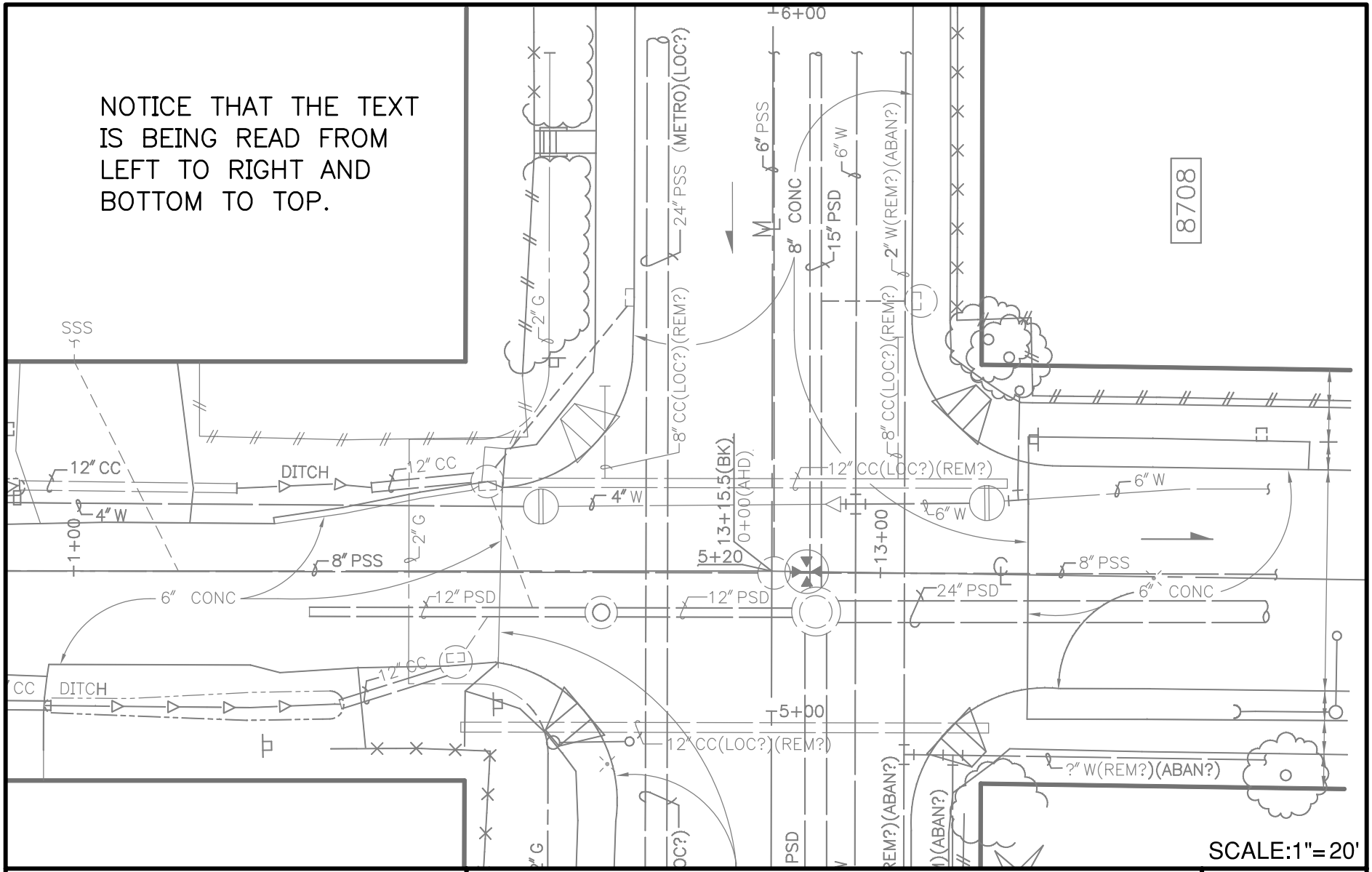
TEXT SIZES

FIGURE NO.
4A

NOTICE THAT THE TEXT IS BEING READ FROM LEFT TO RIGHT AND BOTTOM TO TOP.



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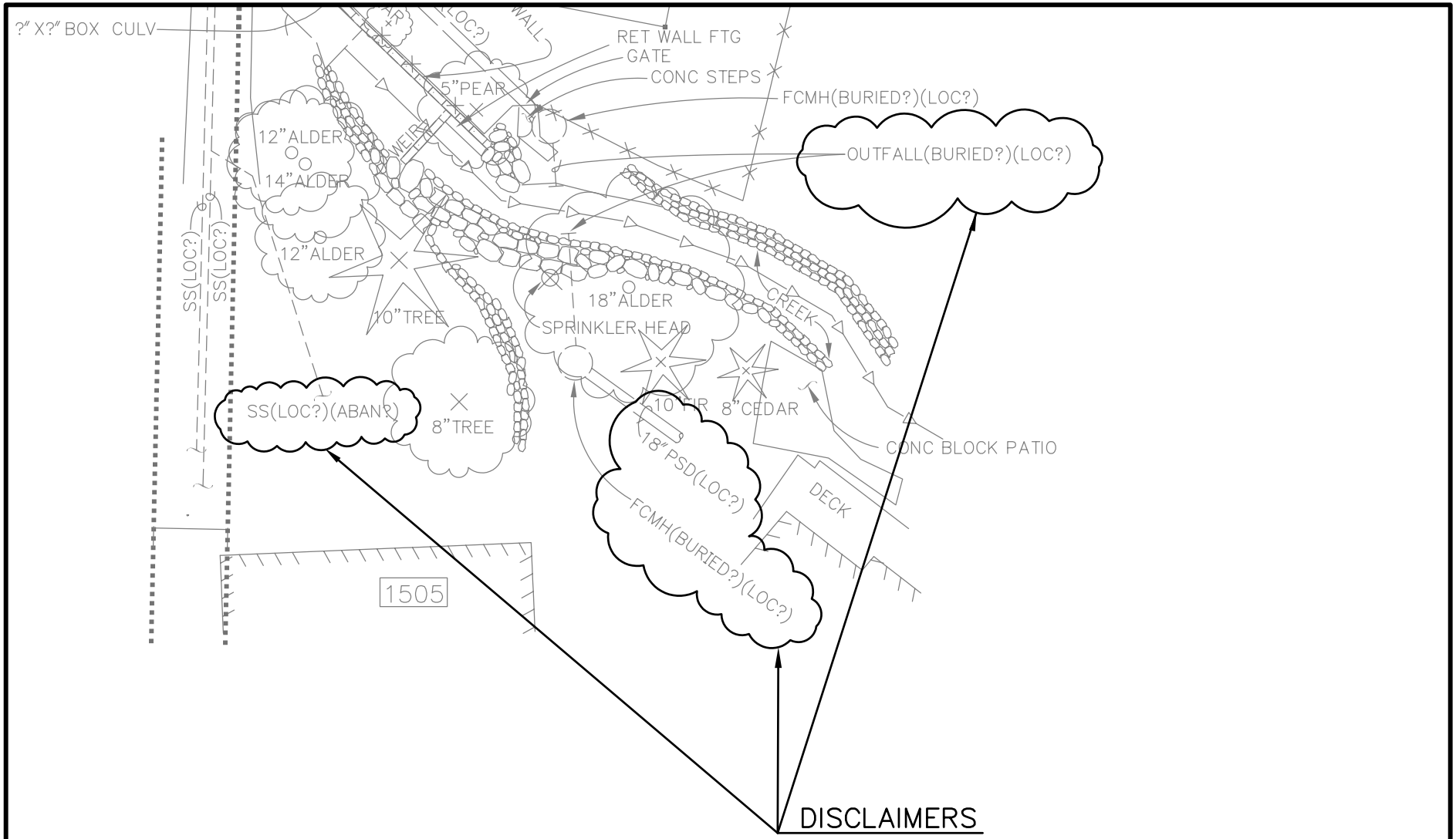
TEXT ORIENTATION

FIGURE NO.
4B



SCALE:1"=20'

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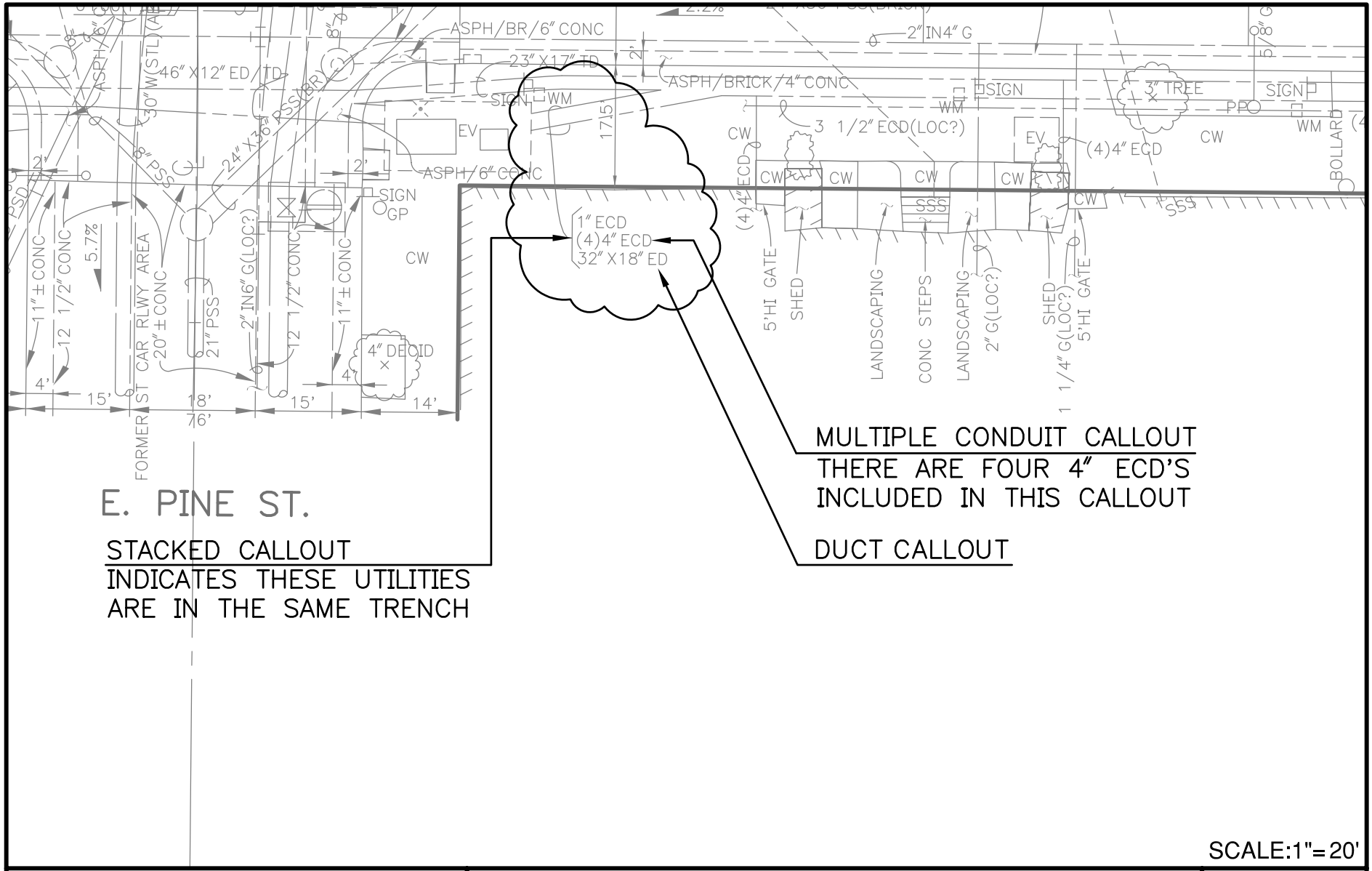
DISCLAIMERS

FIGURE NO.
5A



STACKED CALLOUT
INDICATES THESE UTILITIES
ARE IN THE SAME TRENCH

MULTIPLE CONDUIT CALLOUT
THERE ARE FOUR 4" ECD'S
INCLUDED IN THIS CALLOUT

DUCT CALLOUT

SCALE:1"=20'

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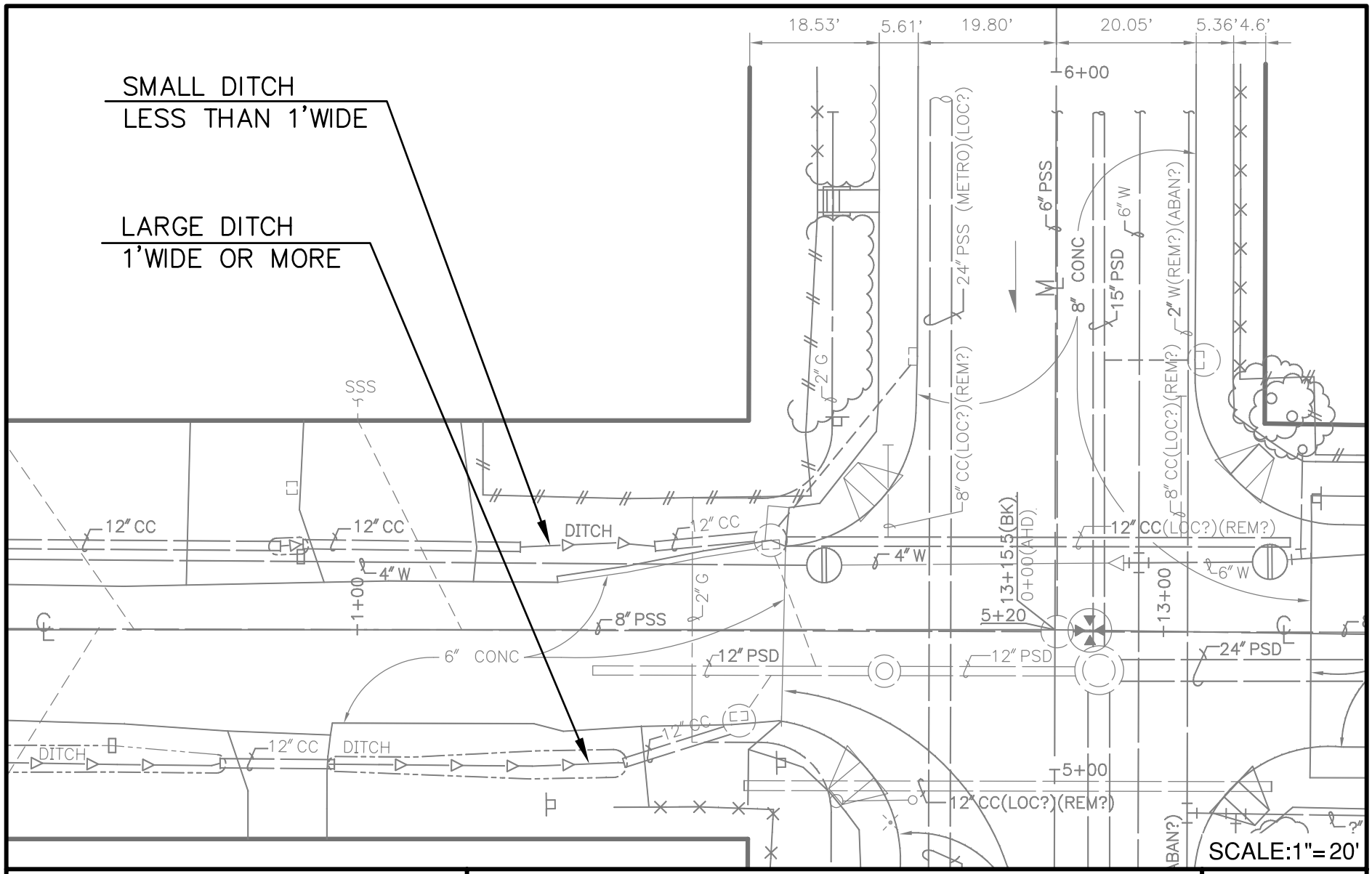
CONDUIT AND DUCT CALLOUTS

FIGURE NO.
5B



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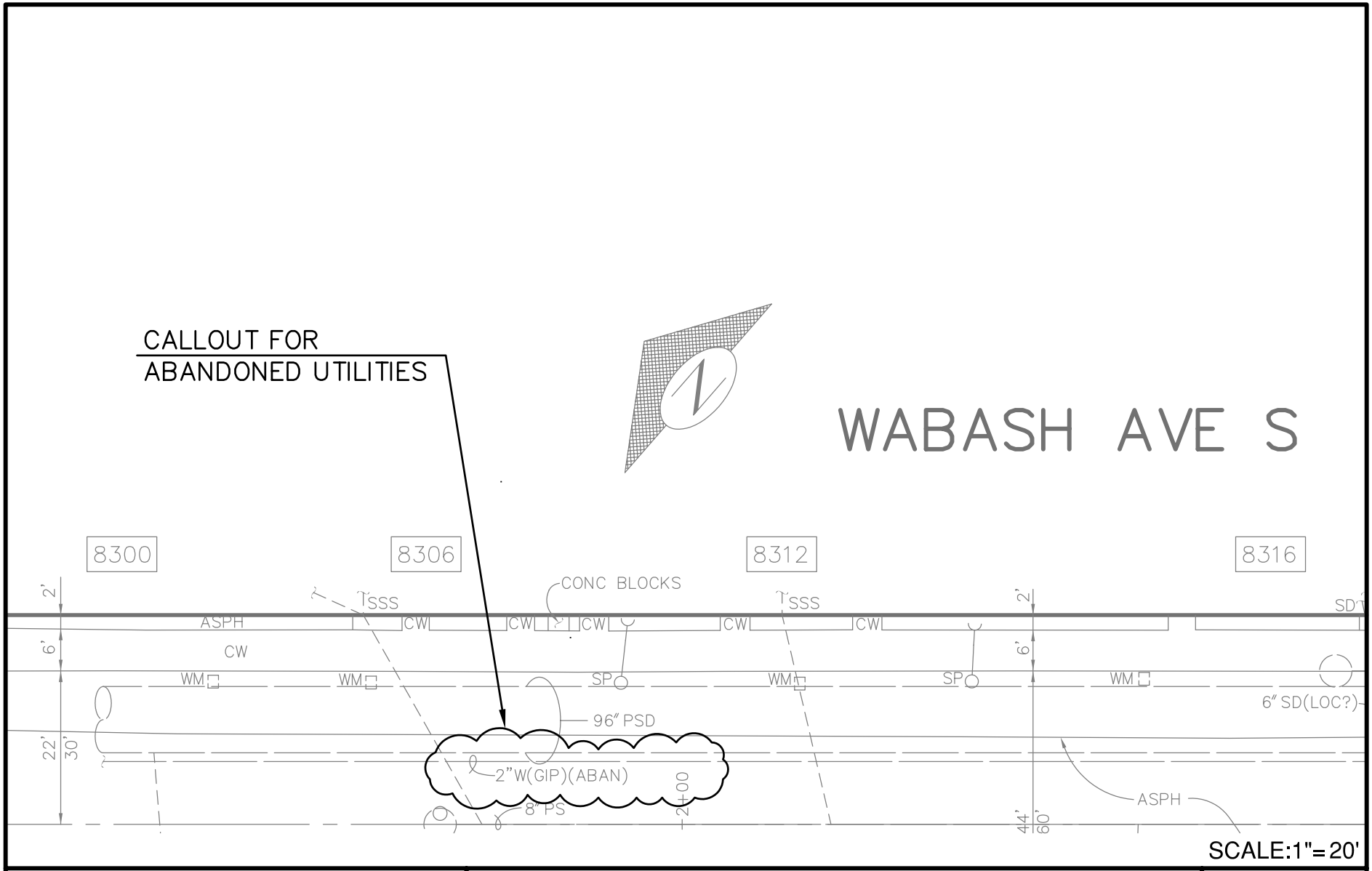
SHOWING
SMALL & LARGE DITCHS

FIGURE NO.
5D



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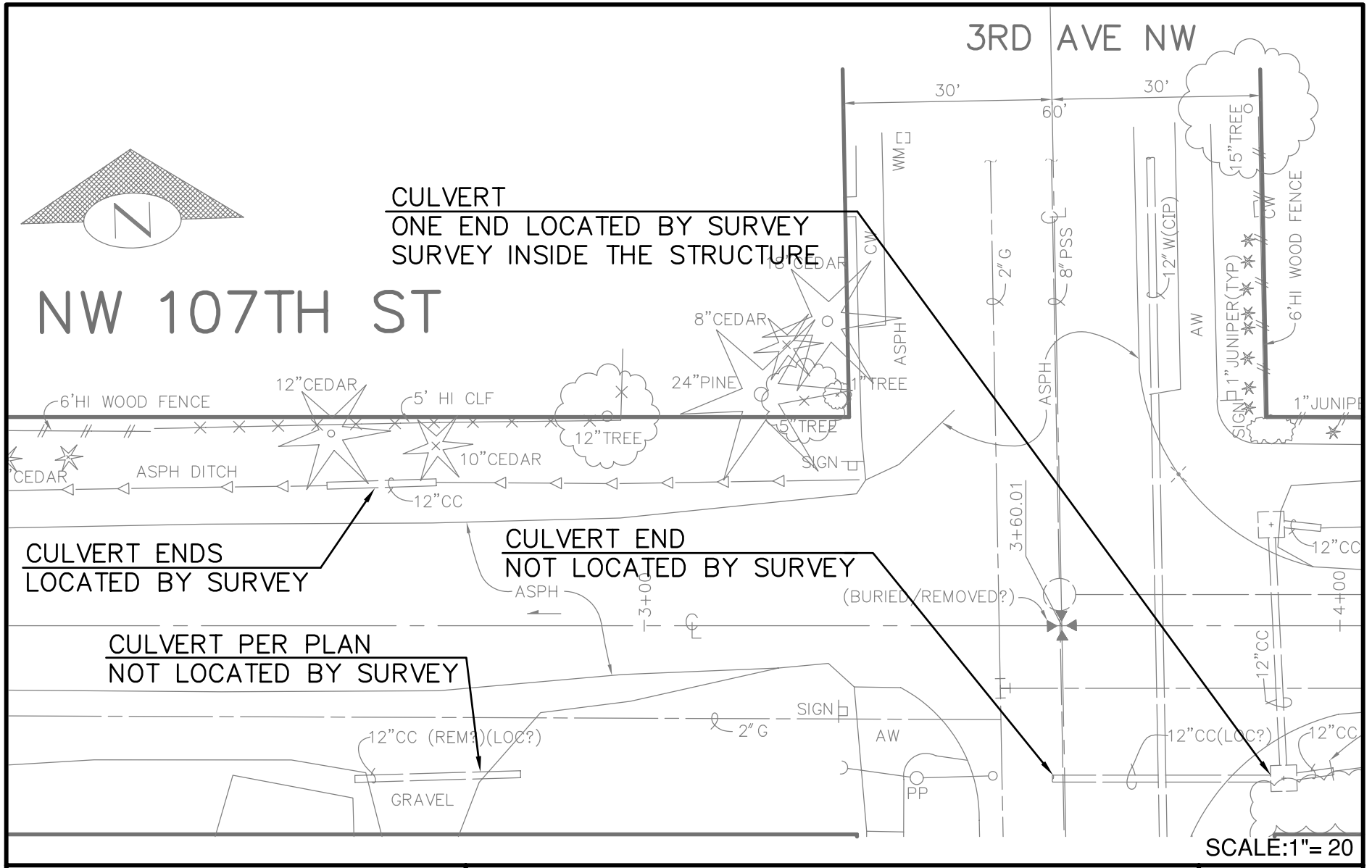
CALLOUTS FOR ABANDONED UTILITIES

FIGURE NO.

5F



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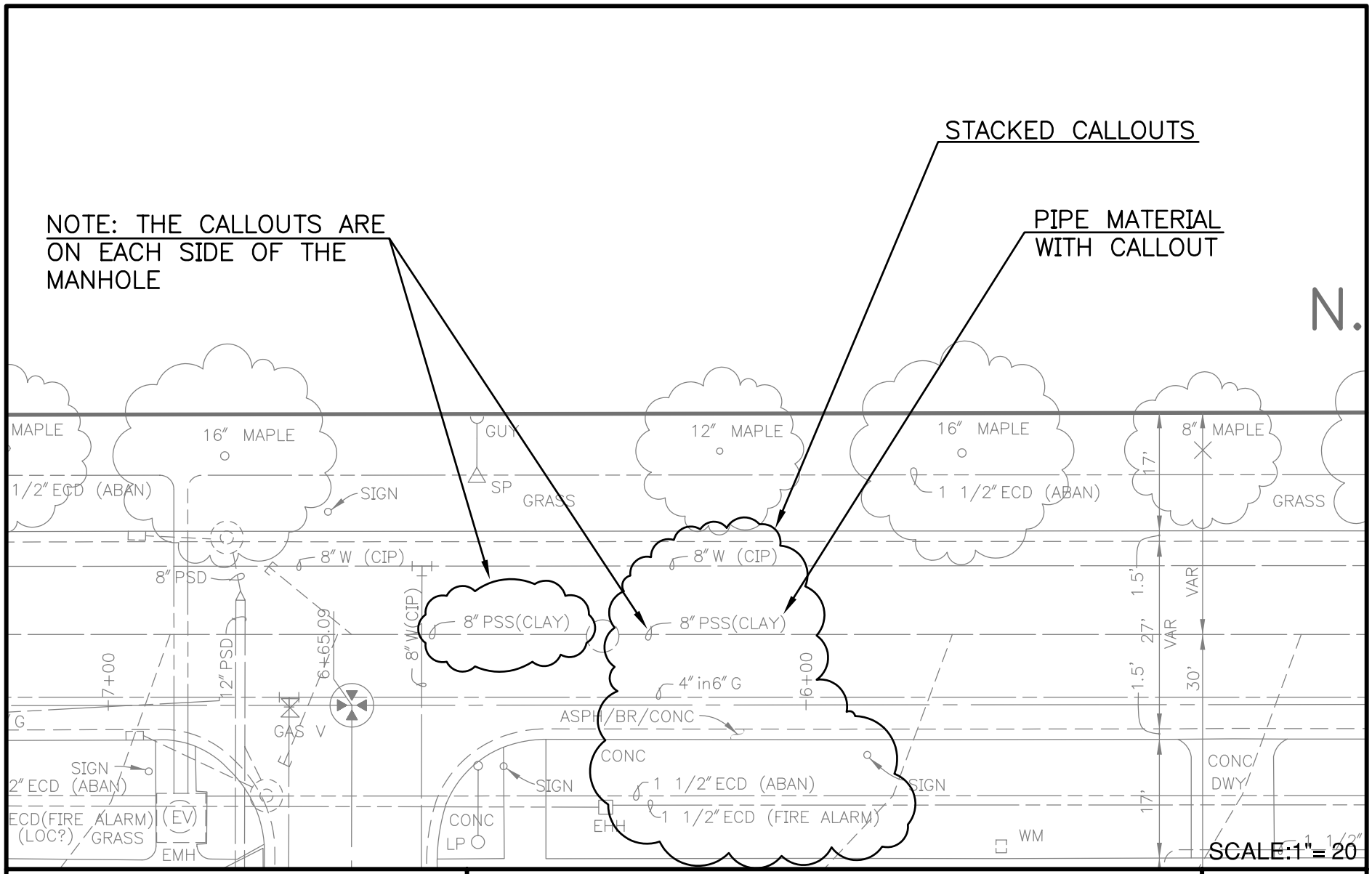
DRAWING CULVERTS FROM PLANS

FIGURE NO.
5G



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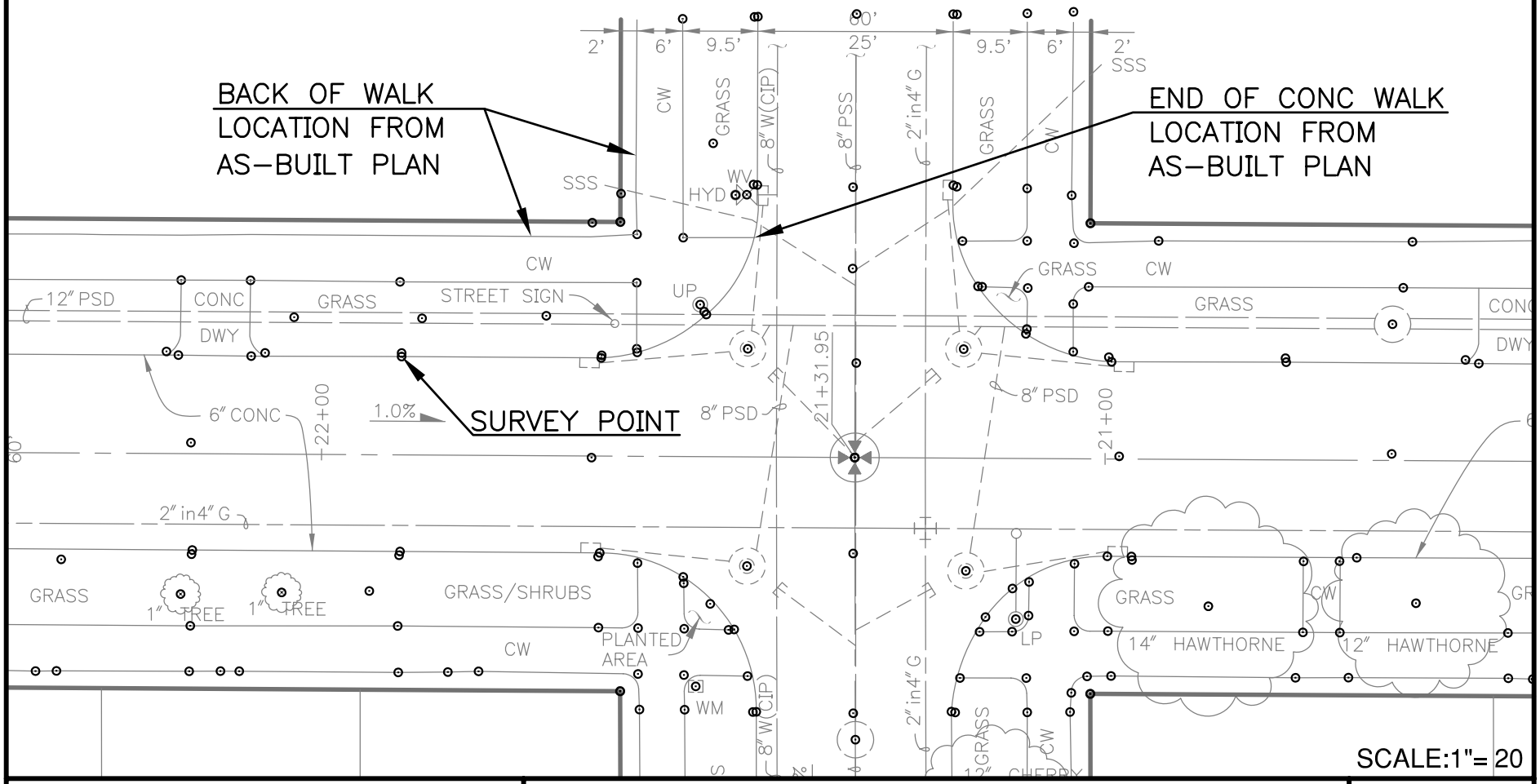
PRESENTATION FOR CALLOUTS

FIGURE NO.
5H

NOTE:
THE FINAL CONC WALK CONFIGURATION WILL BE VERIFIED DURING THE FIELD CHECK.



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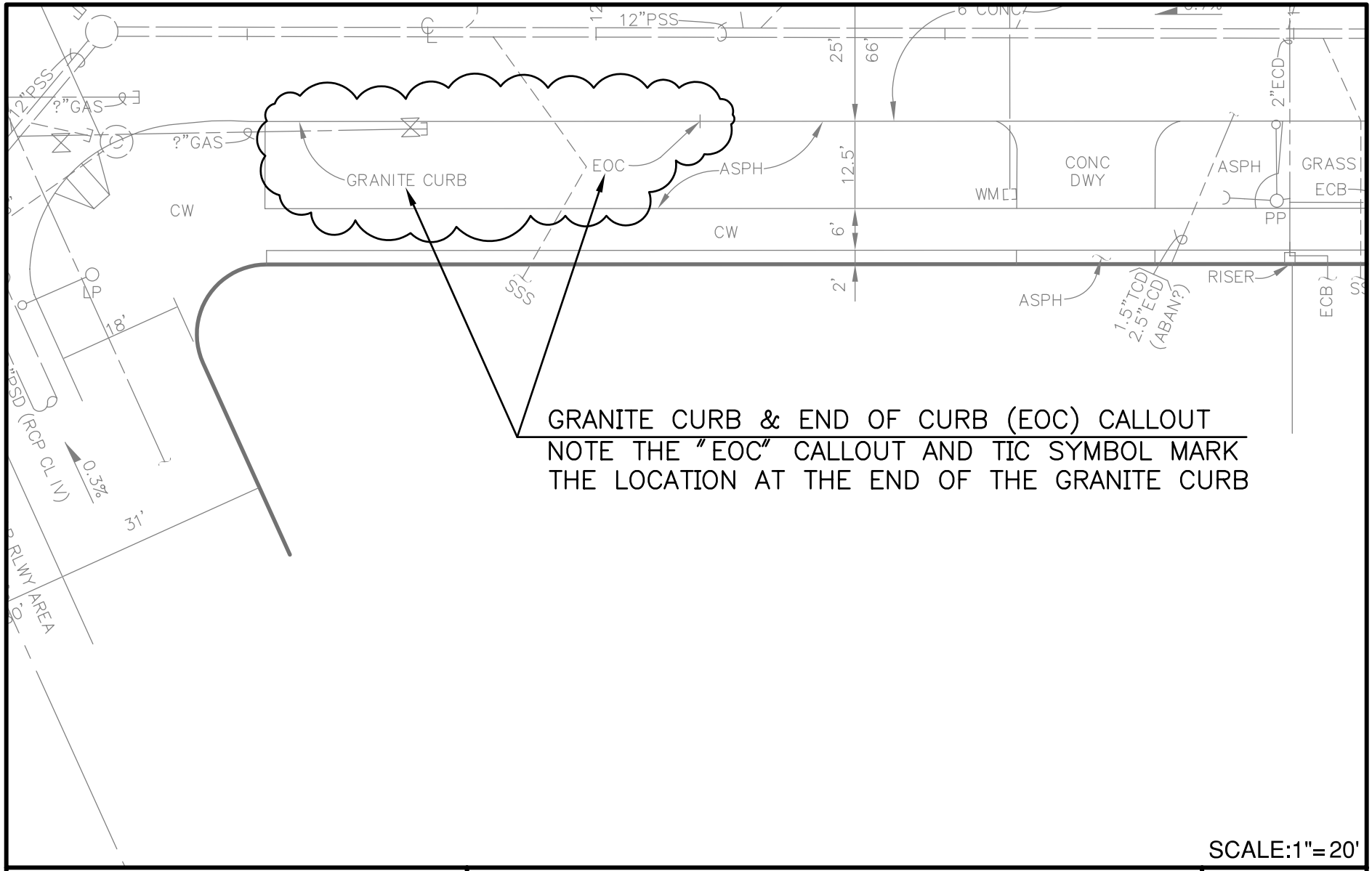
WALKS FROM SURVEY AND PLANS

FIGURE NO.
6A



GRANITE CURB & END OF CURB (EOC) CALLOUT

NOTE THE "EOC" CALLOUT AND TIC SYMBOL MARK THE LOCATION AT THE END OF THE GRANITE CURB

SCALE:1"=20'

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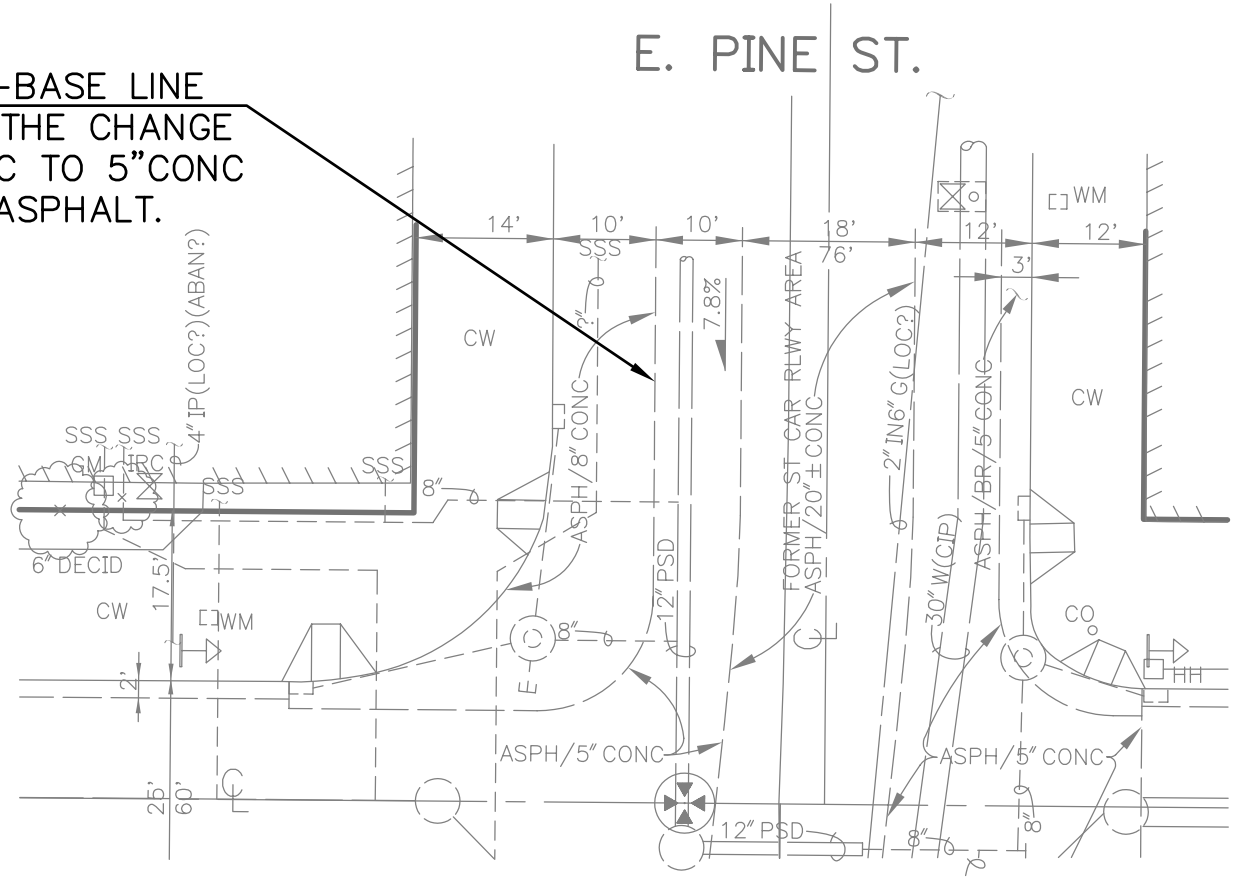
GRANITE CURB & END OF CURB CALLOUTS

FIGURE NO.

6C & 6D

PAVING SUB–BASE LINE
DESIGNATES THE CHANGE
FROM 8"CONC TO 5"CONC
UNDER THE ASPHALT.



NOTE:
MULTIPLE PAVING IMPROVEMENTS
RESULT IN VARIOUS PAVING SURFACES,
SUBSURFACE MATERIALS, AND THICKNESS

SCALE:1"=20'

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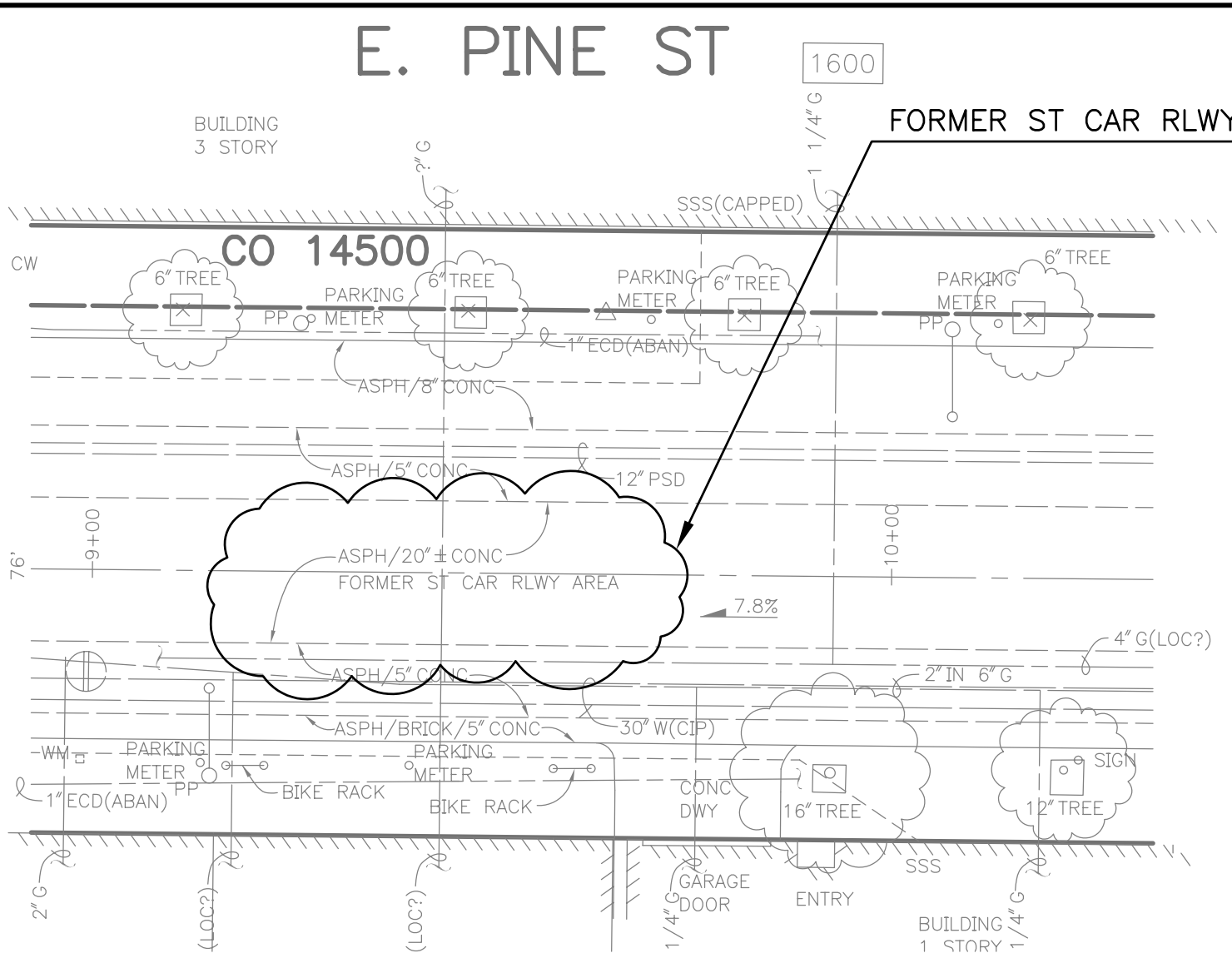
MULTIPLE PAVING IMPROVEMENTS WITHIN THE SAME STREET

FIGURE NO.
6E



SCALE:1"= 20'

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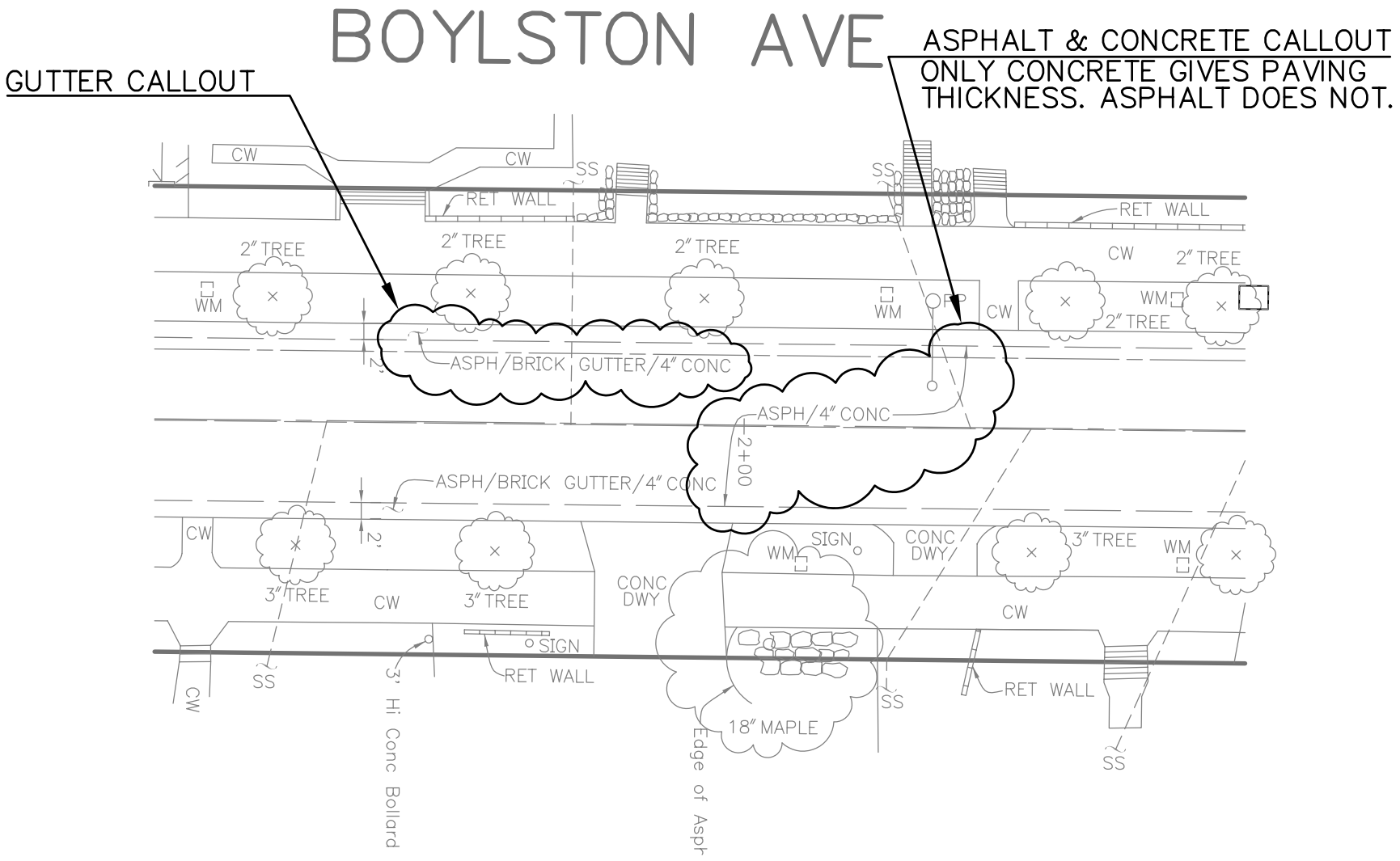
FORMER STREET CAR RAILWAY AREA

FIGURE NO.

6F



SCALE:1"=20'

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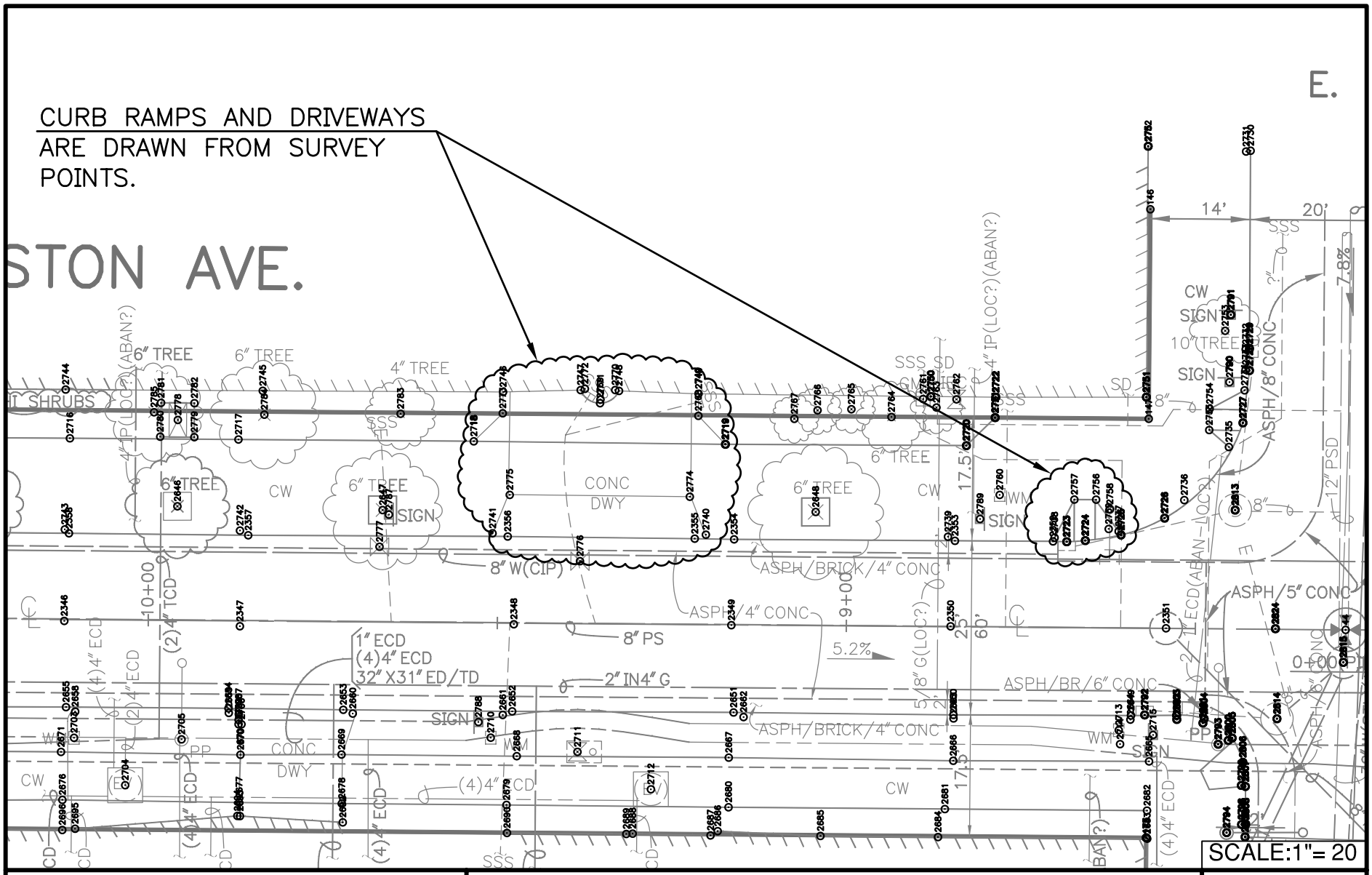
Seattle Public Utilities

GUTTER CALLOUT & ASPHALT/ CONCRETE CALLOUT

FIGURE NO.

6G



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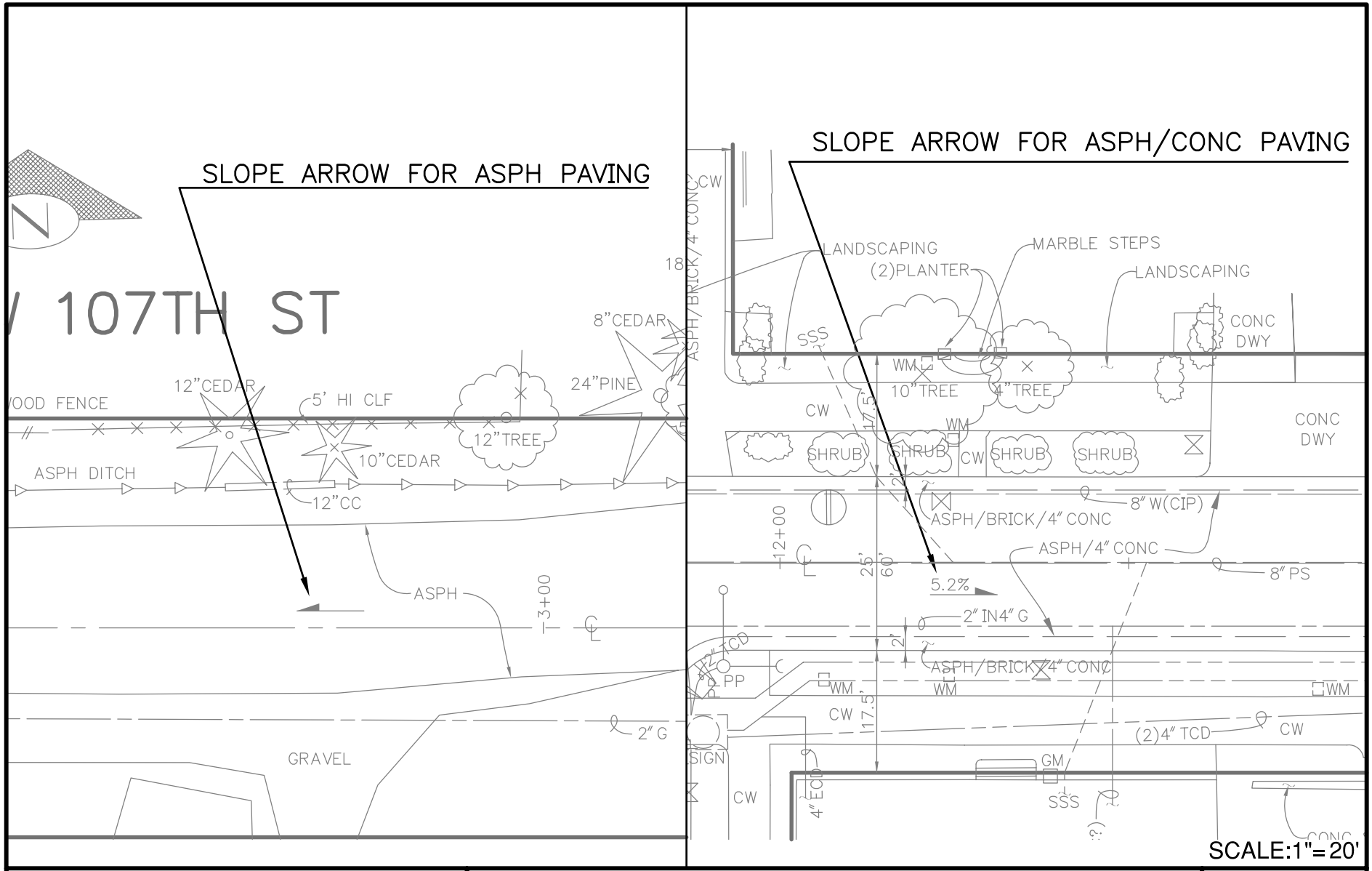
Seattle Public Utilities

CURB RAMPS AND DRIVEWAYS

FIGURE NO.
6J



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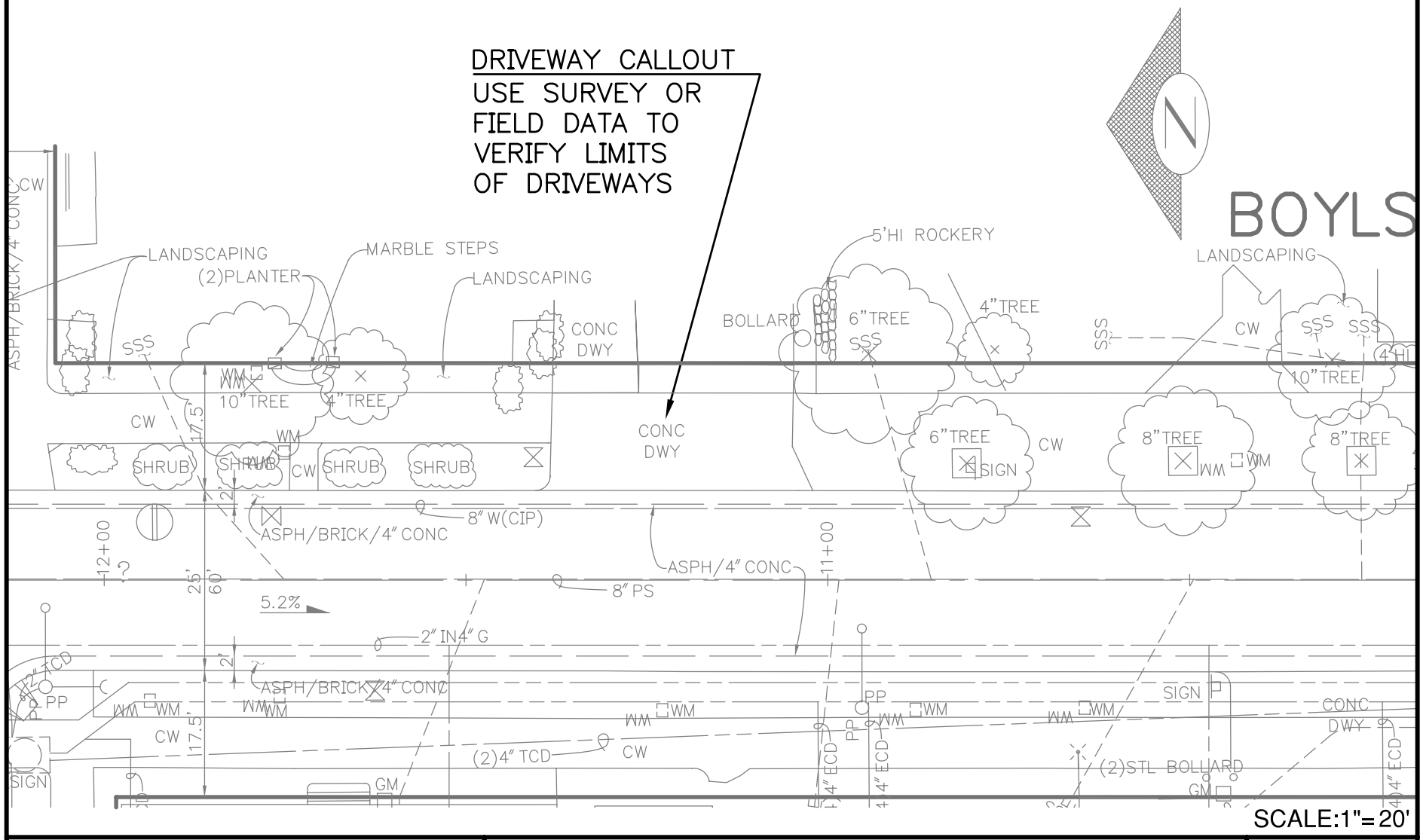
PAVING SLOPES

FIGURE NO.
6K



SCALE:1"=20'

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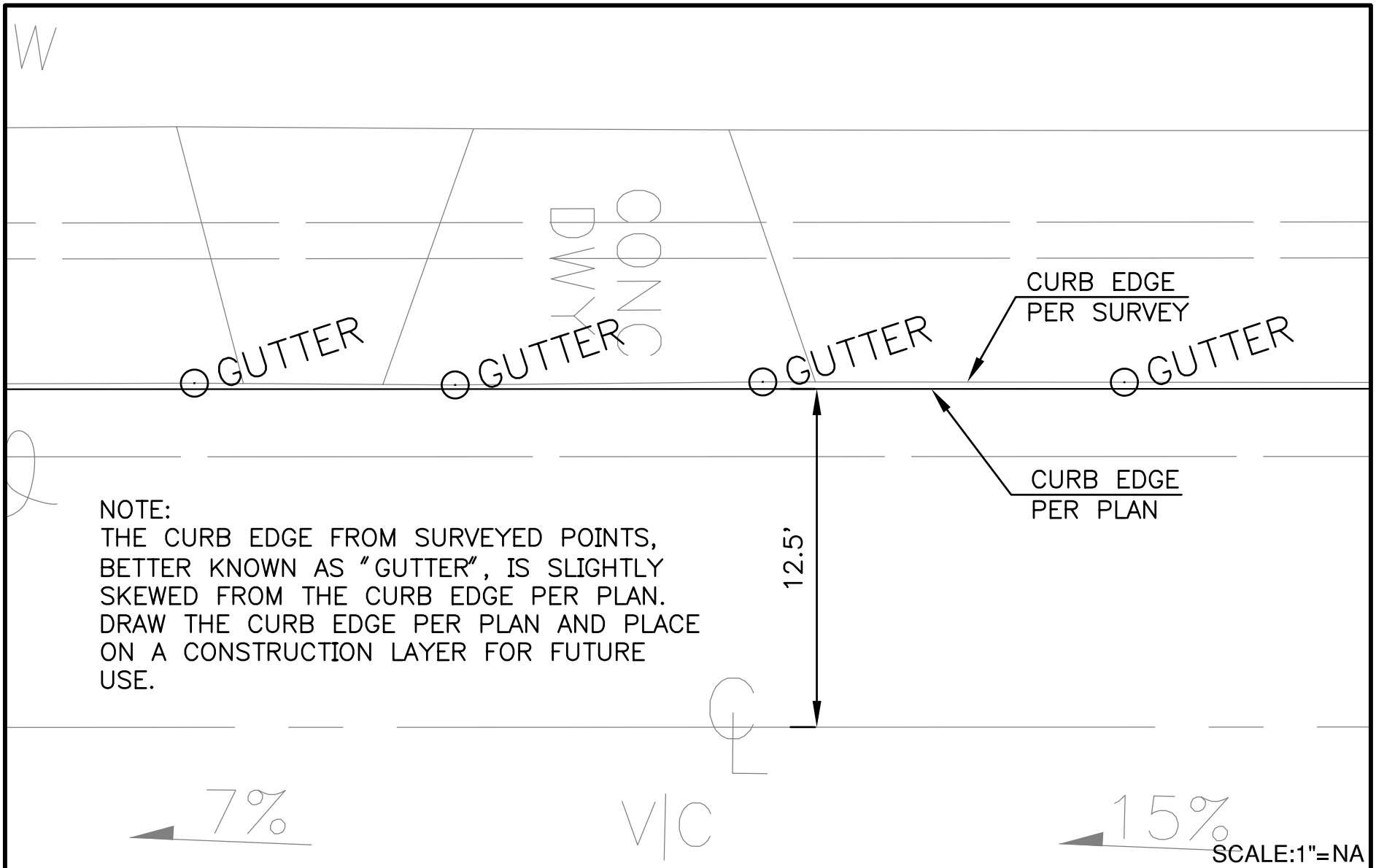
DRIVEWAYS

FIGURE NO.

6L



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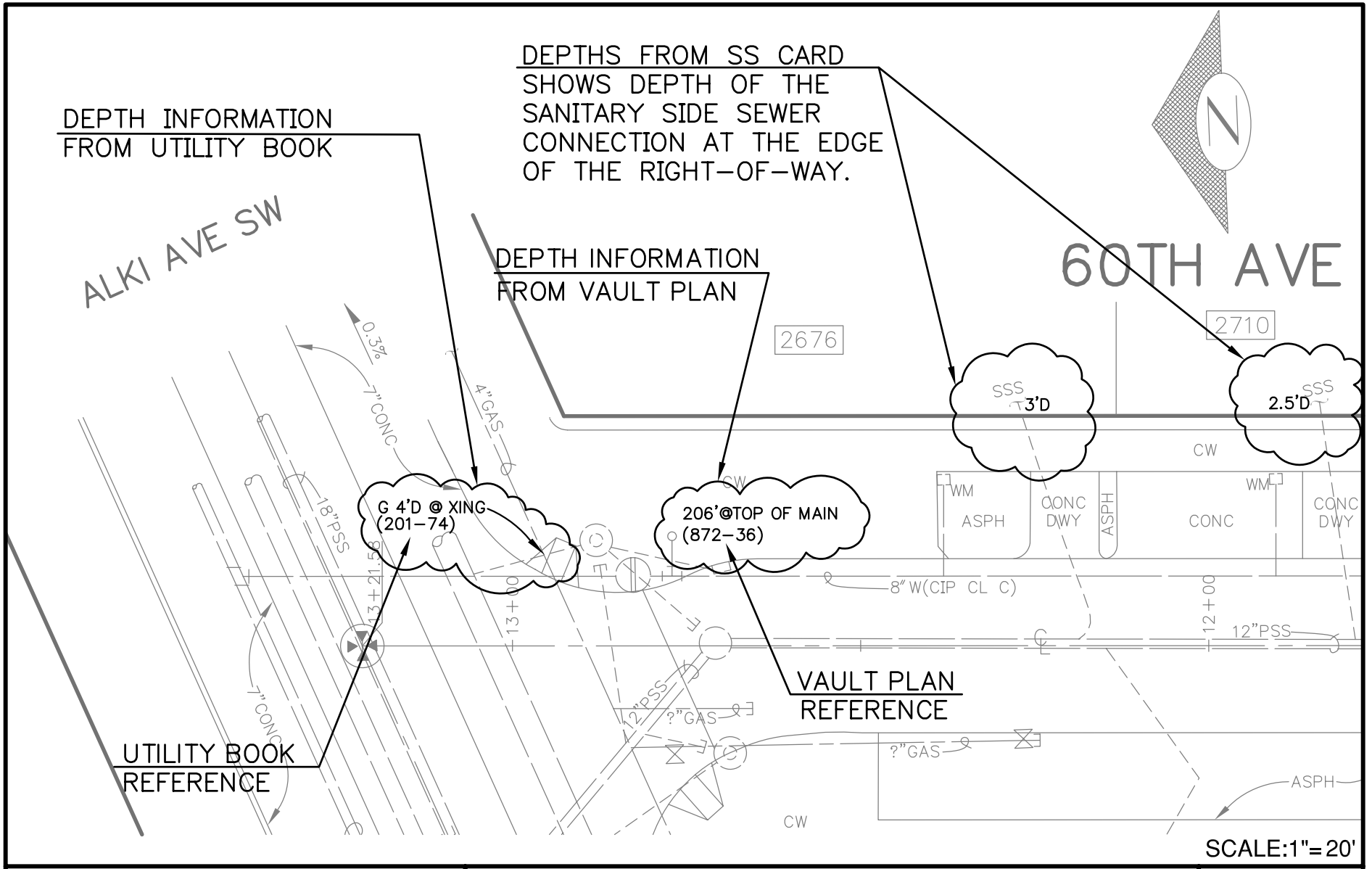
Seattle Public Utilities

CURRENT CURB EDGE vs PLAN CURB EDGE

FIGURE NO.
6M



SCALE:1"=20'

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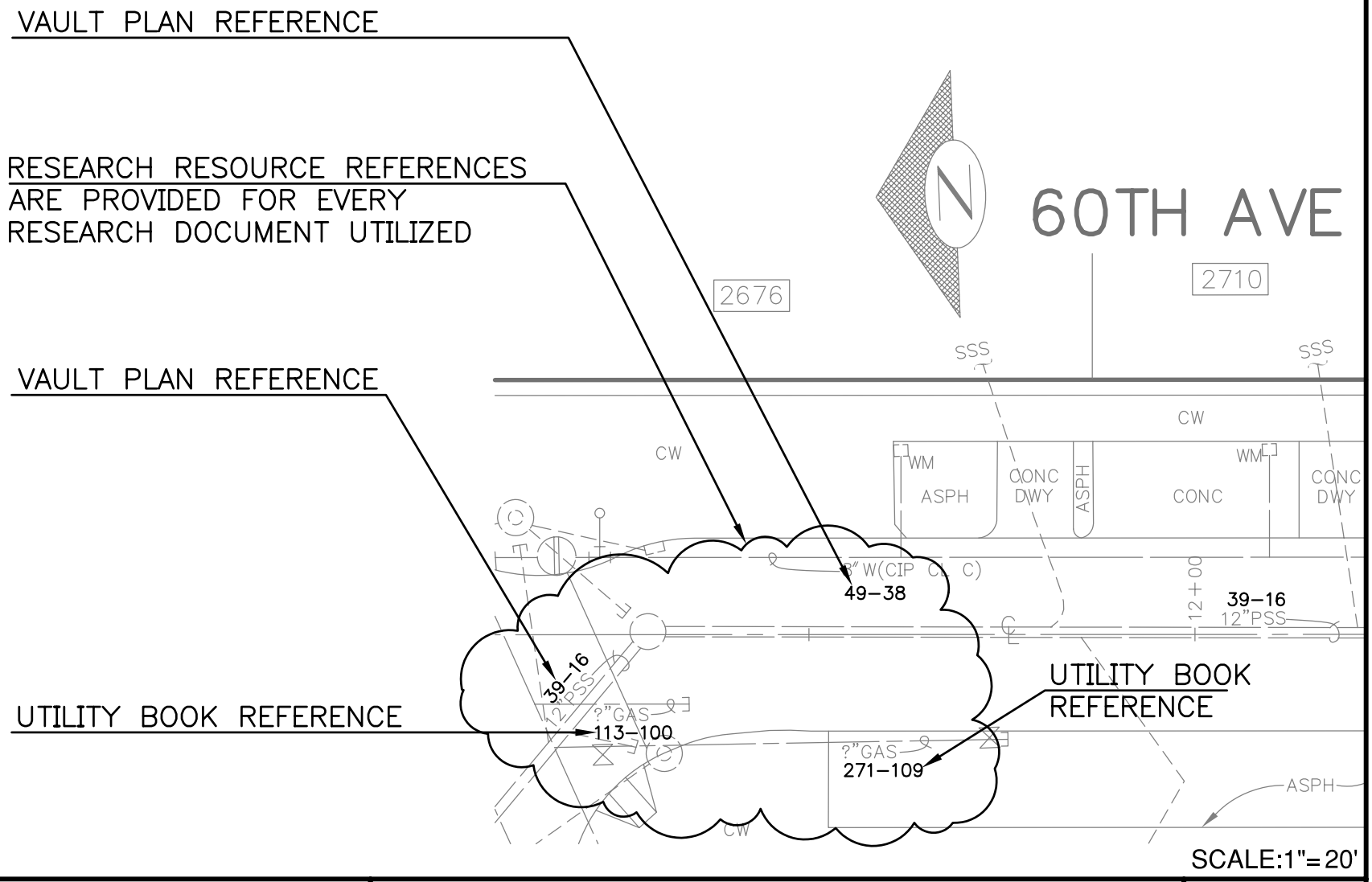
Seattle Public Utilities

DEPTH INFORMATION FROM VARIOUS RESEARCH RESOURCE REFERENCES

FIGURE NO.
7B



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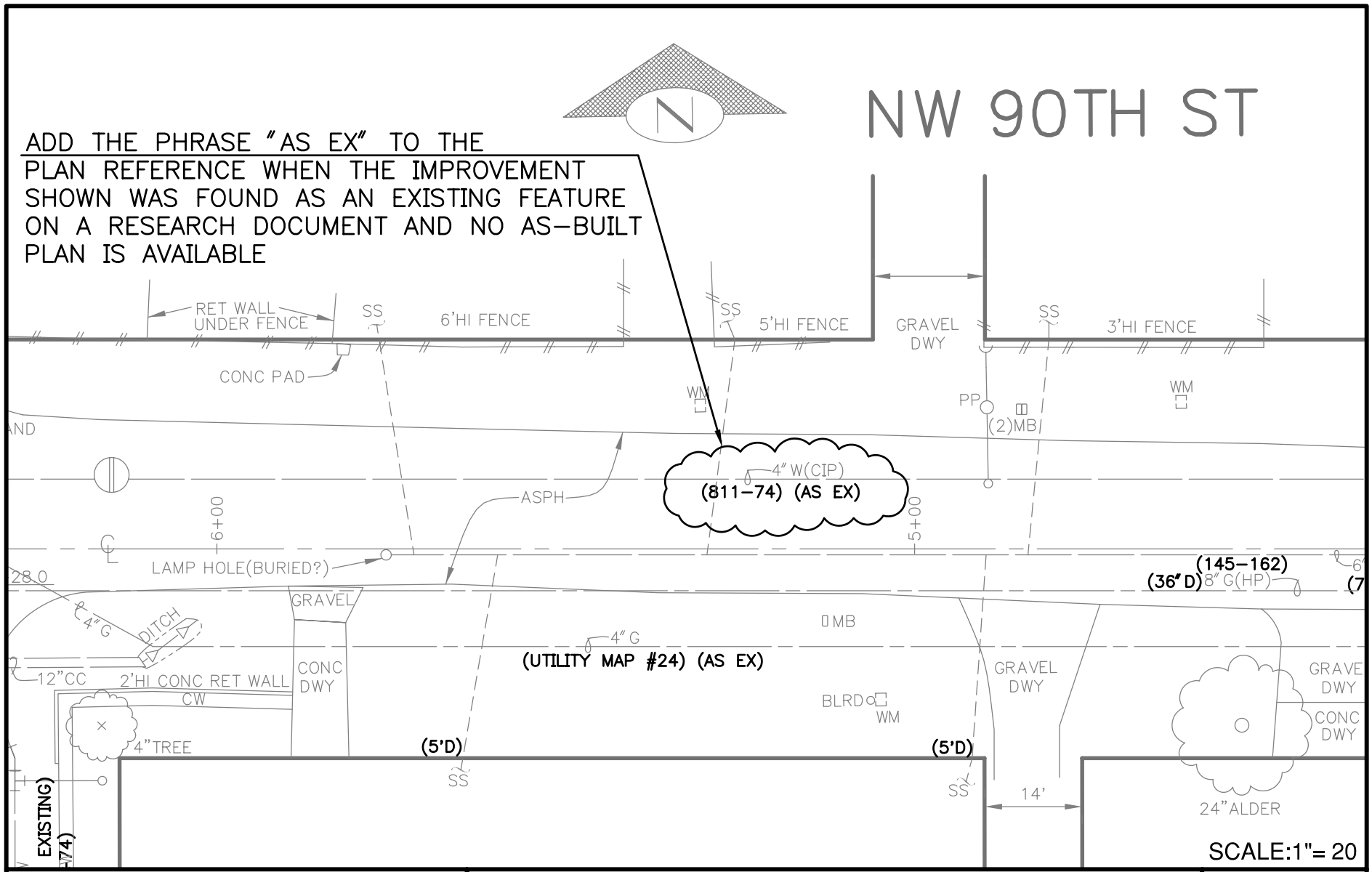
RESEARCH RESOURCE REFERENCES FROM VARIOUS RESEARCH DOC'S

FIGURE NO.
7C



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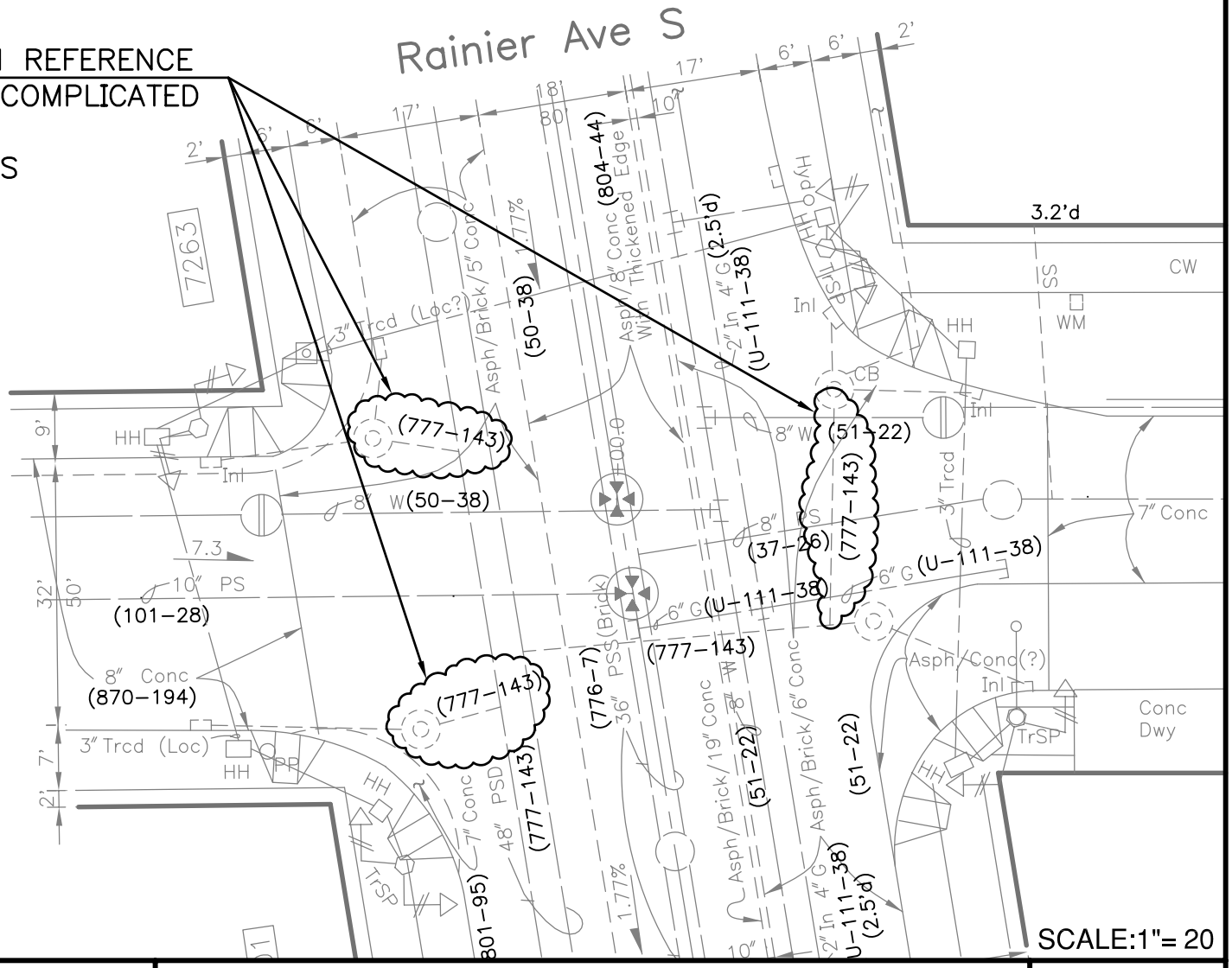
"AS EX" ADDED TO A RESEARCH REFERENCE CALLOUT

FIGURE NO.
7D

CALL OUT A RESEARCH REFERENCE FOR CONNECTIONS IN COMPLICATED AREAS WITH MULITPLE SEWER/DRAINAGE PLANS



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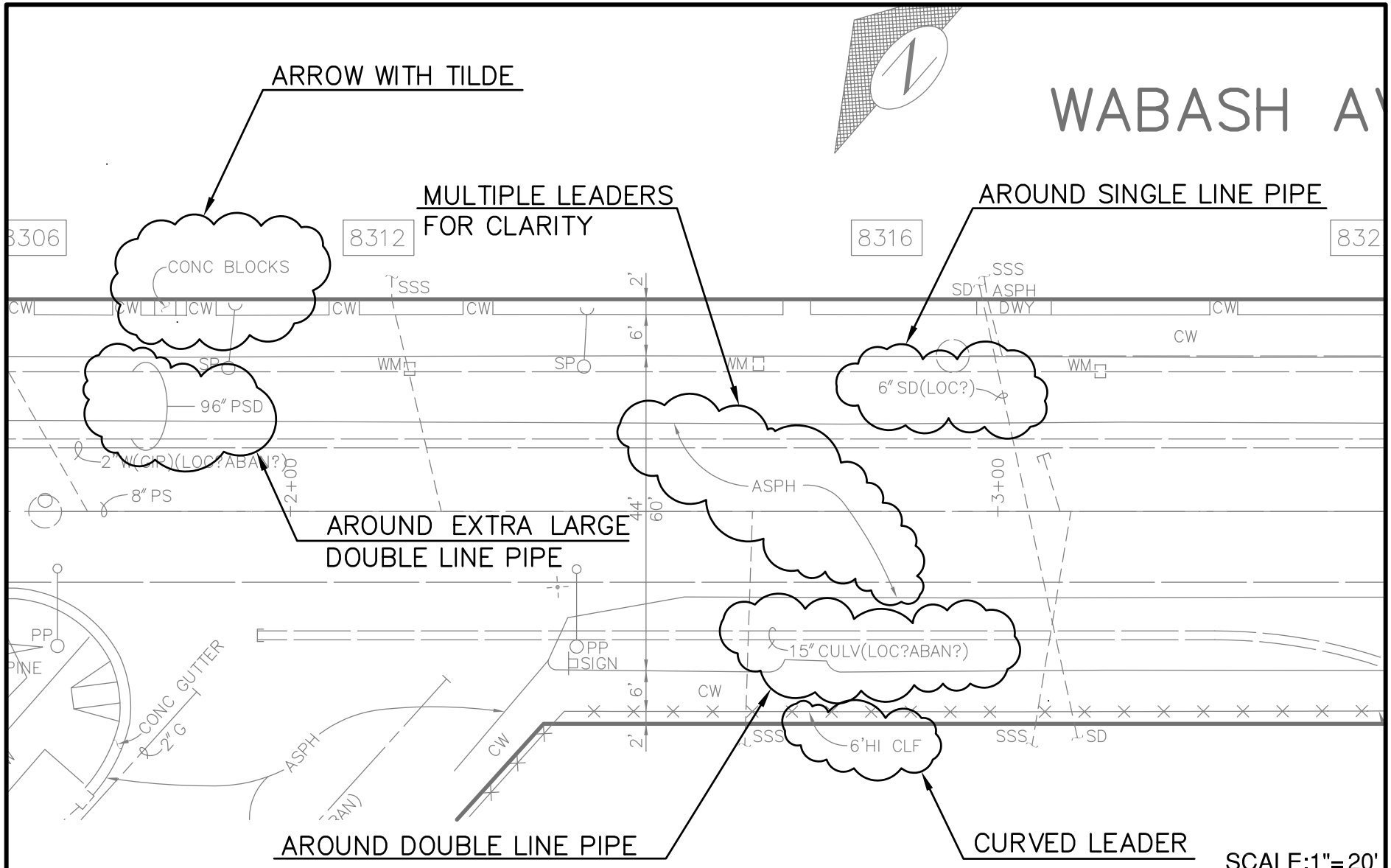
CATCH BASIN & INLET CONNECTIONS

FIGURE NO.
7E



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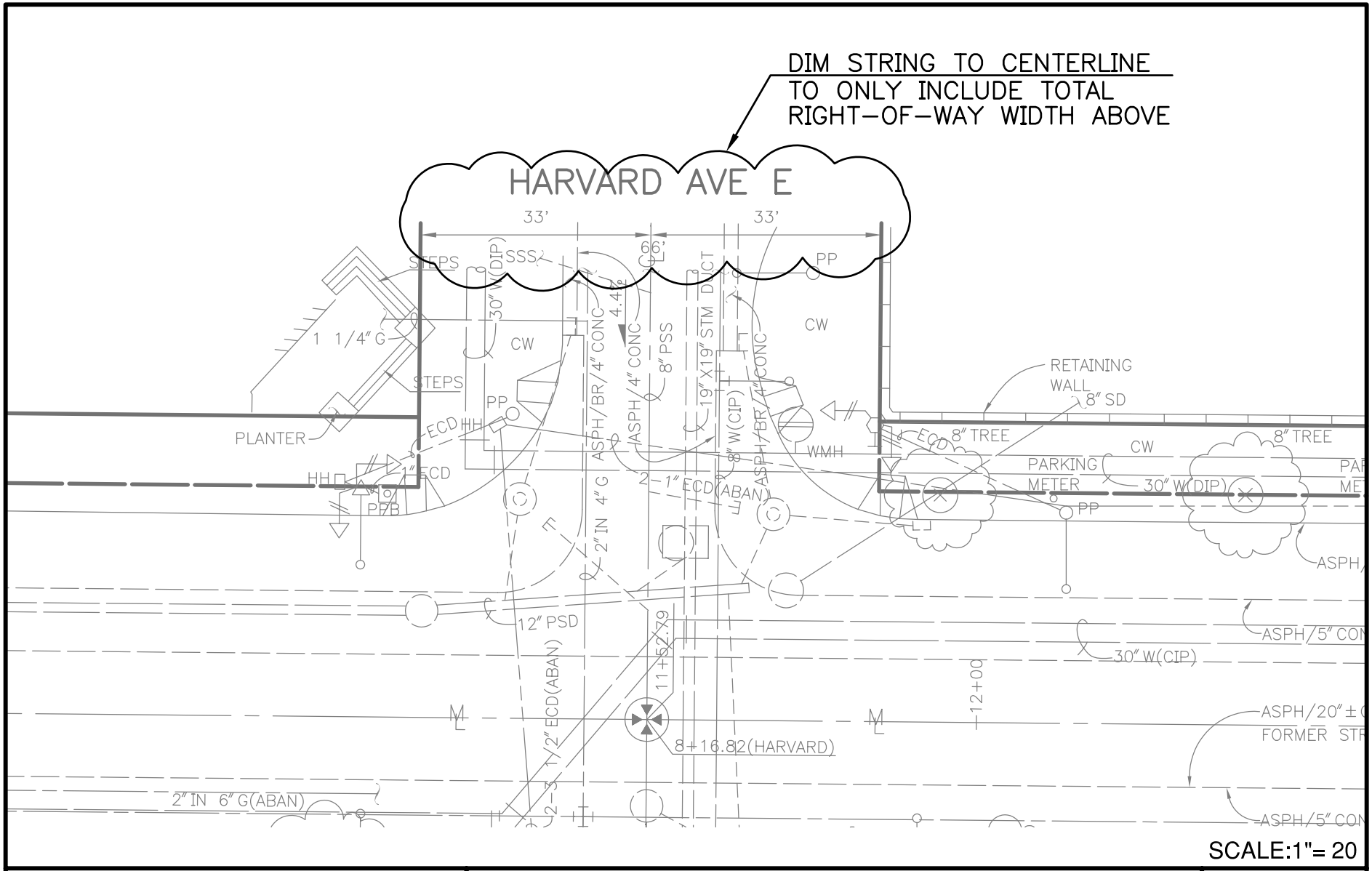
Seattle Public Utilities

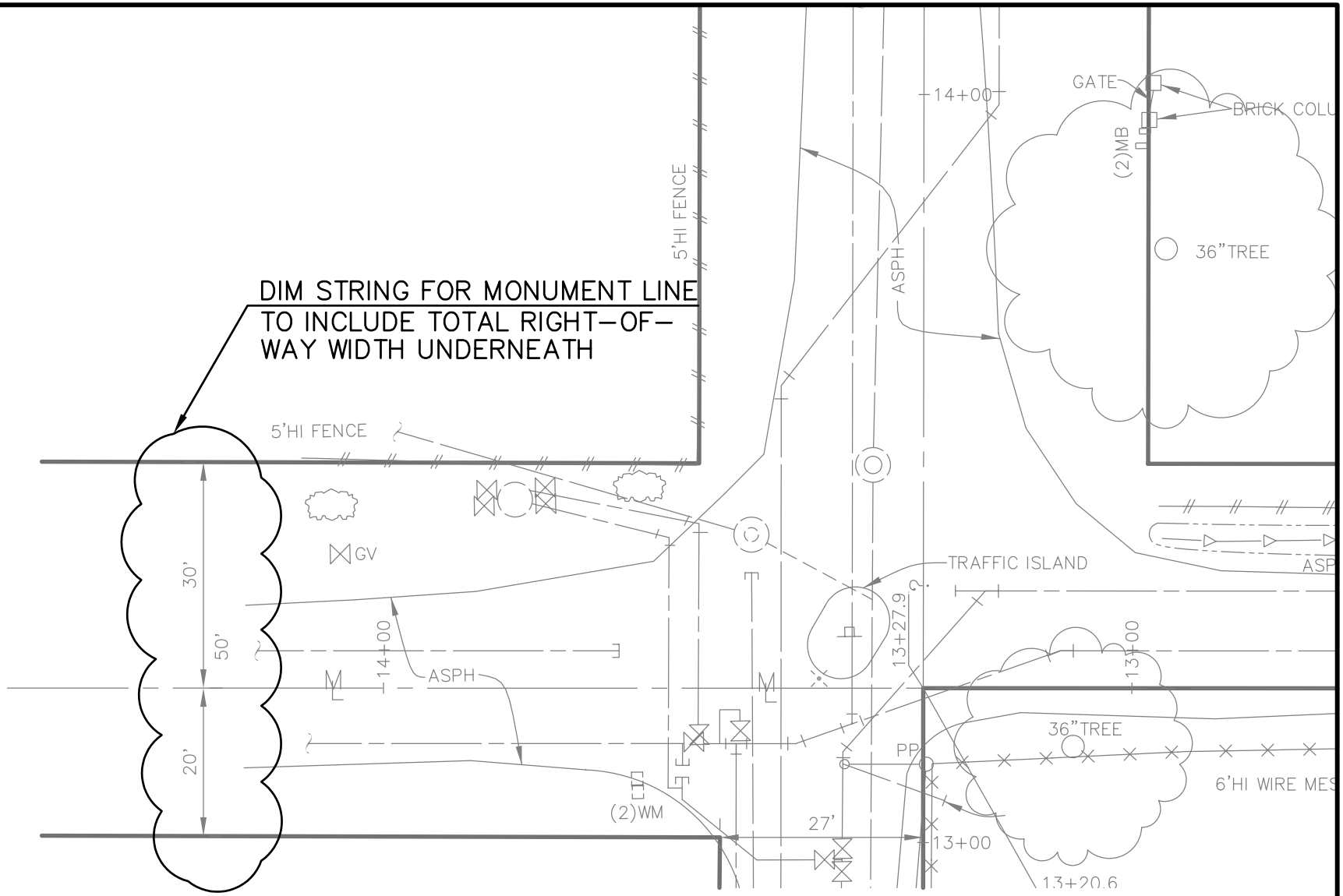
LEADERS

FIGURE NO.
8A



SCALE:1"= 20

City of Seattle ***Seattle Public Utilities***	DIM STRING TO CENTERLINE	FIGURE NO. 9A



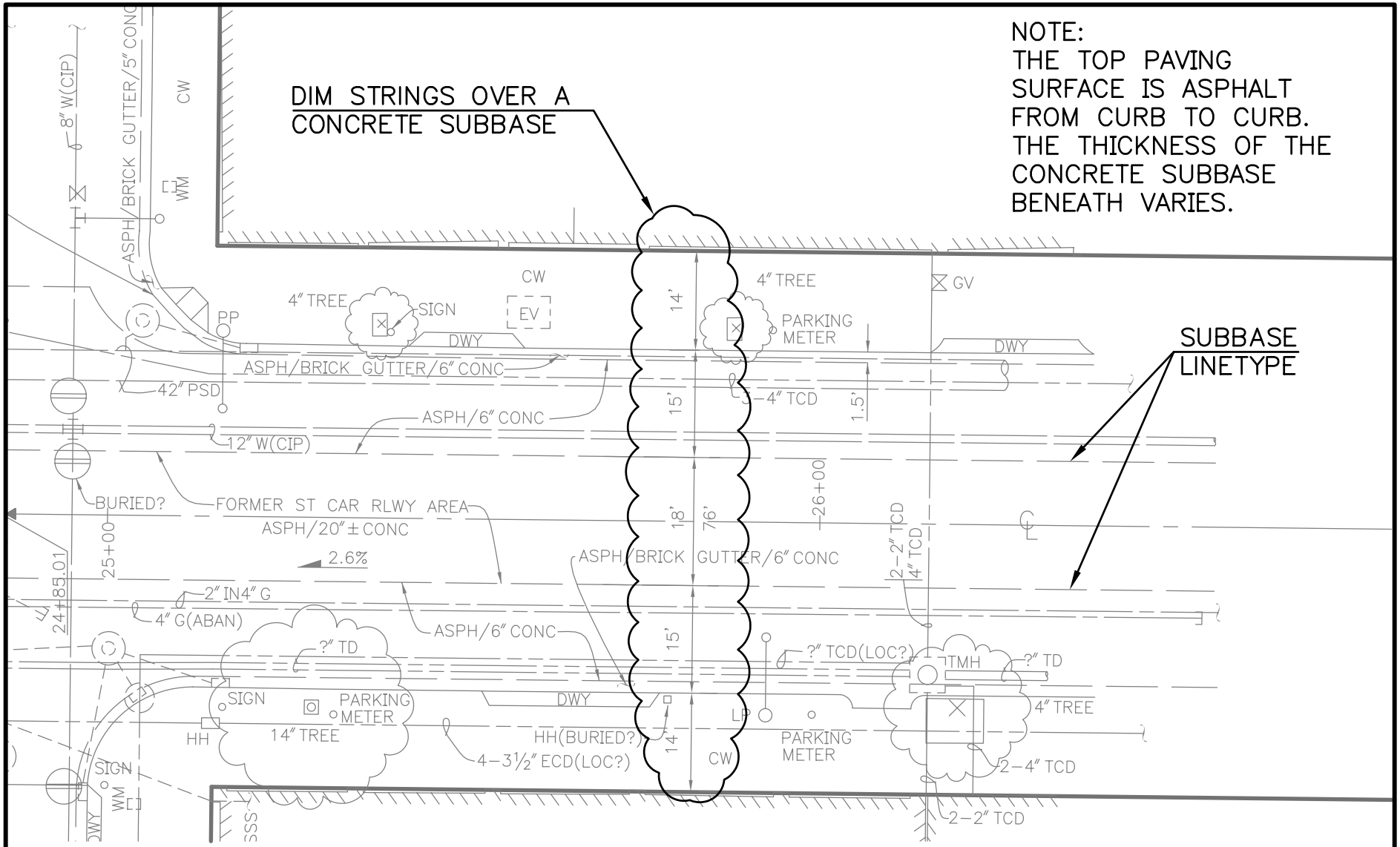
SCALE:1"= 20

City of Seattle
Seattle Public Utilities

DIM STRING FOR MONUMENT LINES

FIGURE NO.

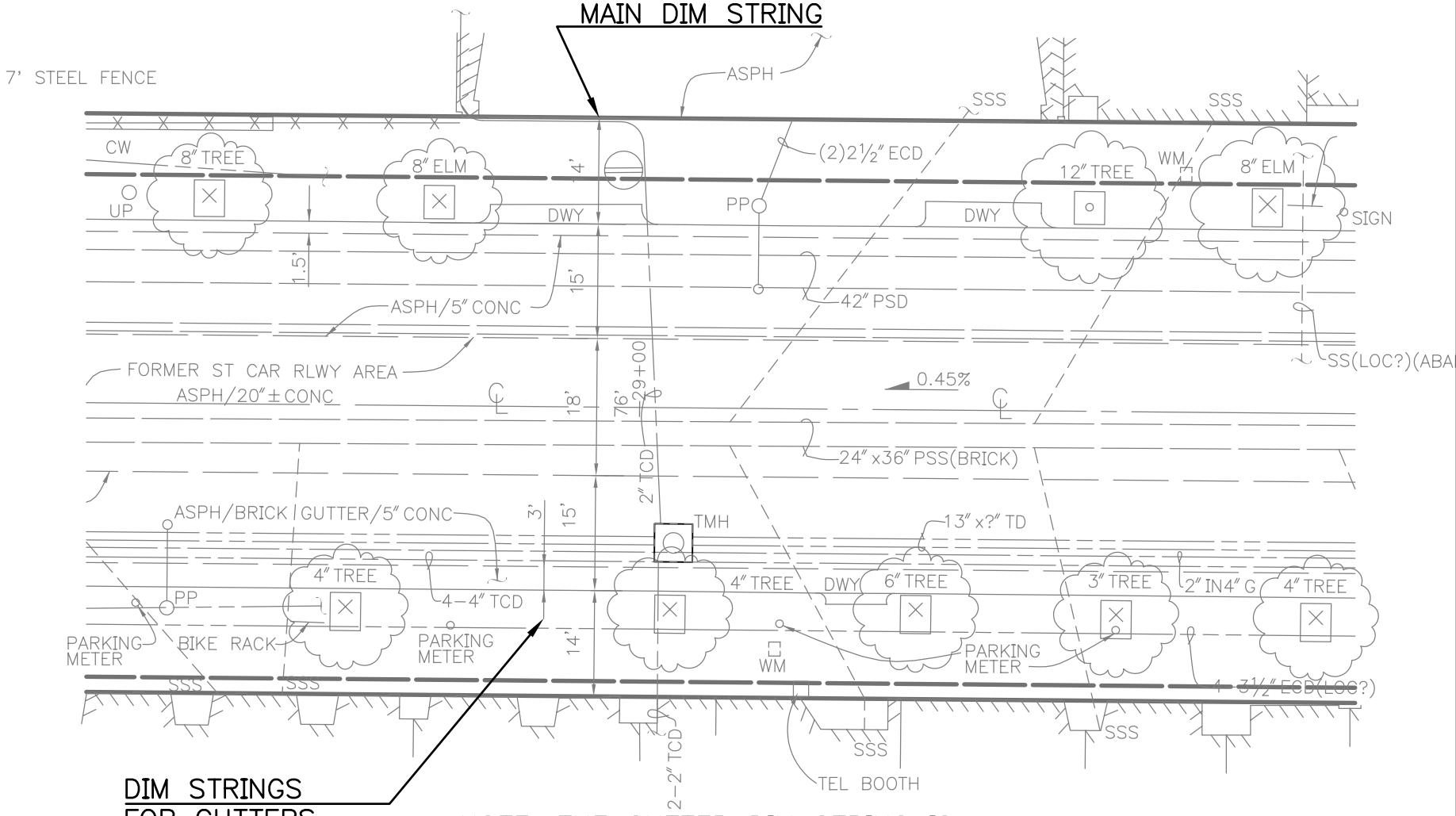
9B



City of Seattle
Seattle Public Utilities

DIM STRINGS ON A PAVING SUBBASE

FIGURE NO.
9C



SCALE:1"= 20

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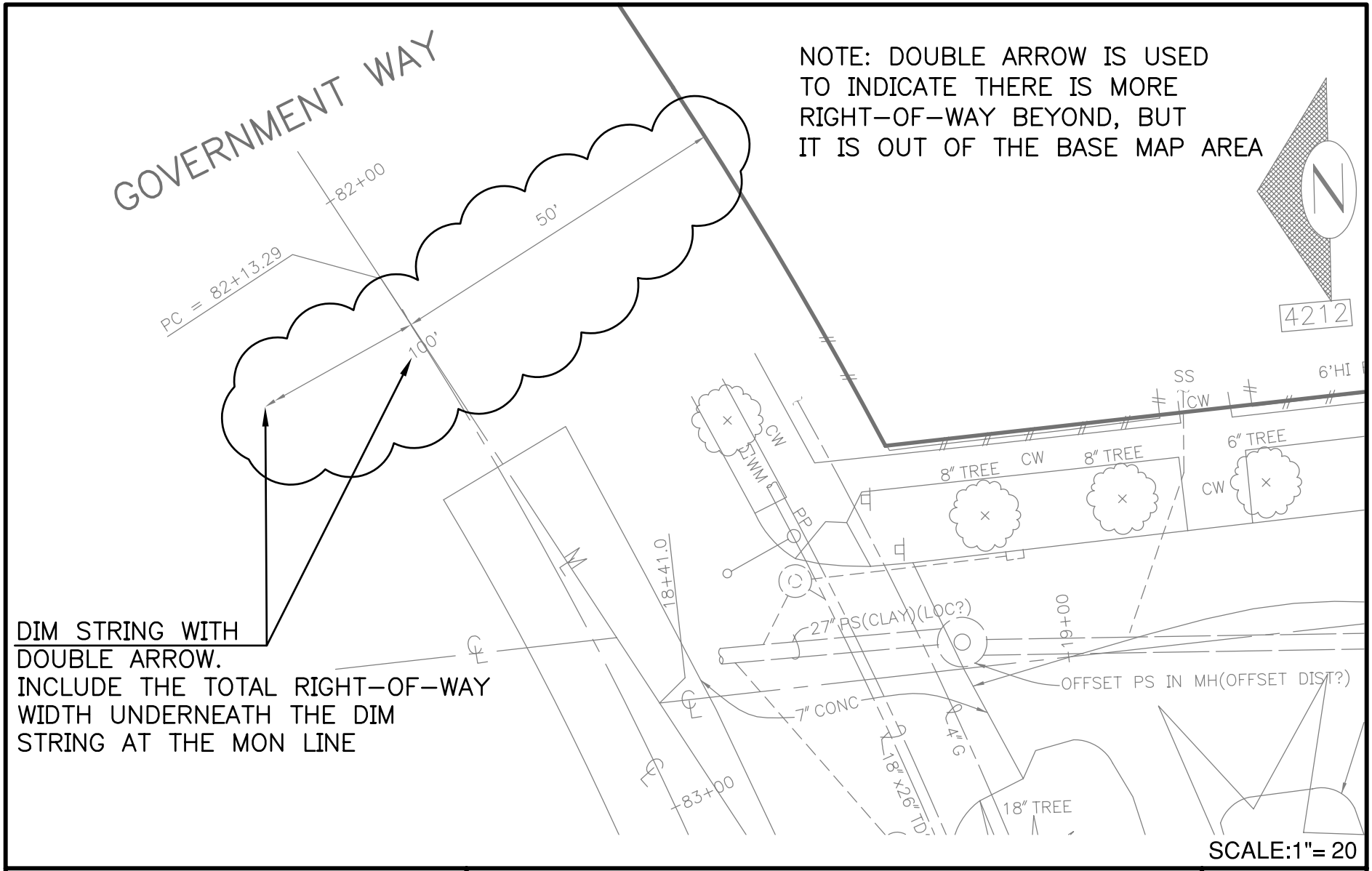
Seattle Public Utilities

DIM STRINGS FOR GUTTERS

FIGURE NO.

9D



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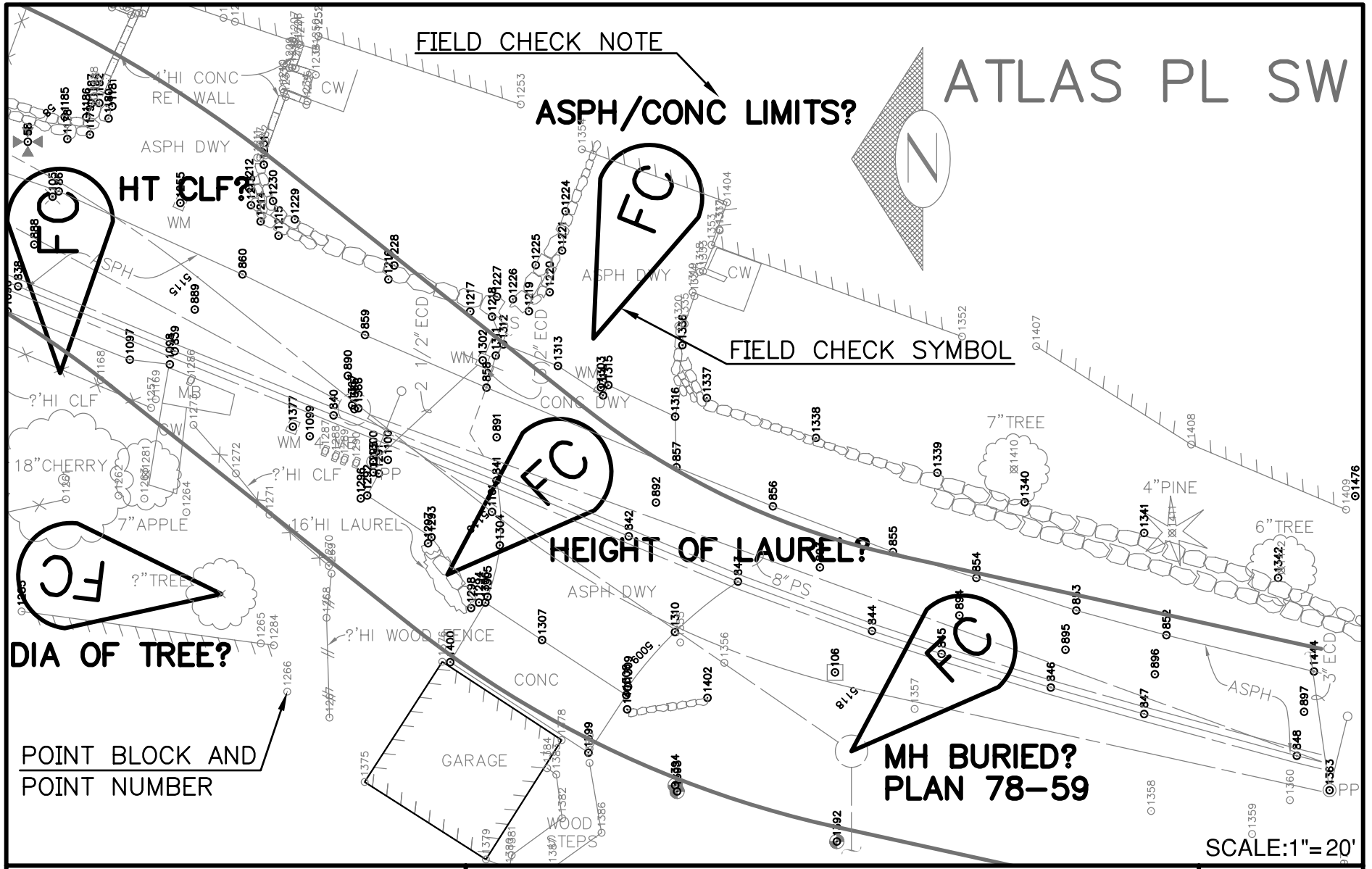
Seattle Public Utilities

DIM STRING WITH DOUBLE ARROW

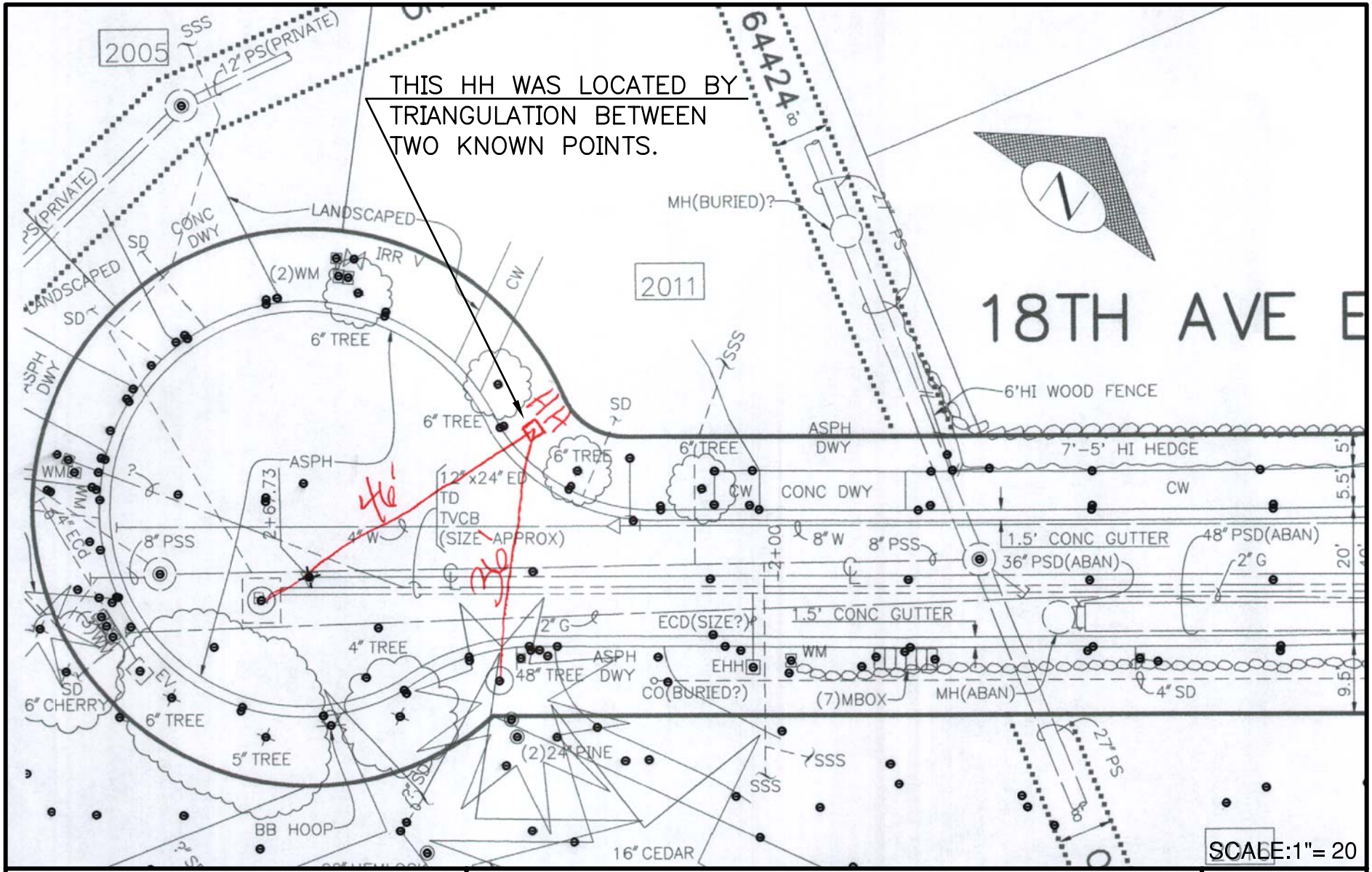
FIGURE NO.
9E



City of Seattle
Seattle Public Utilities

FIELD CHECK NOTES

FIGURE NO.
10A



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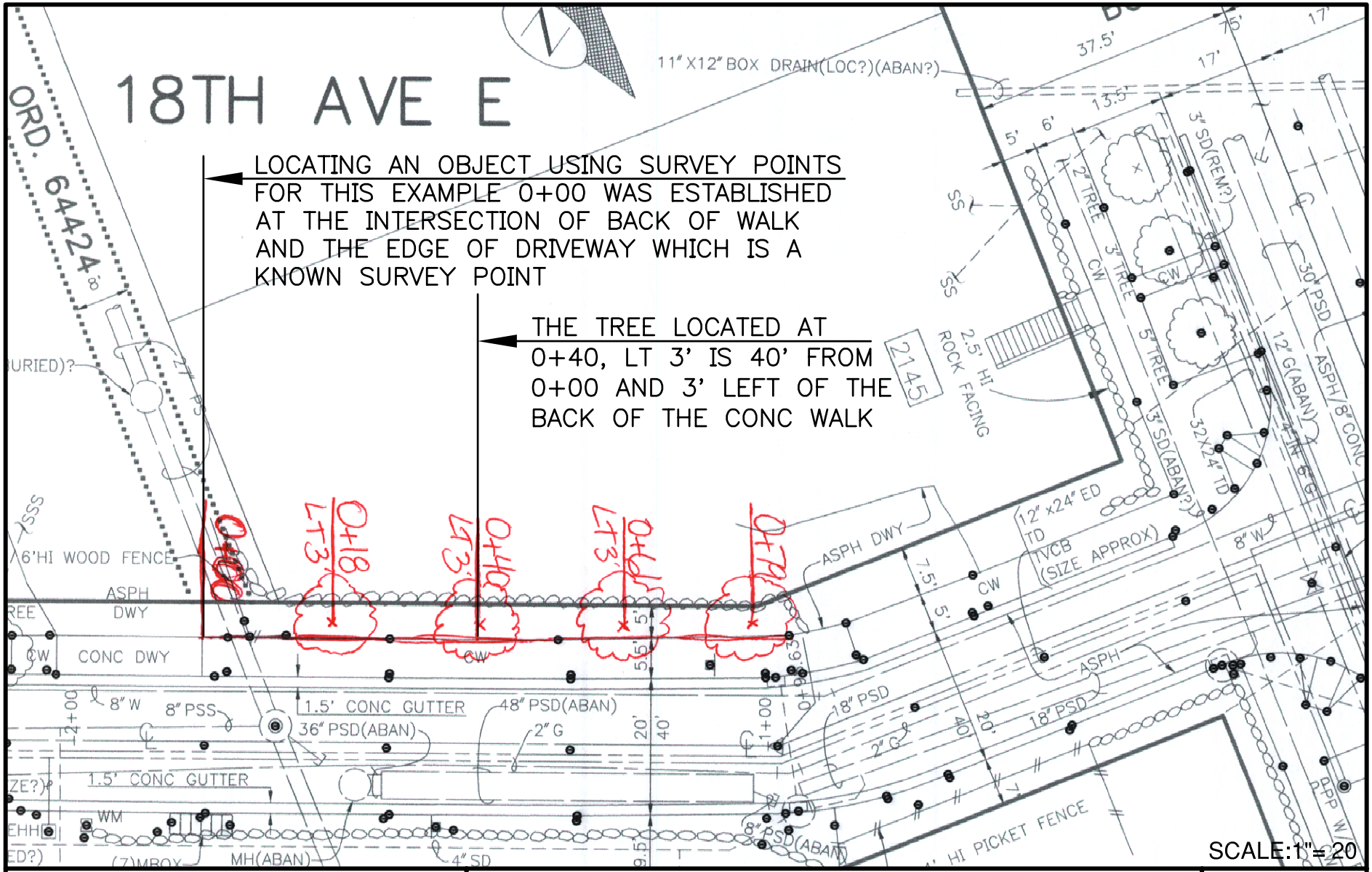
LOCATE AN OBJECT BY TRIANGULATION

FIGURE NO.
10C



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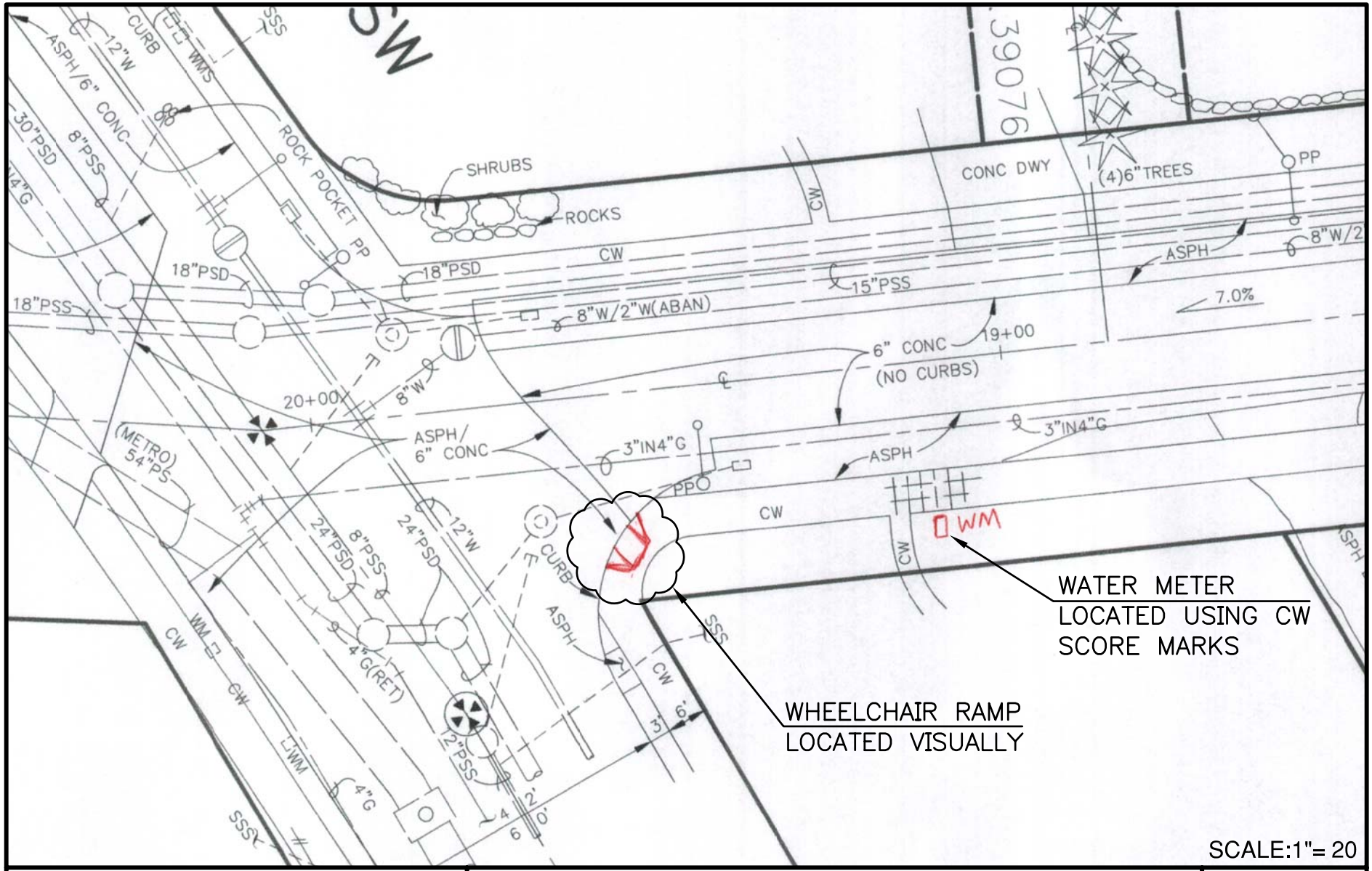
LOCATE AN OBJECT USING A STATIONING LINE RELATIVE TO A SURVEY POINT

FIGURE NO.
10D



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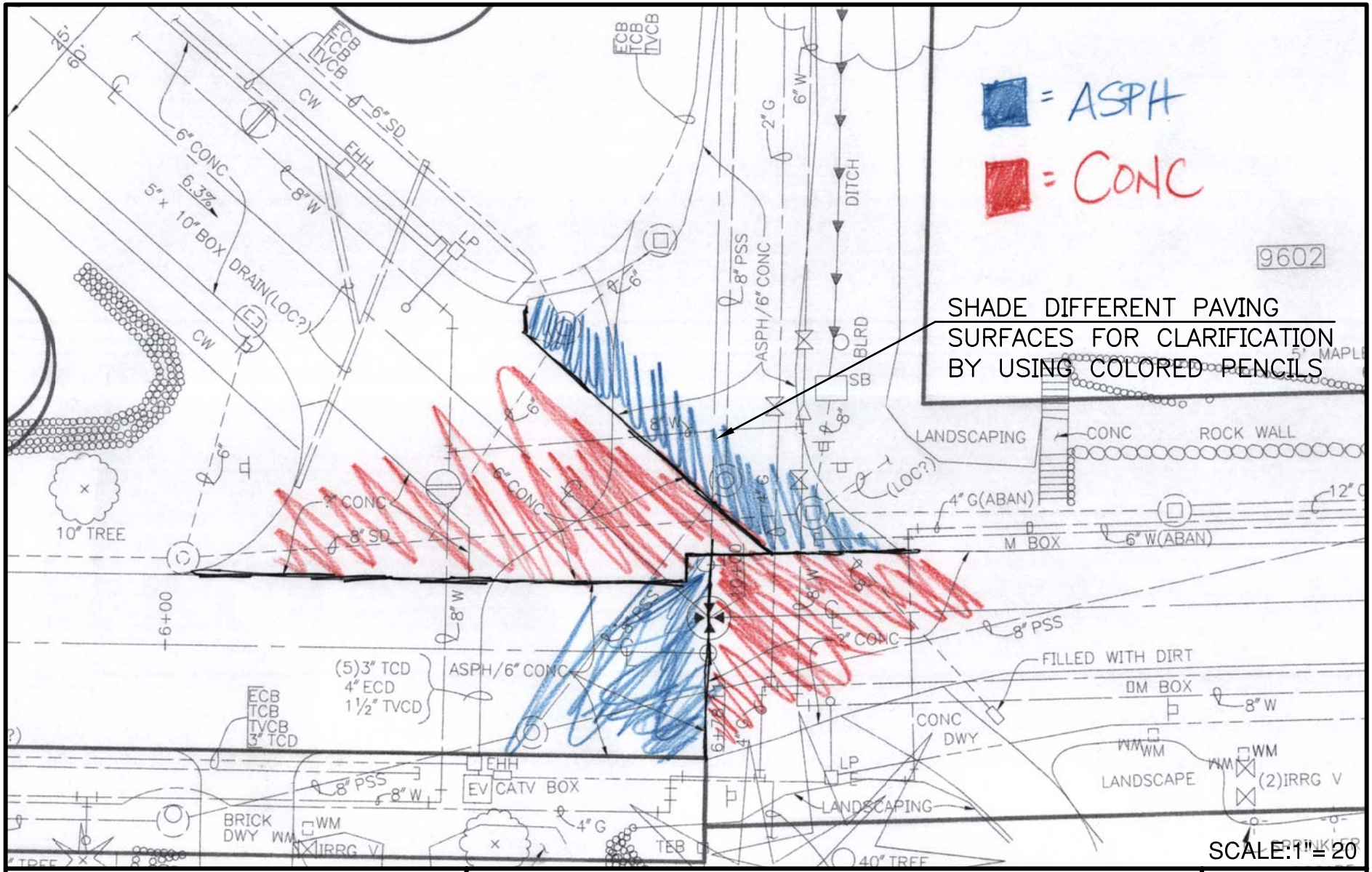
LOCATE AN OBJECT VISUALLY

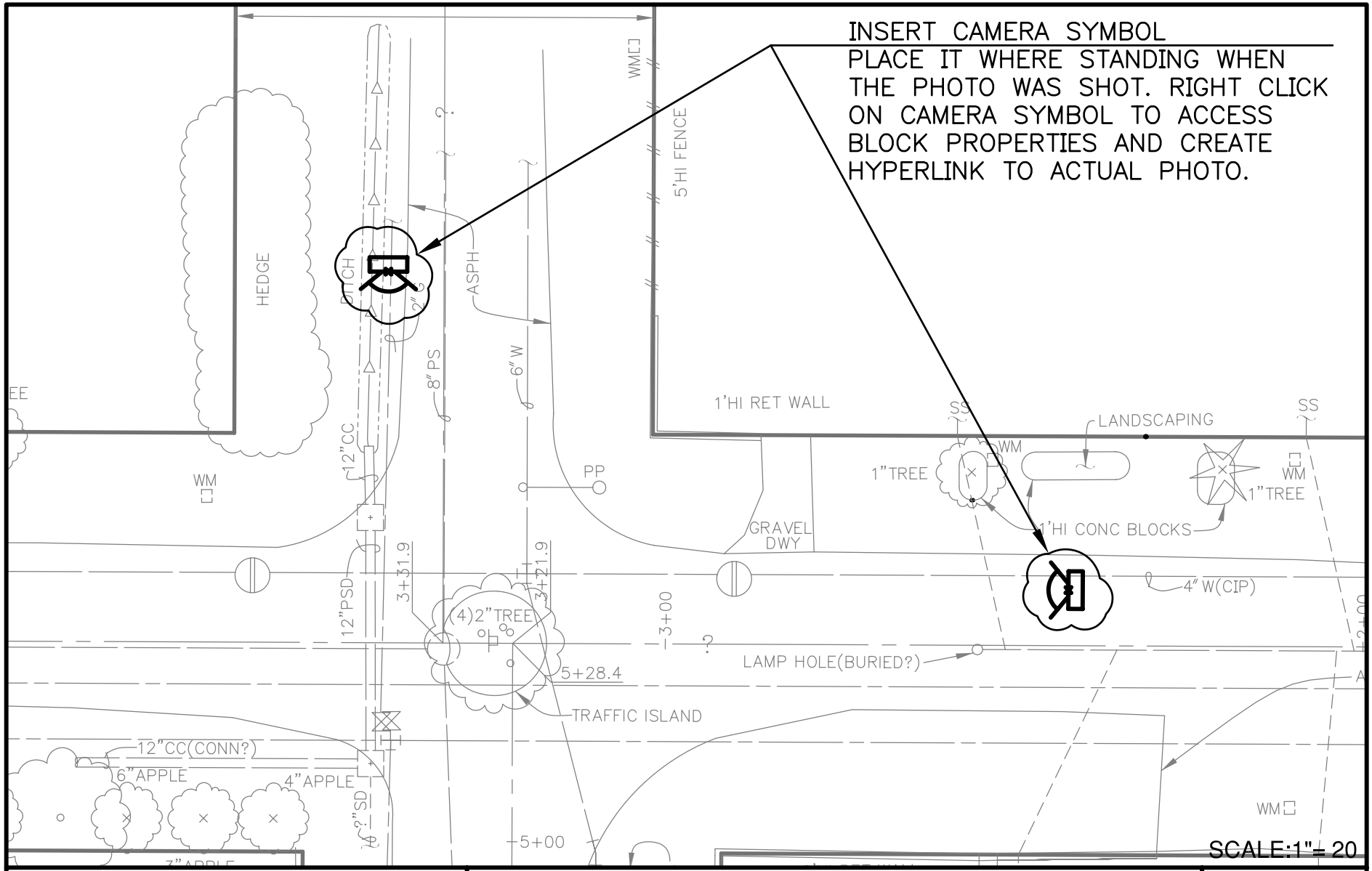
FIGURE NO.
10E



City of Seattle
Seattle Public Utilities

SHADING PAVED SURFACES

FIGURE NO.
10F



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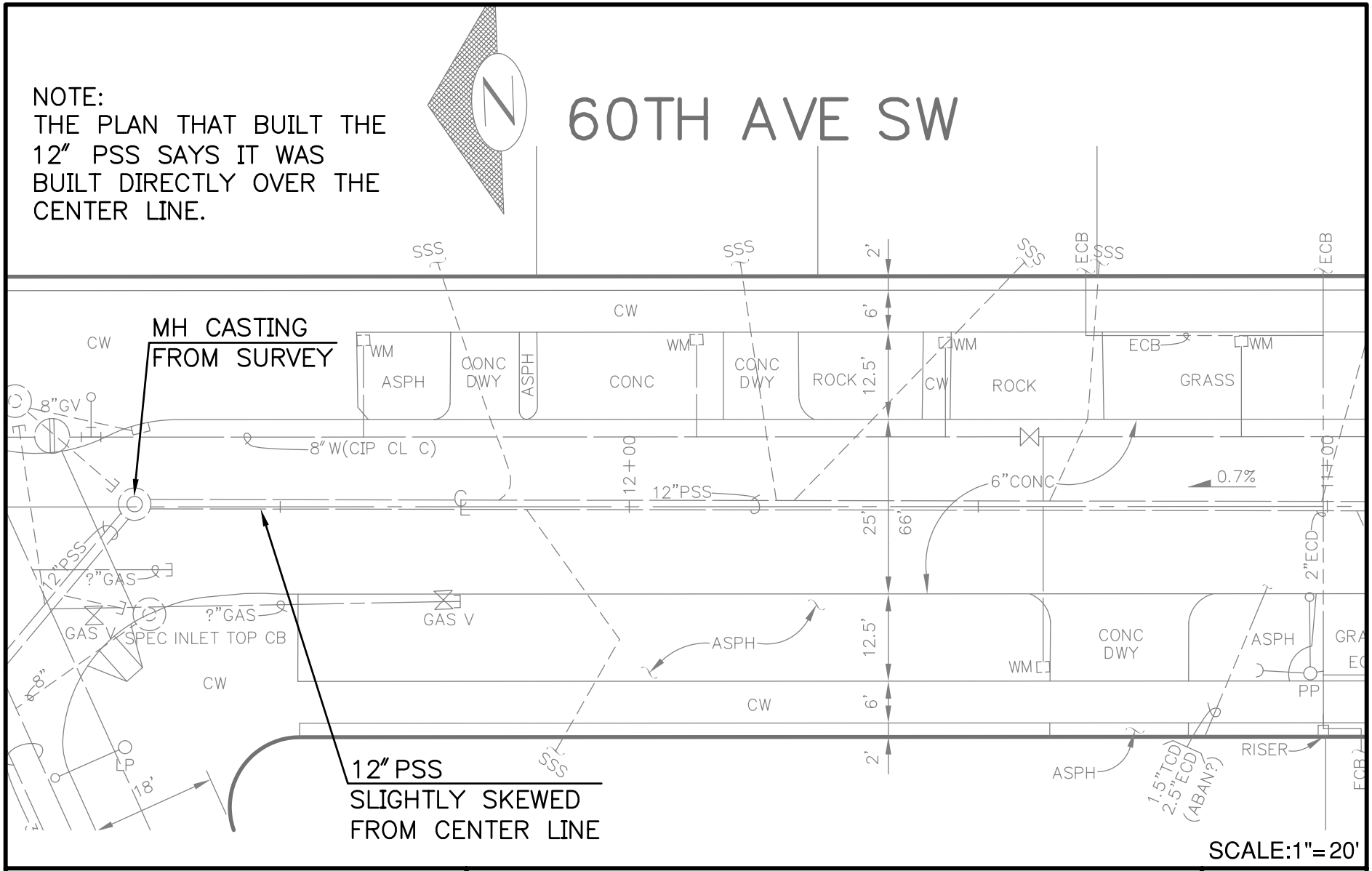
TAKING PHOTOS IN THE FIELD

FIGURE NO.
10G

NOTE:
THE PLAN THAT BUILT THE 12″ PSS SAYS IT WAS BUILT DIRECTLY OVER THE CENTER LINE.



SCALE:1"=20'

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SEWER LOCATED OFF OF THE CENTER LINE

FIGURE NO.
11C

V.

MANHOLE NUMBER

MANHOLE TYPE CORRESPONDS TO STANDARD PLAN NUMBER

M.H. #1

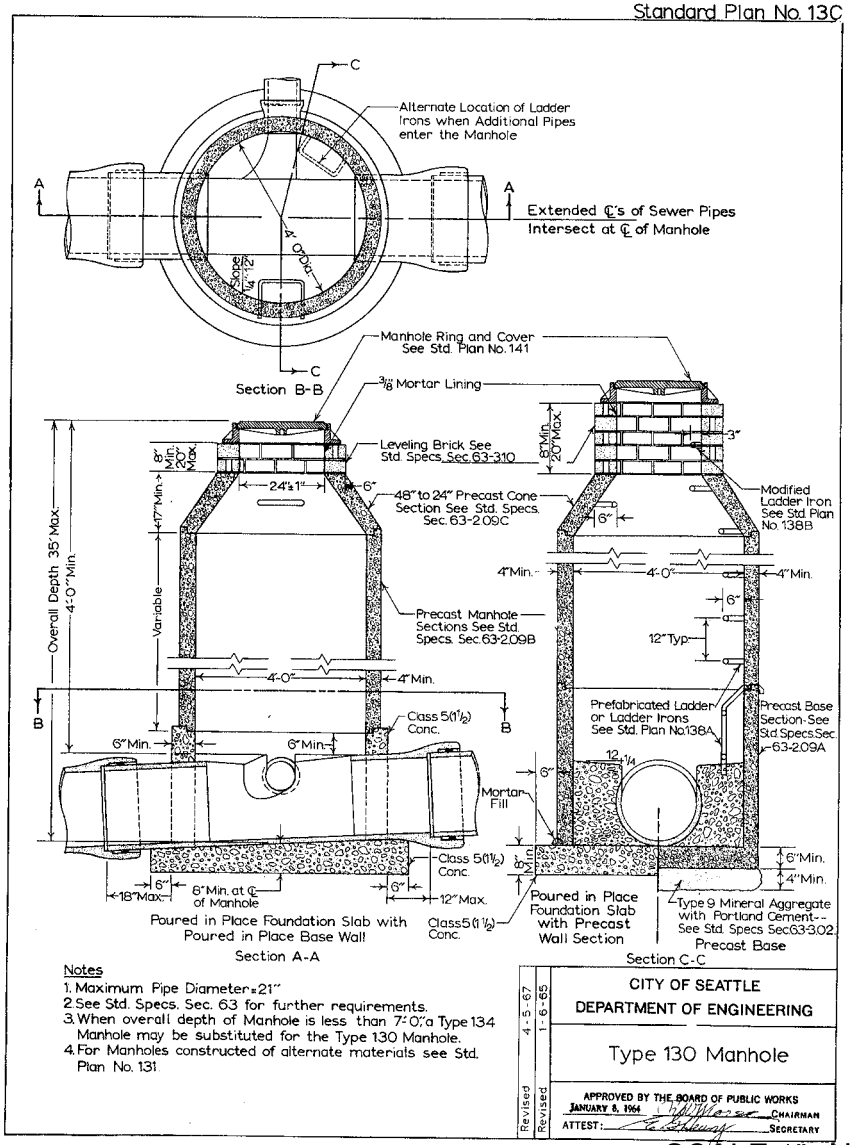
Type 130

Ex. 18" C.C.

℄ Paving

I.E. 272.58 – 12" S

Standard Plan No. 130



Notes

1. Maximum Pipe Diameter=21"
2. See Std. Specs. Sec. 63 for further requirements.
3. When overall depth of Manhole is less than 7'-0" a Type 134 Manhole may be substituted for the Type 130 Manhole.
4. For Manholes constructed of alternate materials see Std. Plan No. 131

CITY OF SEATTLE
DEPARTMENT OF ENGINEERING

Type 130 Manhole

Revised 4-5-67
Revised 1-6-65

APPROVED BY THE BOARD OF PUBLIC WORKS
JANUARY 8, 1964
CHAIRMAN
ATTEST: SECRETARY

SCALE:1"=NA

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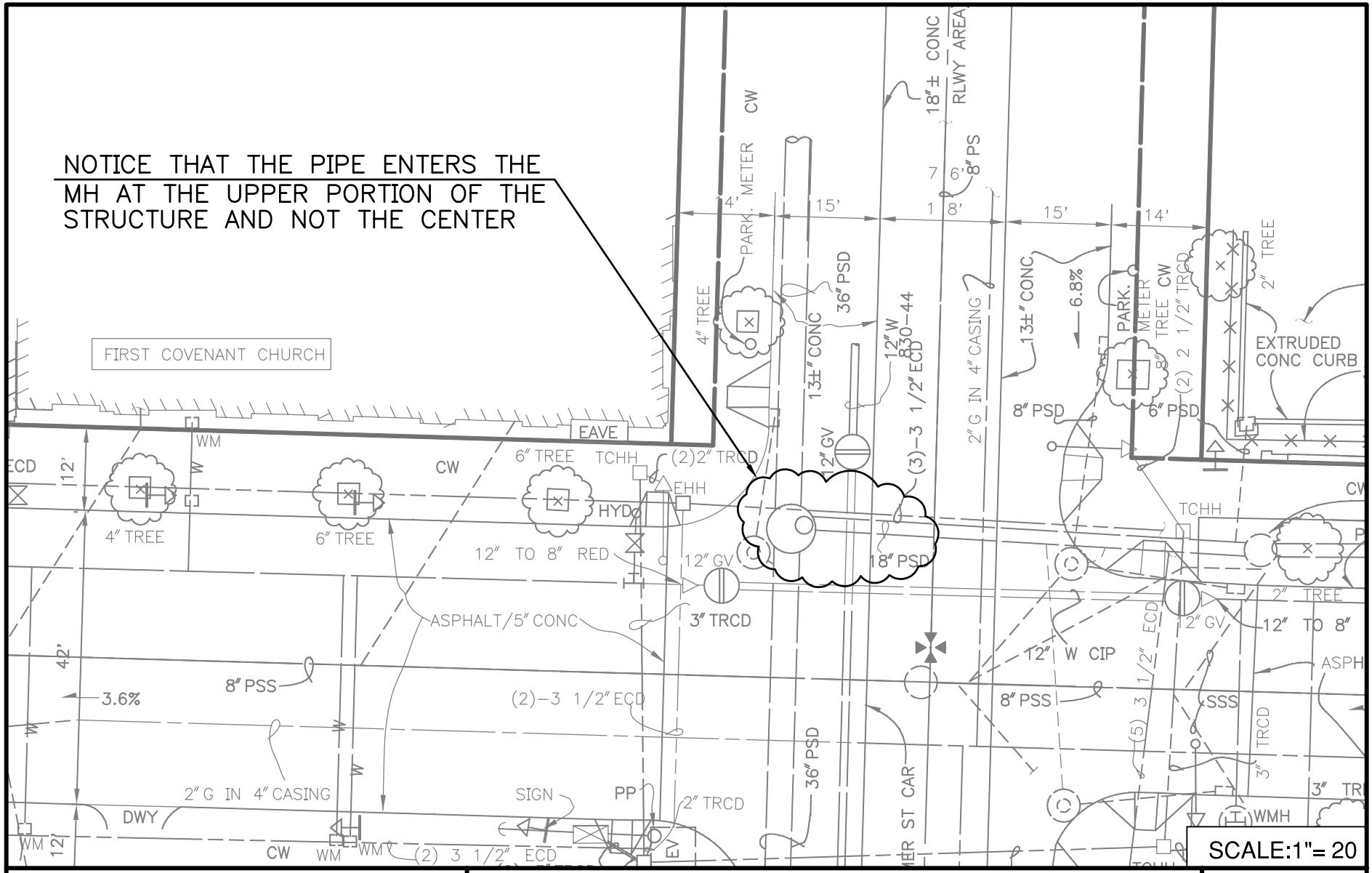
MH TYPE & STANDARD PLAN # ARE SAME

FIGURE NO.
11D



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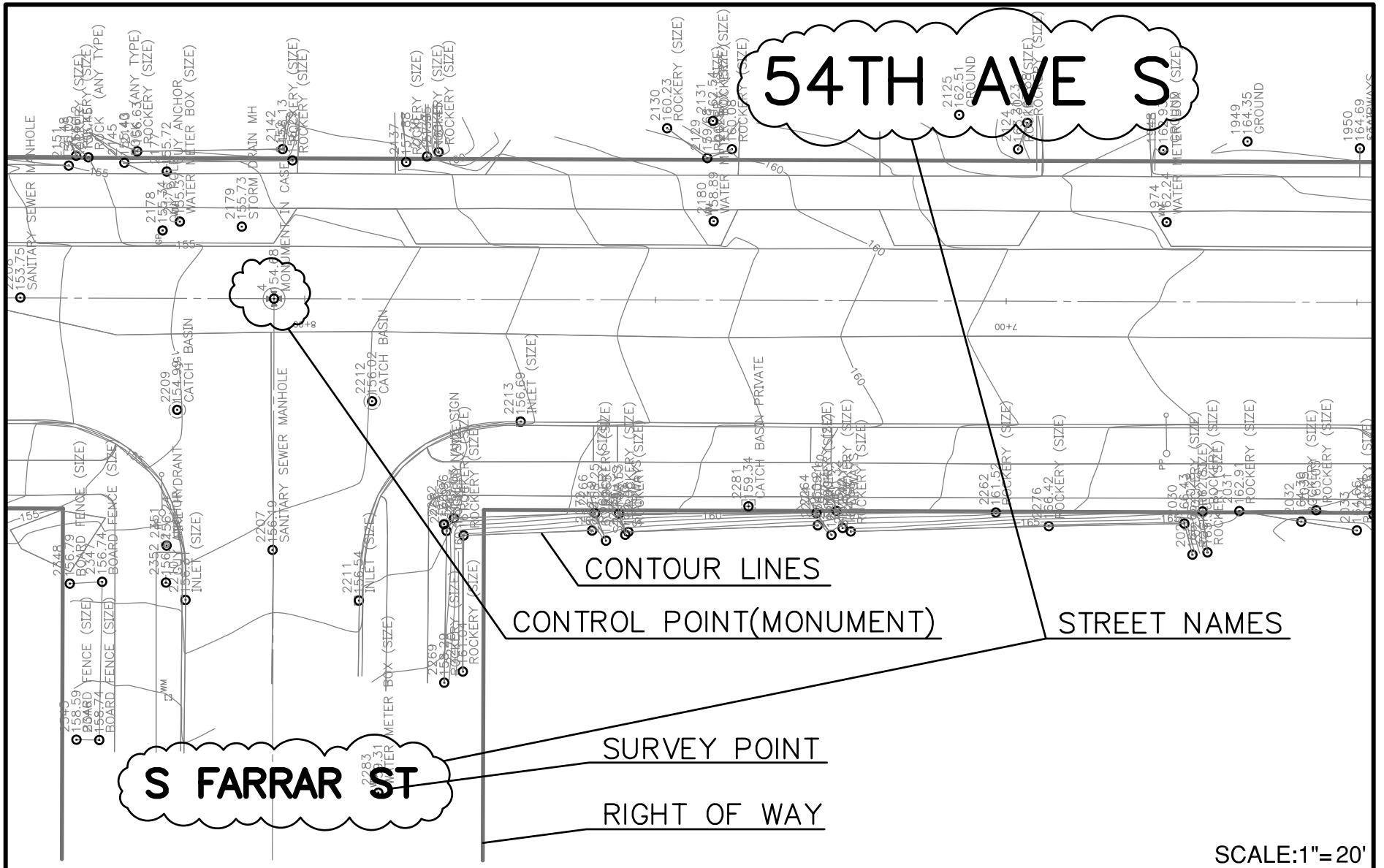
Seattle Public Utilities

OFFSET PIPE GOING INTO MH

FIGURE NO.
11E



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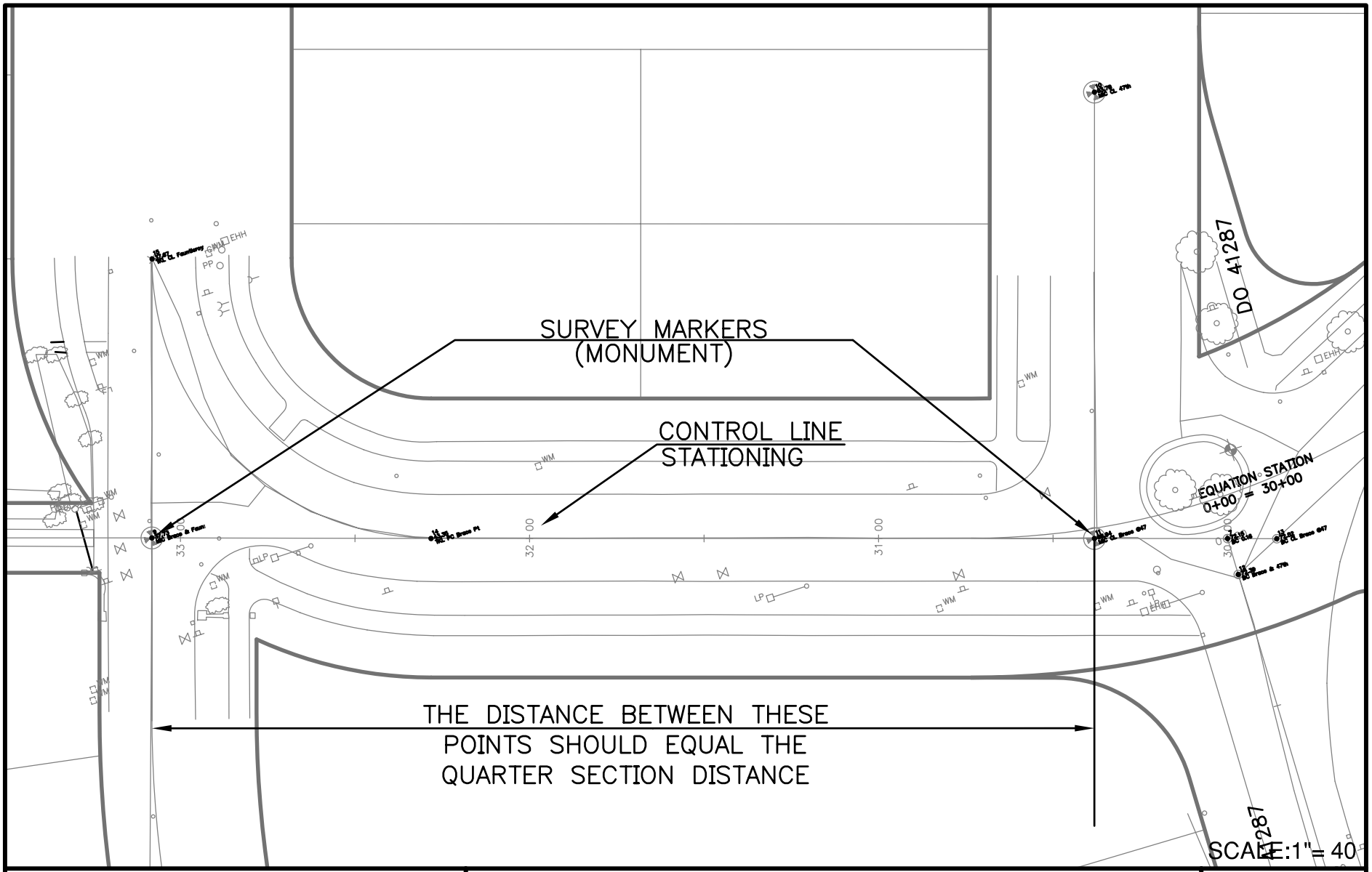
SURVEY POINTS, CONTROL LINES & POINTS, RIGHT-OF-WAY LINES, CONTOURS

FIGURE NO.
12A



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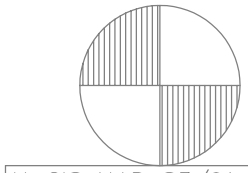
CONTROL LINE STATIONING ON A SURVEY DRAWING

FIGURE NO.

12C



H: GIS NAD 83/91
V: NAVD-88

BASIS OF BEARING: INTX WABASH AVE.S/RAINIER AVE.S to INTX WABASH AVE.S./CLOVERDALE PL.S.

COORDINATE BASIS:
MONUMENT (1) HELD: MIC @ INTX WABASH AVE.S/RAINIER AVE.S.
FOR LOCATION: Y FOR AZIMUTH: Y
MONUMENT (2) HELD: INTX WABASH AVE.S./CLOVERDALE PL.S
FOR LOCATION: N FOR AZIMUTH: Y
MONUMENT (3) HELD: NA
FOR LOCATION: N FOR AZIMUTH: N

BENCH (1) FIELDBOOK/PAGE: FBK 2438-RR/PG.3 (ELEV=27.20) (Pt.#5)--BASIS OF ELEV.
BENCH (2) FIELDBOOK/PAGE: FBK 2439-II/PG.61 (ELEV=32.26), FBK 2466-YY/PG.71 (ELEV=32.19), MSD.ELEV=32.46 (Pt.#7)
CITY DATUM/NAVD88 DIFFERENCE: BRASS CAP#2523 NAVD88 ELEV=42.57-33.18(CITY OF SEATTLE DATUM MSD.ELEV)=-9.39(Pt.#8)

PROJECT NUMBER: C301425

ALT. PROJECT NUMBER:

FIELD BOOKS: 2439-II(loc.& vert.datum notes),2438-RR,2466-AAA,2438-TT,2466-WW,2438-PP,2466-YY,1730,2407,1887-C,2438

REFERENCE DOCUMENTS: VAULT MAPS #82-82,#88-19

STREET STATIONING: 0+00 @ WABASH AVE.S/RAINIER AVE.S (see comments)
STREET STATIONING FBK/PLAN: FBK 2438 PG.15

DATE: 6-05-2001 INITIALS: EAN

GEOREGISTRATION NOTES: TILE#183(NW35-24-4),TILE#179(NE34-24-4)

COMMENTS: Stationing increases along centerline of Wabash Ave.S. to SE

SCALE:1"=NA

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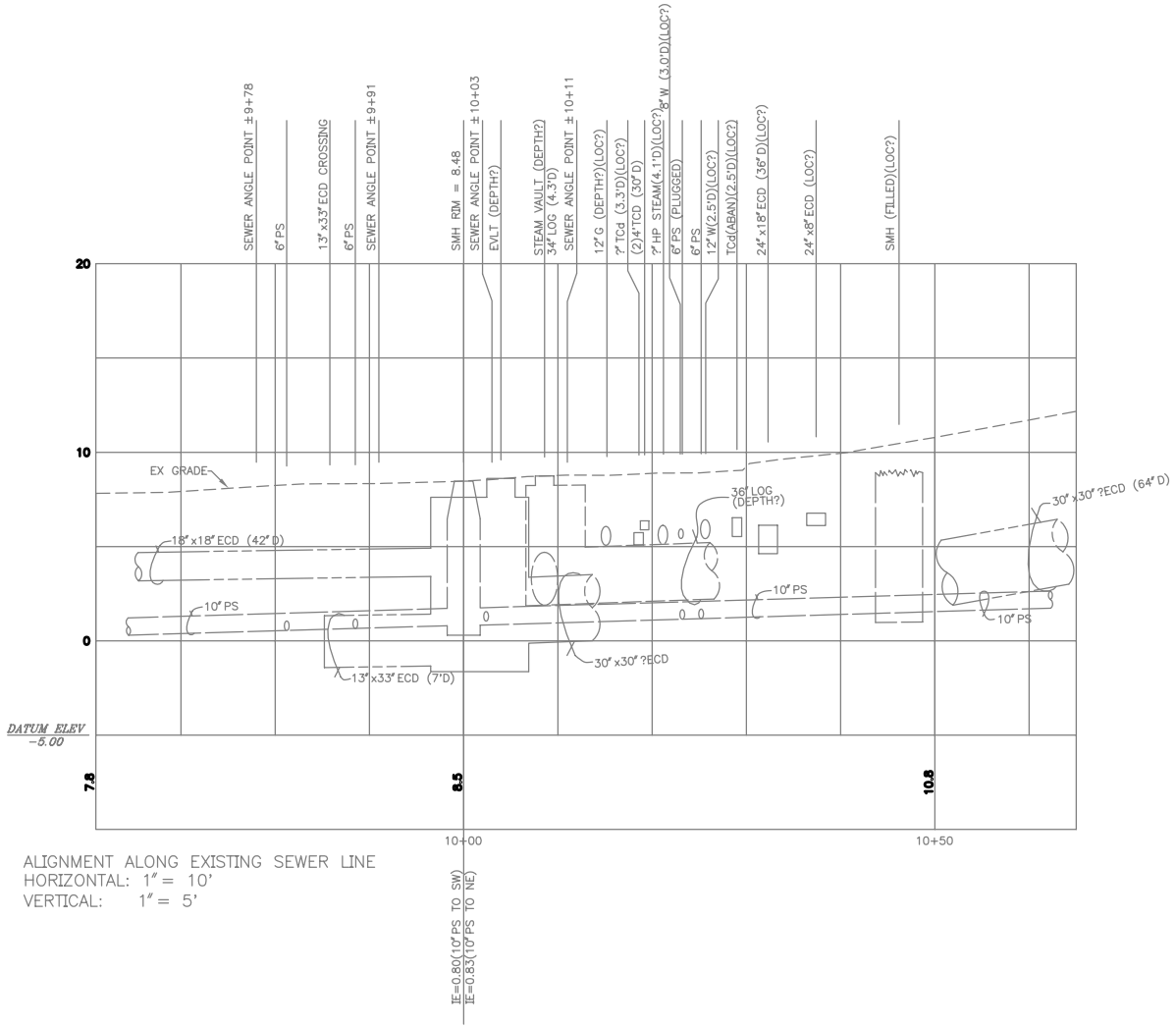
Seattle Public Utilities

DATUM BLOCK FROM SURVEY

FIGURE NO.
12I



ALIGNMENT ALONG EXISTING SEWER LINE
HORIZONTAL: 1" = 10'
VERTICAL: 1" = 5'

SCALE:1"= 10

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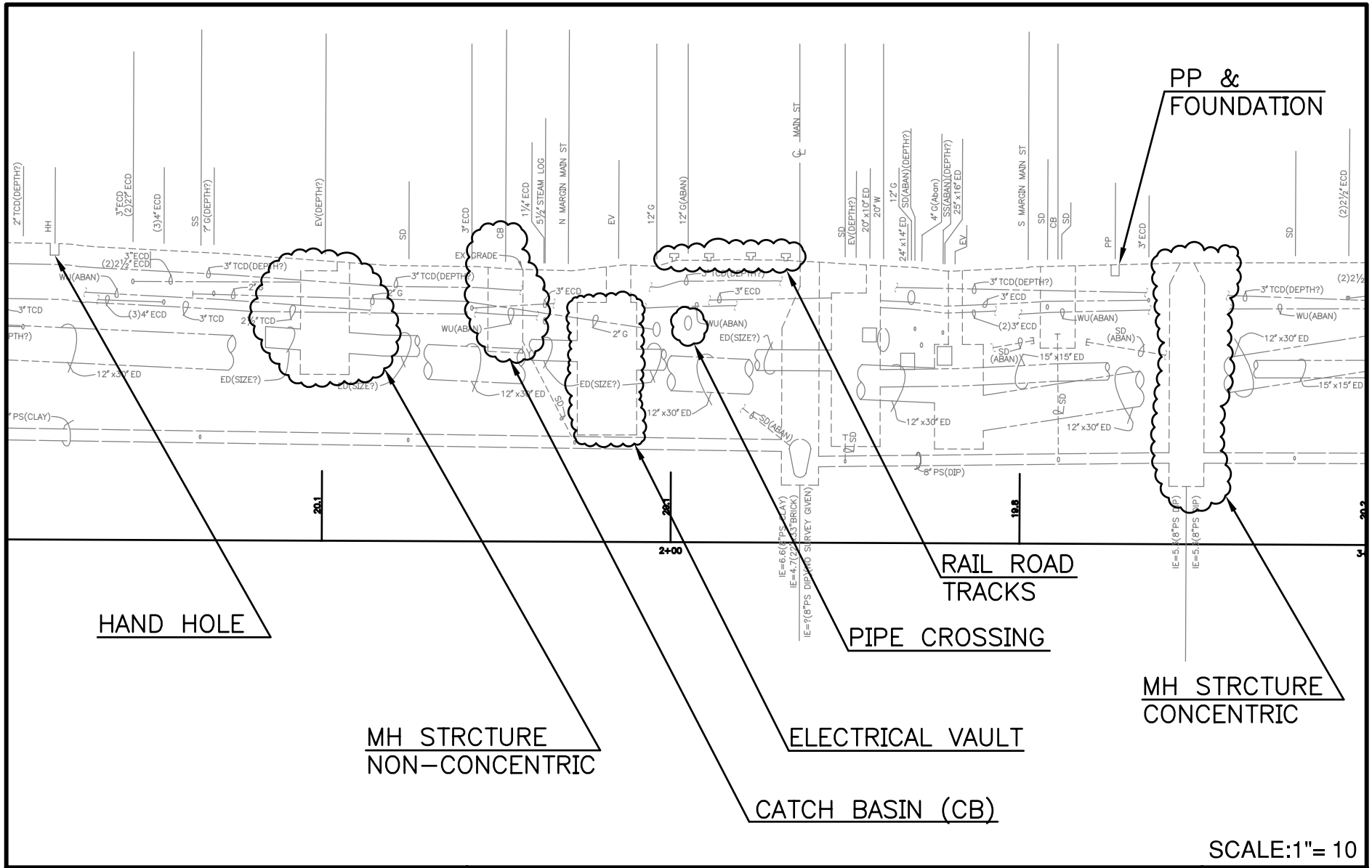
TYPICAL PROFILE

FIGURE NO.
14A



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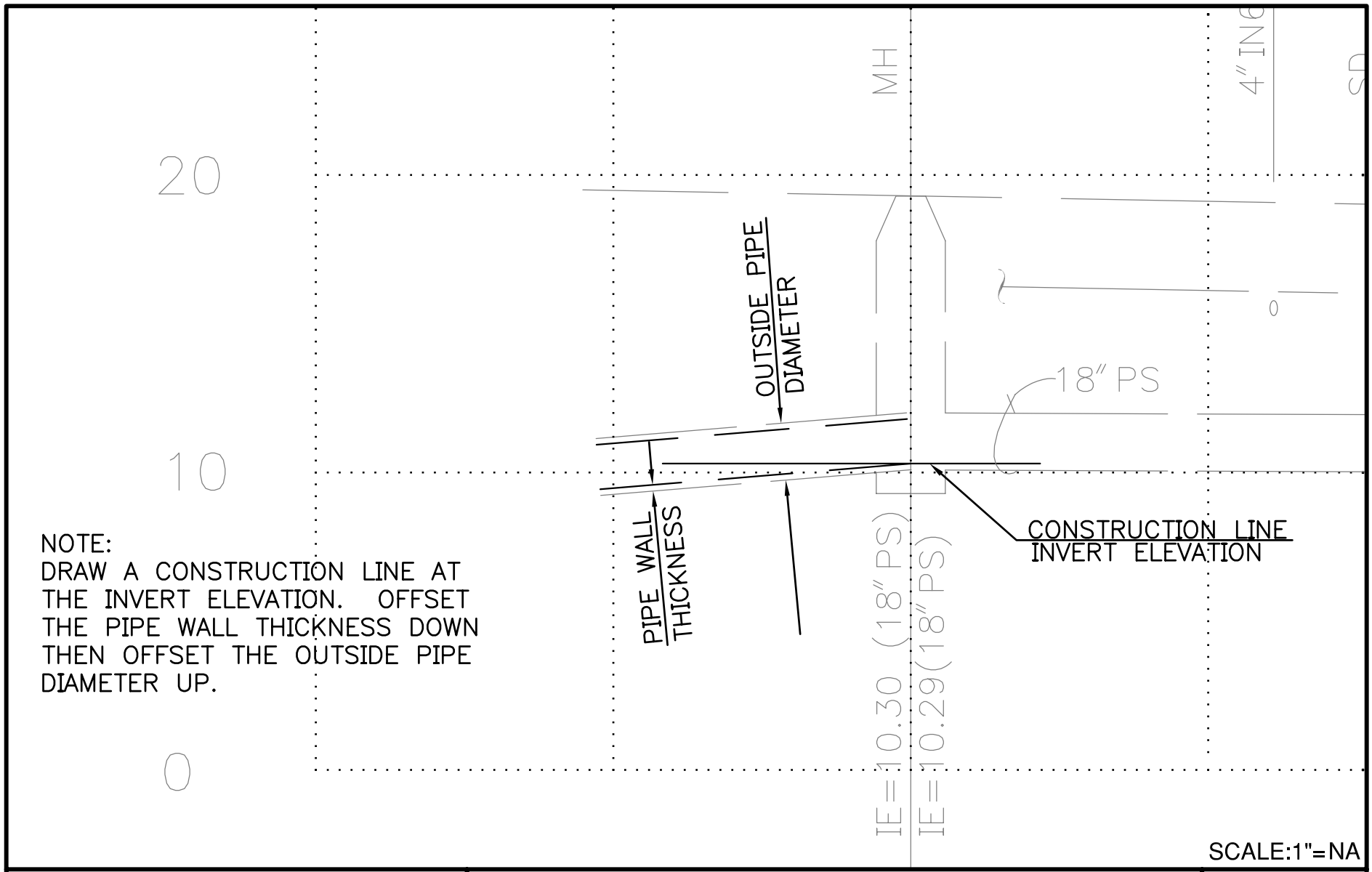
TYPICAL PROFILE SYMBOLS

FIGURE NO.
14B



NOTE:
DRAW A CONSTRUCTION LINE AT THE INVERT ELEVATION. OFFSET THE PIPE WALL THICKNESS DOWN THEN OFFSET THE OUTSIDE PIPE DIAMETER UP.

SCALE:1"=NA

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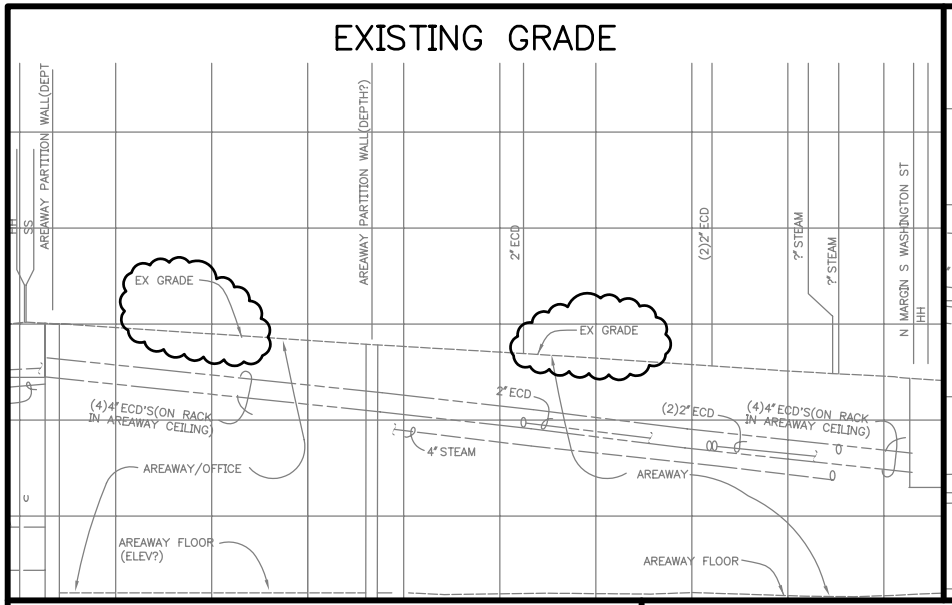
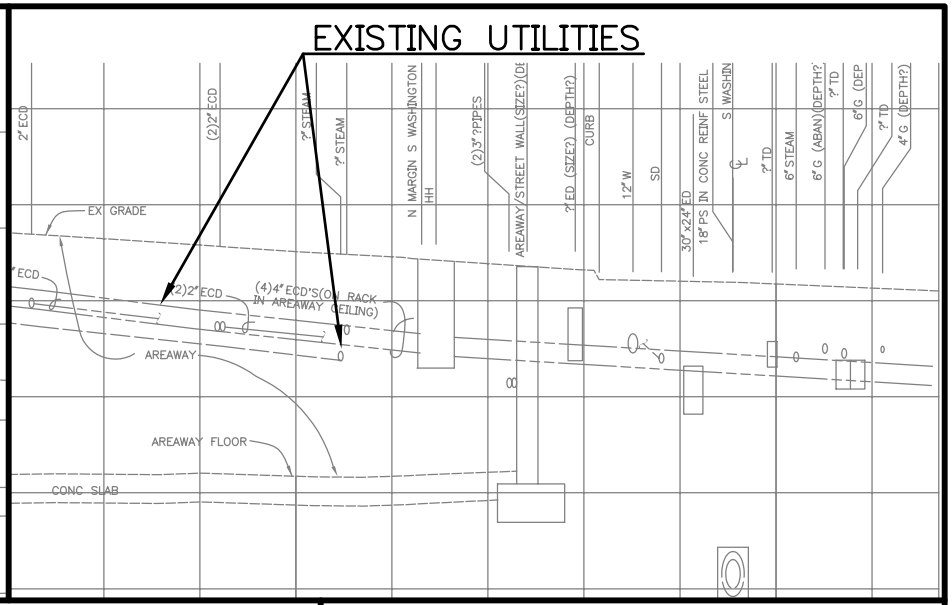
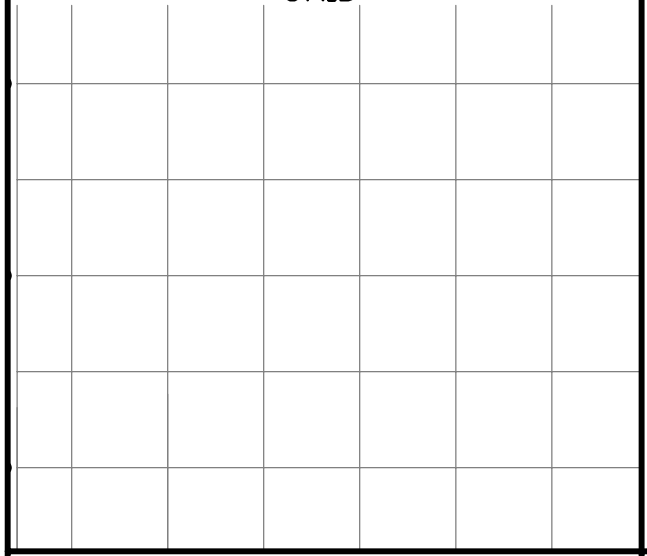
Seattle Public Utilities

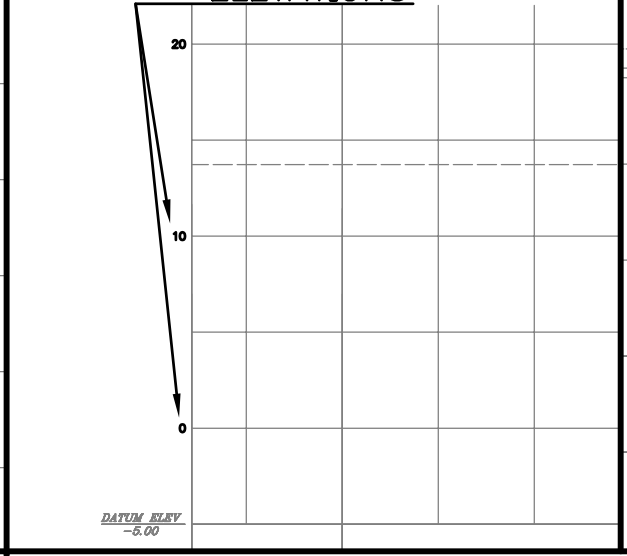
LAYING OUT A PIPE USING INVERT ELEVATIONS

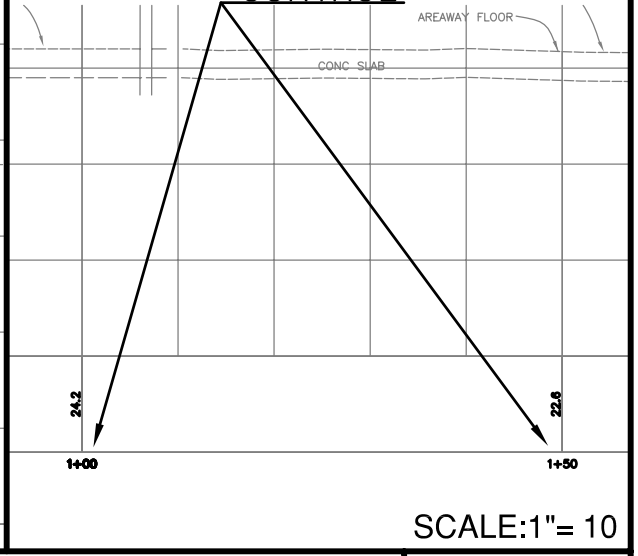
FIGURE NO.
14C











SCALE:1"= 10

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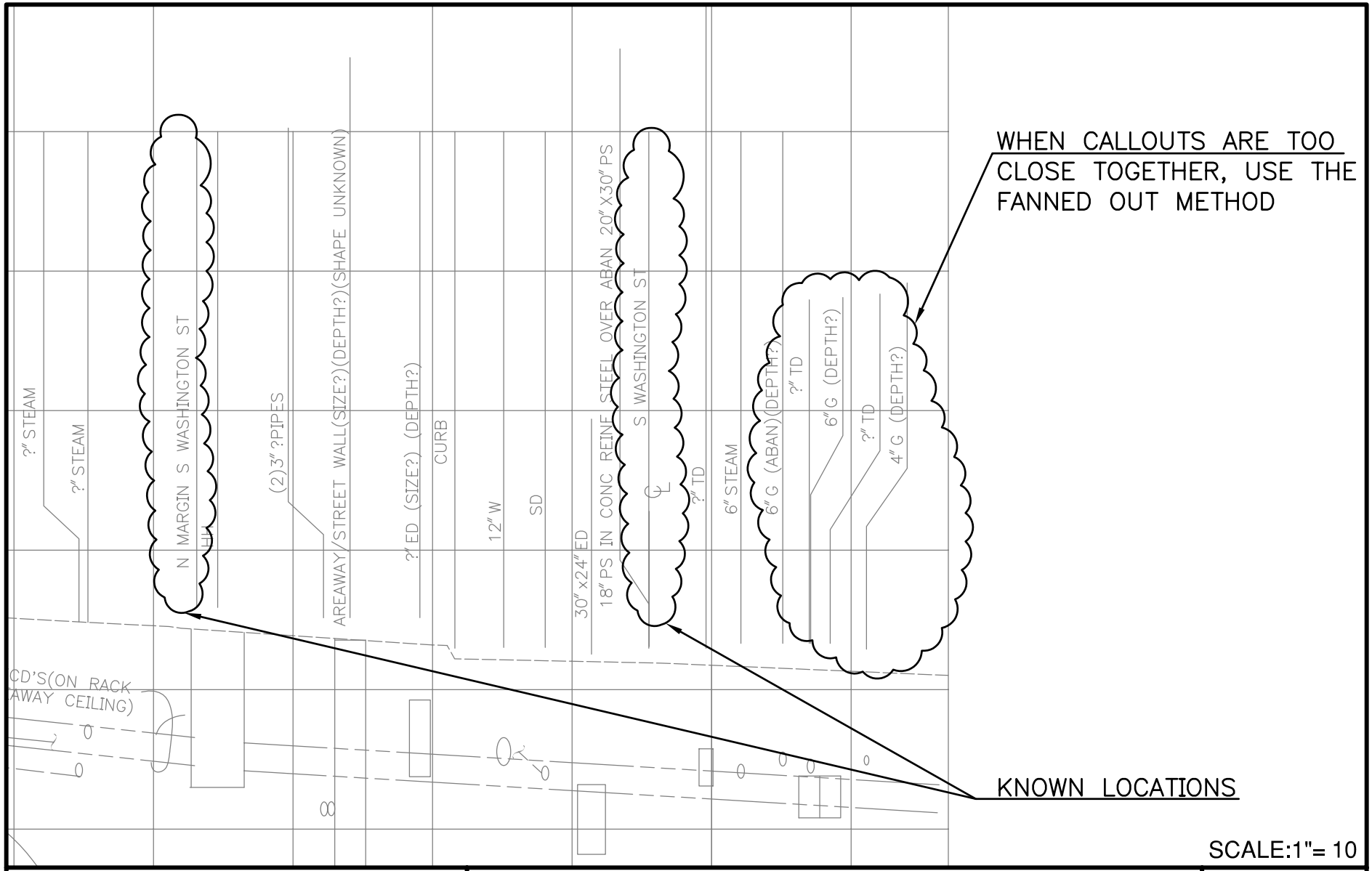
PARTS OF A PROFILE

FIGURE NO.
14D



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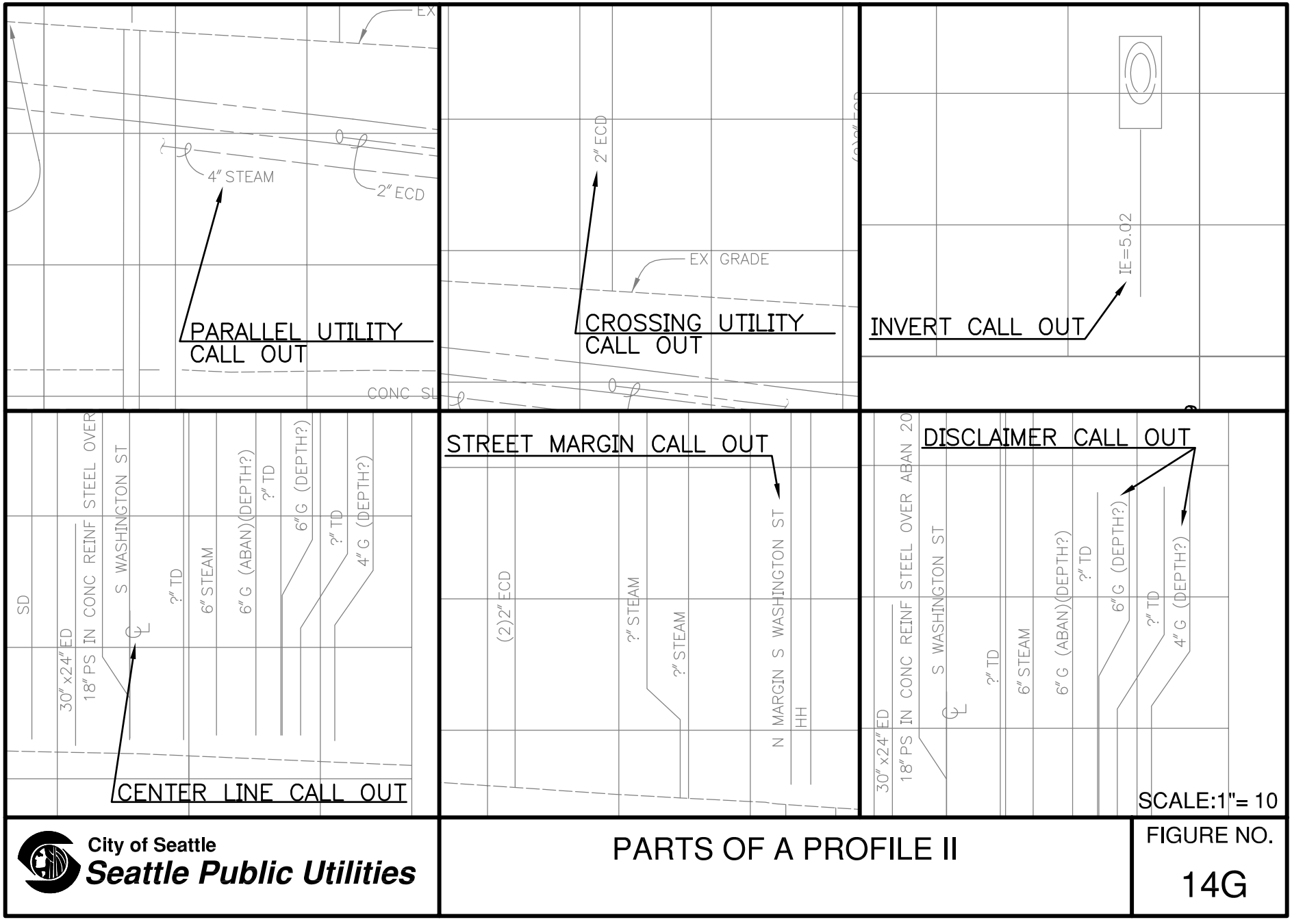
KNOWN LOCATIONS & FANNED OUT LABELS ON A PROFILE

FIGURE NO.
14E



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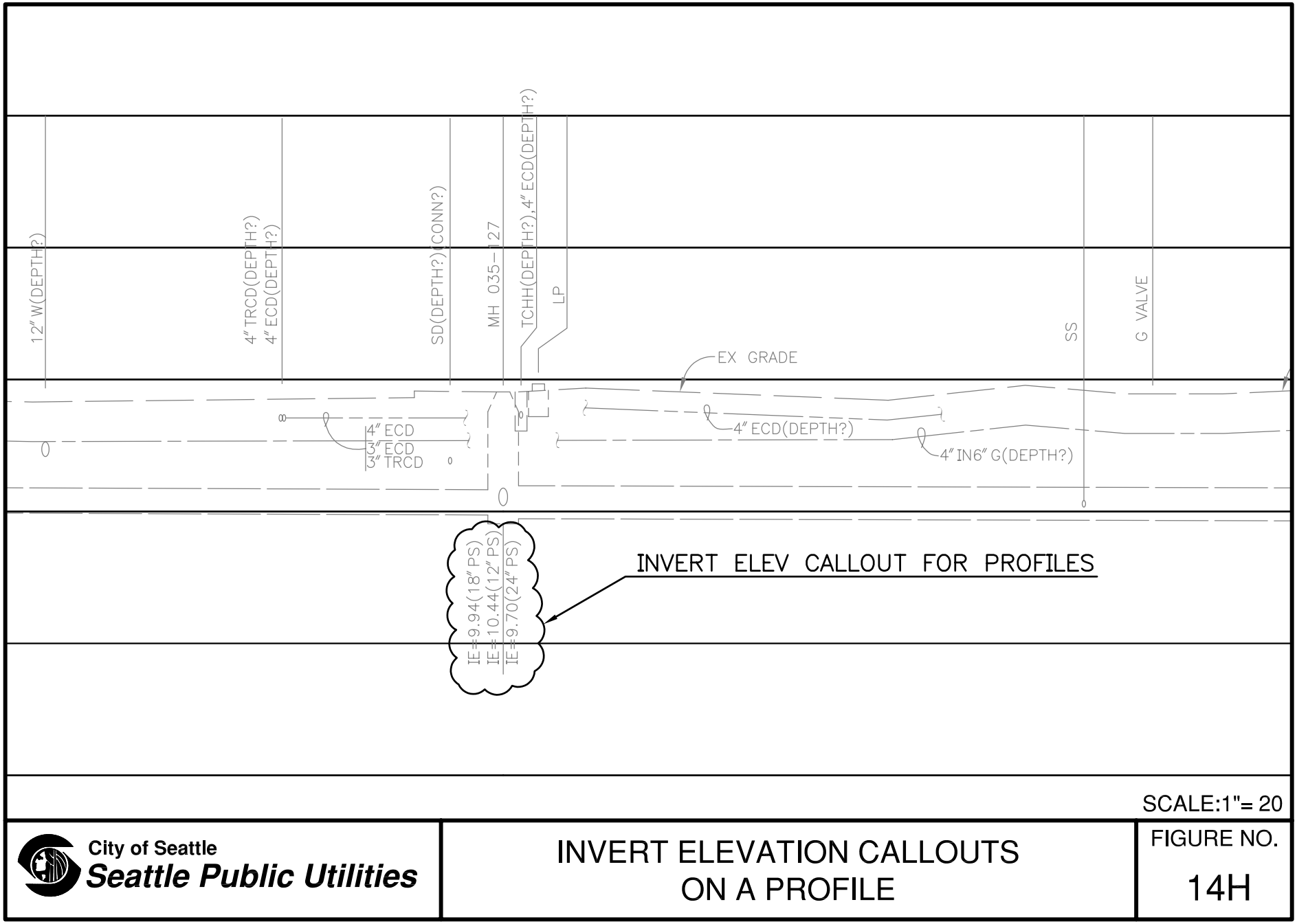
Seattle Public Utilities

PARTS OF A PROFILE II

FIGURE NO.
14G



SCALE:1"= 20

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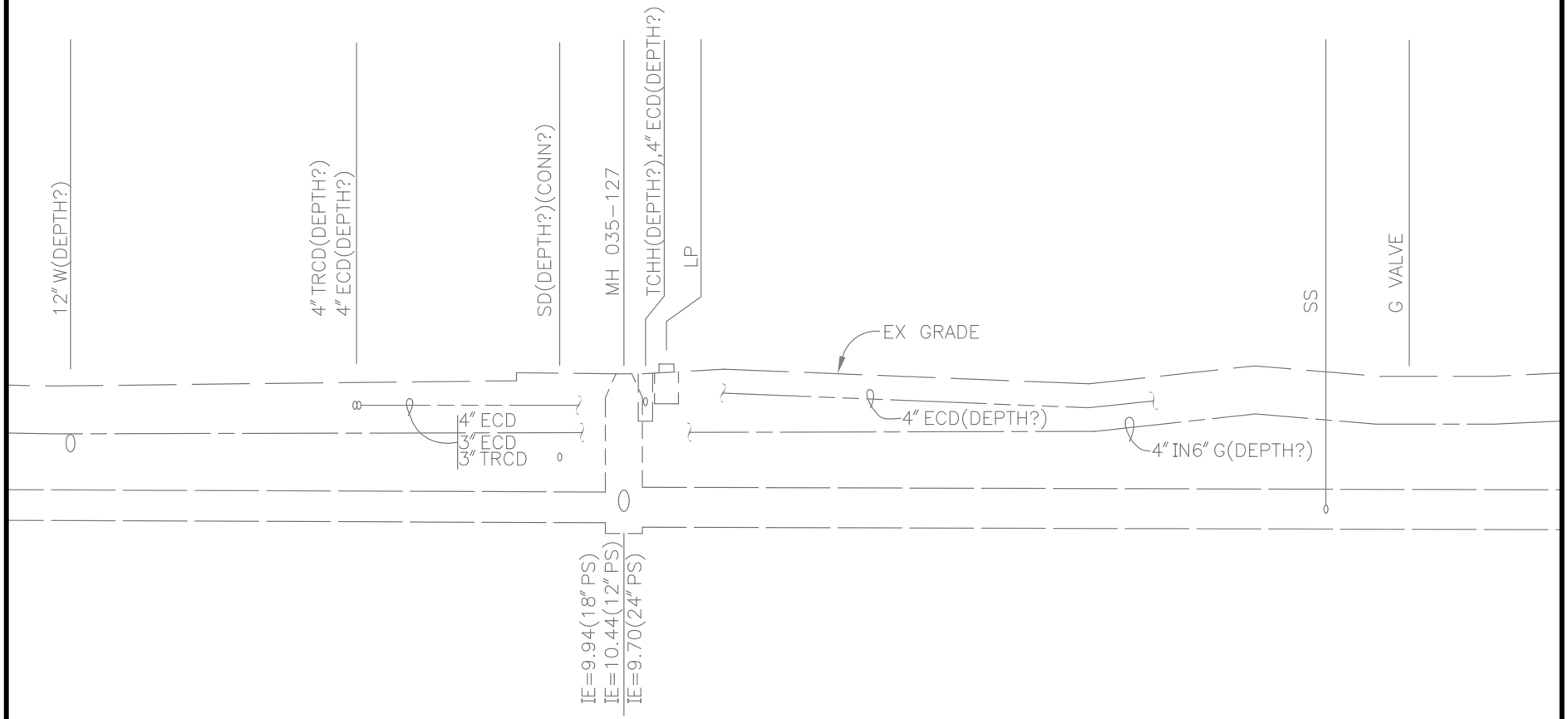
Seattle Public Utilities

INVERT ELEVATION CALLOUTS ON A PROFILE

FIGURE NO.
14H



WESTLAKE AVE N

VIEWING EASTERLY

FROM APPROX VACATED PROSPECT ST TO VACATED WARD ST
AND FROM THE MH 180' N OF MH 035-127 TO MH 035-129

SCALE: H 1"=20' V 1"=10'

SCALE:1"= 20

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Seattle Public Utilities

PROFILE TITLE

FIGURE NO.
14I

Appendix 3
Base Map Group Documents and Forms

The Base Map Group uses several document and forms for map production. Appendix 3 is a collection of these forms.

Table of Contents

Figure #	Title
	OTHER SUPPORTING DOCUMENTS (cont.)
13	Survey Point List
	Instructions: Survey Point List.doc
14	No Figure 14
15	No Figure 15
16	Pipe Chart (in SPU Help) (See Section 5.6 of *Guide*)
	Link: Pipe Size Chart.doc
17	Gas Map Request Form
	PSE Gas Map Request Form.xls
18	Engineering Records Index: Historic Water Records
	Instruction: Engineering Records Index.doc

Appendix 3
Figure 2 and 2A
Instructions - Base Map Estimate Form

This section on Figure 2 and 2A contains two forms used in the base map estimating process. A filled out example and the template version of each of forms is provided. Both of these estimating forms are located in our common directory at “P:\TR\Atr\BASEMAP\estimating”.

The first form is used to estimate the time it takes to create a base map and is named “BM_Estimate.xls”.

The second form takes the estimated time from “BM_Estimate.xls” and then creates a breakdown into base map tasks and their related increments of time and percentages of completion during the base map project. When this form is used it makes the task of reporting work progress on a base map project very easy. This form is named “BM_estimate_breakdown.xls”.

EXAMPLE-BASE MAP ESTIMATE

Basemap Estimate

Job Title: S. Hill St.
Job Number: C102589

Date: June 30, 2003
Estimator: Dean Huber Designer: Paul Kimani
Quarter Section(s): NE 8-24-4
Water book page number:
Description of project limits:

S. Hill St. from 13th Ave. S to 15th Ave.S and 14th Ave S. from S. Hill to S. Plum

The following table is a tool for estimating the hours to create basemaps and profiles.

Hours Per Lineal Foot						
	Right of Way Width (interpolate for intermediate widths)					
complexity	**40 or less**	**60**	**75**	**100**	**more**	**profile**
non-street	0.04	0.05	0.08	0.11	0.13	0.004
residential	0.06	0.09	0.11	0.13	0.16	0.007
arterial	0.10	0.12	0.15	0.17	0.20	0.015
downtown	0.14	0.16	0.19	0.22	0.24	0.020

Base Map Estimate:
Assumptions:

1. The base map will extend from R/W to R/W and will include all surface and underground features.

2. The base map will be created from current survey information. The survey hours are not included in this estimate.

(enter street length in feet and complexity factor from chart above)

Street	**length (feet)**	**complexity factor**	**hours**
S. Hill St. from 13th Ave. S to 15th Ave.S	740	0.09	66.6
14th Ave S. from S. Hill to S. Plum	463	0.09	41.67
13th Ave S at S Hill St intersection	160	0.09	14.4
15th Ave S at S Hill St intersection	160	0.09	14.4
S Plum St at 14th Ave S intersection	110	0.09	9.9
			0
			0
			0
		Total	**146.97**

Total Time: **146.97** **Workdays:** **18**

Profile Estimate: (enter street length in feet and complexity factor from chart above)

Street	**length (feet)**	**complexity factor**	**hours**
S. Hill St. 13th Ave. S to 15th Ave.S	740	0.007	5.18
14th Ave S. From S. King to S. Plum	463	0.007	3.241
			0
			0
		Total	**8.421**

Total Time: **8.421** **Workdays:** **1**
and Total Time: **155.391** **Total Workdays:** **19**

EXAMPLE-BASE MAP ESTIMATE

Basemap Labor Breakdown	% of total	Hours
Research	11.0%	17
Drafting	60.0%	93
Supervision & Coordination	15.0%	23
Checking and Quality Control	14.0%	22
Total	**100.0%**	**155**

Basemap Estimate

Job Title:
Job Number:

Date:
Estimator: Designer:
Quarter Section(s):
Water book page number:
Description of project limits:

The following table is a tool for estimating the hours to create basemaps and profiles.

Hours Per Lineal Foot						
	Right of Way Width (interpolate for intermediate widths)					
complexity	**40 or less**	**60**	**75**	**100**	**more**	**profile**
non-street	0.04	0.05	0.08	0.11	0.13	0.004
residential	0.06	0.09	0.11	0.13	0.16	0.007
arterial	0.10	0.12	0.15	0.17	0.20	0.015
downtown	0.14	0.16	0.19	0.22	0.24	0.020

Base Map Estimate:
Assumptions:
1. The base map will extend from R/W to R/W and will include all surface and underground features.

2. The base map will be created from current survey information. The survey hours are not included in this estimate.

(enter street length in feet and complexity factor from chart above)

Street	length (feet)	complexity factor	hours
			0
			0
			0
			0
			0
			0
			0
			0
		Total	**0**

Total Time: 0 **Workdays:** 0

Profile Estimate: (enter street length in feet and complexity factor from chart above)

Street	length (feet)	complexity factor	hours
			0
			0
			0
			0
		Total	**0**

Total Time: 0 **Workdays:** 0
Grand Total Time: 0 **Total Workdays:** 0

TEMPLATE-BASE MAP ESTIMATE

Basemap Labor Breakdown	% of total	Hours
Research	11.0%	0
Drafting	60.0%	0
Supervision & Coordination	15.0%	0
Checking and Quality Control	14.0%	0
Total	**100.0%**	**0**

Estimated Basemap Hours Breakdown

(fill in areas)

20th Ave NE

C301317

Jason Graham

Est. total hrs = 328.84

Project Start Up			Est. %	Est. Hrs	Act. %	Act. Hrs.
Preliminary Estimate		D25	1.0%	3.3	0.9%	3.0
Project Familiarization		D25	4.0%	13.2	3.6%	12.0
Create planform		D25	0.5%	1.6	0.3%	1.0
Research						
Vault		D25	2.0%	6.6	1.5%	5.0
Street Use						
Side Sewers		D25	0.5%	1.6	0.5%	1.5
Franchise Utilities	58%	D25	1.0%	3.3	0.9%	3.0
Pull Plans		D25	0.5%	1.6	0.6%	2.0
Fill-in planform		D25	1.0%	3.3	0.6%	2.0
Final Estimate		D25	0.5%	1.6	0.5%	1.5
Supervision & Coordination		D28	8.0%	26.3	7.6%	25
		Sub-Total	19.0%	62.5	17.0%	56.0
Basemap production						
Check control and R/W		D26	1.0%	3.3	1.0%	3.2
Check Topo and points		D26	6.0%	19.7	4.6%	15.0
Draw research		D26	32.0%	105.2	28.0%	92.0
		Sub-Total	39.0%	128.2	33.5%	110.2
Field Check (2 people at 3.5% each)		D26	7.0%	23.0	4.9%	16.0
Draft field check items	20%	D26	3.0%	9.9	2.7%	9.0
Supervision & Coordination		D28	3.0%	9.9	2.4%	8.0
Self-check		D26	7.0%	23.0	5.5%	18.0
Lead checking		D29	12.0%	39.5	10.6%	35.0
Final drafting		D26	3.0%	9.9	2.4%	8.0
Final check	22%	D29	2.0%	6.6	1.8%	6.0
Basemap Closeout & Archive		D26	1.0%	3.3	0.6%	2.0
Supervision & Coordination		D28	4.0%	13.2	3.0%	10
		Grand Total	42.0%	138.1	34.1%	112.0

	Estimated %	Est. Hrs.	Actual %	Actual Hrs.
D25	11.0%	36.1724	11.1%	31
D26	60.0%	197.304	58.7%	163.2
D28	15.0%	49.326	15.5%	43
D29	14.0%	46.0376	14.7%	41.0
	100.0%	329	100.0%	278.2

Actual vs. Estimated: 84.60%

Estimated Basemap Hours Breakdown

(fill in areas)

(Project Name)

(Project No.)

(Drafter) **Est. total hrs =**

Project Start Up			Est. %	Est. Hrs	Act. %	Act. Hrs.
Preliminary Estimate		D25	1.0%	0.0		
Project Familiarization		D25	4.0%	0.0		
Create planform		D25	0.5%	0.0		
Research						
Vault		D25	2.0%	0.0		
Street Use						
Side Sewers		D25	0.5%	0.0		
Franchise Utilities	58%	D25	1.0%	0.0		
Pull Plans		D25	0.5%	0.0		
Fill-in planform		D25	1.0%	0.0		
Final Estimate		D25	0.5%	0.0		
Supervision & Coordination		D28	8.0%	0.0		
		Sub-Total	19.0%	0.0		0.0
Basemap production						
Check control and R/W		D26	1.0%	0.0		
Check Topo and points		D26	6.0%	0.0		
Draw research		D26	32.0%	0.0		
		Sub-Total	39.0%	0.0		0.0
Field Check (2 people at 3.5% each)		D26	7.0%	0.0		
Draft field check items		D26	3.0%	0.0		
Supervision & Coordination	20%	D28	3.0%	0.0		
Self-check		D26	7.0%	0.0		
Lead checking		D29	12.0%	0.0		
Final drafting		D26	3.0%	0.0		
Final check	22%	D29	2.0%	0.0		
Basemap Closeout & Archive		D26	1.0%	0.0		
Supervision & Coordination		D28	4.0%	0.0		
		Grand Total	42.0%	0.0		0.0

	Estimated %	Est. Hrs.	Actual %	Actual Hrs.
D25	11.0%	0		
D26	60.0%	0		
D28	15.0%	0		
D29	14.0%	0		
	100.0%	0		0

Actual vs. Estimated:

Appendix 3
Figure 3
Instructions - Planform

This section covers the form used to log and organize research documents used in the creation of a base map. It is called “PLANFORM.xls” and can be found in our common directory at P:\Tr\ATr\BASEMAP\Research.

“Planform” contains two primary parts. One is the “Base Map Info” portion and the other is the “Research Plans” portion. Each one has it’s own blank/template and example all contained within the same document. These features can be identified as the booklet tabs located at the bottom of the document.

The “Base Map Info” portion provides general project information. The “Research Plans” portion is where the research documents are logged in.

The following are simplified directions to get started using “Planform”.

1. Open in “Planform” in Excel at the location mentioned above. Refer to the tabs (booklets) marked “example”.

2. Fill out the fields in the excel booklet “Basemap Info”. This information will transfer to the “Research Plans” booklet.

3. Fill out the “Research Plans” booklet. This will be the primary booklet to be worked out of and printed. All plans and utility books will be logged here.

4. The side sewer booklet may be filled out if desired. This is a good idea for larger jobs.

Plans are normally logged in arbitrarily and then sorted chronologically after as the example illustrates.

Basemap Info Sheet

Job Name	NW 107TH ST DRAINAGE IMPROVEMENT
Job #	C300329
Location	PALATINE AVE N, 1ST AVE NW, 2ND AVE NW, 4TH AVE NW, PHINNEY AVE N
Drafter(s)	DEAN HUBER
1/4 Section(s)	SE 25-26-3 TILE 359, SW 30-26-4 TILE 402
Existing Base Map(s)	201-7-47
VPI #	12
Utility Map #	520
Survey Field Book(s)	2081-O
Stationing Field Book(s)	2076 pg 41
Other source(s)	
Comments	
Start date	August 12, 2001
Completion date	September 22, 2001

Side Sewer Card List

Card #	Used?	Comments	Card #	Used?	Comments	Card #	Used?	Comments
2737-9	Y	1ST AVE NW						
2749-7	Y	2ND AVE NW						
2749-8	Y	2ND AVE NW						
2749-9	Y	2ND AVE NW						
2779-7	Y	4TH AVE NW						
4340-9	Y	GREENWOOD AVE N						
4340-10	Y	GREENWOOD AVE N						
5252-7	Y	PALATINE AVE N						
5252-8	Y	PALATINE AVE N						
5252-9	Y	PALATINE AVE N						
1944-22A	N	N 107TH ST						
1944-22B	Y	N 107TH ST						
1944-25A	Y	N 110TH ST						
5289-7	N	PHINNEY AVE N						
5289-8	N	PHINNEY AVE N						
5289-9	N	PHINNEY AVE N						
2779-6	Y	4TH AVE NW						

Existing Base Map(s)

9/26/2005 11:52

Job Name	NW 107TH ST DRAINAGE IMPROVEMENT
Job #	C300329
Location	AVE NW, PHINNEY AVE N
Drafter(s)	DEAN HUBER
1/4 Section(s)	SE 25-26-3 TILE 359, SW 30-26-4 TILE 402
Existing Base Map(s)	201-7-47
VPI #	12
Utility Map #	520
Survey Field Book(s)	2081-O
Stationing Field Book(s)	2076 pg 41
Other source(s)	
Comments	
Start date	August 12, 2001
Completion date	September 22, 2001

Plan/Book(page)/Permit #	Year As-built or Inspected	Virtual Vault	Vault Plan	Microfilm	Franchise Utility	Area	Comments	Grading	Landscaping	Miscellaneous	Paving	Sewer	Signal & Lighting (VPI)	Storm Drains	Walks	Water	Gas	Telephone & Communications	Electrical / City Light	Misc. Franchise Utilities	Signal / Traffic files (Muni 7)	Misc research documents
777-402	1939	X				Greenwood Ave N	53-18C, 4'CW on eastside								X							
KC53-55A	1939		X			Greenwood Ave N	Pavement Widening				X											
777-404	1947	X				Alley east of Palatine		X														
806-52	1948		X			Greenwood Ave N/107th	12"W(CIP), 23'E of CL									X						
806-54	1948		X			Phinney										X						
777-103	1949	X				S of 110th	8"PS					X										
777-104	1949	X				N of 110th	6"PS, 8"PS					X										
6C-A	1950				X	Whole Area	Gas prior to Annexation										X					
844-17	1952			X		3rd Ave NW	12"W(CIP), 14'E of CL									X						
Water 2408	1953		X			NW 110th/4th Ave NW	8"W, 6"W									X						
43T-39	1954				X	Greenwood Ave N/110th	See Map 6C											X				
146-169	1956				X	Phinney	2"G										X					
154-70	1957				X	2nd Ave /107th	2"G										X					
811-75	1958		X			Whole Area	4"W, 8"W, 16"W, see Water Job 2408									X						
811-92	1958		X			Whole Area	Profiles									X						
850-92	1959		X			Greenwood Ave N	Safety Lighting System						X									
852-81	1961			X		3rd Ave NW, westside	Safety Lighting System						X									
856-85	1965			X		Whole Area								X								

Plan/Book(page)/Permit #	Year As-built or Inspected	Virtual Vault	Vault Plan	Microfilm	Franchise Utility	Area	Comments	Grading	Landscaping	Miscellaneous	Paving	Sewer	Signal & Lighting (VPI)	Storm Drains	Walks	Water	Gas	Telephone & Communications	Electrical / City Light	Misc. Franchise Utilities	Signal / Traffic files (Muni 7)	Misc research documents
856-93	1965		X			Whole Area	Profiles							X								
857-11	1966		X			Phinney										X						
856-86	1967			X		Whole Area								X								
856-94	1967			X		NW 110th St	Profile							X								
188-122	1967				X	1st Ave NW											X					
43FF-32	1967				X	Greenwood Ave N												X				
203-75	1967				X	NW 110th St/1st Ave NW	2"G										X					
201-136	1967				X	Palatine Ave N											X					
43NN-20	1969				X	Greenwood Ave N/107th	Tele Vault											X					
72AT26-34	1976				X	107th, 1st NW, Phinney													X			
43AC-157	1977				X	N 110th St/Greenwood	2"TCD											X					
428-14	1978				X	3rd Ave NW	Resurfacing				X											
870-58	1978		X			3rd Ave NW	Asph Walk								X							
72AS-56	1979				X	1st Ave NW/107th	3"ECD												X			
777-282	1980	X				Greenwood Ave N	Arterial Street Lighting						X									
239-140	1980				X	2nd Ave NW/110th	2"G, 1 1/4" in 2"G										X					
870-145	1985		X			Greenwood Ave N	Signal Interconnect						X									
43AM-136	1986				X	Greenwood Ave N												X				
873-51	1987		X			Alley east of Palatine	6"Conc, 30"PSD, 6"SD				X			X								
777-354	1988	X				Greenwood Ave N	Asph Overlay				X											
43AO-65	1988				X	Greenwood Ave N/107th	2"TCD											X					
872-98	1988		X			Greenwood Ave N									X							
874-54	1989		X			Alley east of Palatine(107th)																
260-4	1991				X	Phinney/110th	2"G										X					
43AW-20,22	1993				X	Greenwood Ave N	18"X12"TD											X				
271-147,148	1997				X	Phinney	2"G										X					
275-8	1998				X	4th Ave NW/107th	2"G										X					
91SS-151	1998				X	Palatine Ave N/110th	Pedestal, 7'ECD to pole												X			
275-53,54,55	1999				X	Palatine Ave N/107th	2"G										X					
883-87	2001		X			Greenwood Ave N					X											
777-568	2002	X				NW 110th St																
154-68	?				X	Phinney											X					
154-18	?				X	NW 110th St	2"G										X					

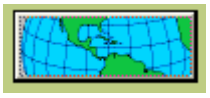
Appendix 3
Figure 4
Instructions – “Etag”

Etag is a custom routine used to automate the process of adding plan and utility book references to base map callouts. “Etag” is an attributed ACAD block. The plan and utility book references are invisible when plotted for final use.

1. Use this routine by typing “i” for the “insert” command while in LDT or ACAD.
2. Hit the “browse” button next to name.
3. Browse to P:\CaddSupport\Blocks\P-Common\Etag.dwg.
4. Do not redefine the block.
5. Pick the insertion point.
6. Type in the pipe of utility callout.
7. Then type in the plan or utility book reference(s).

Appendix 3
Figure 5
Instructions – Archiving Base Maps into the Technical Resources Inventory Database

1. Open database: P:\BasemapArchive\Basemap_Inventory.mdb.
2. Select “Add or Edit Basemap Records”.
3. Select “Add CAD Basemap”.
4. Select tile for location of basemap to be archived.
5. Accept assigned basemap number.
6. Enter basemap extents description. Ex: 22nd Ave NE from NE 127th St to NE 125th St.
7. Enter Topo/Survey field book number(s).
8. Enter Stationing Control field book number(s).
9. Enter project number.
10. Enter alternate project number, if there is one.
11. Enter revised date. This is the date the basemap was last revised.
12. Enter “Revised By” person’s initials.
13. Enter current date.
14. Enter “Archived By” person’s initials.
15. Select either “Scanned From Mylar” or “Full Base Map”.
16. Add any comments that are needed.
17. Select the georeference button:



18. GeoReferencing may be done in a number of ways. Please select the method that best fits your basemap. In the case of an alley, which the database will not recognize, use the nearest street. If the basemap covers more than one site, select the “Multiple Site” box and then select the “ADD SITE” button to georeference the additional sites.
19. Once all basemap sites have been georeferenced, select the “Save” button and then the “Exit” button. This will return you to the Basemap Inventory page.
20. Select the “Save” button.
21. If you have additional basemaps to archive, select “Add CAD Basemap” button and repeat above procedure for each basemap to archive.
22. Once all basemaps are entered, at the Basemap Inventory page, Select the “Exit” button to return to the starting page, select the “Backup Database” button and then select the “Exit” button to exit the database.

Appendix 3
Figure 6
Instructions – Interpreting Utility Book & Utility Map Information

Utility Books

37 Series

- ALPHANUMERIC:
  Books in this series are numbered 37A through approximately 37G.
- Contents:
  Old Steam, Electrical, and some OLD Telephone and TV

39 Series

- ALPHANUMERIC:
  Books in this series are numbered 39A through 37E.
- Contents:
  Old Steam, Electrical, and some OLD Telephone and TV

43 Series

- ALPHANUMERIC:
  Books in this series are numbered 43A through 43Z, then 43AA hrough 43ZZ, then 43AB, 43AC, and so on.
- Contents:
  Telephone & TV

72 Series

- ALPHANUMERIC:
  Books in this series are numbered 72A through 72Z, then 72AA through 72ZZ, then 72AB through 72AZ, and then 72BA through approximately 72BU and so on.
- Contents:
  Electrical (City Light)

91 Series

- ALPHANUMERIC:
  Books in this series are numbered 91A through 91Z, then 91AA through 91ZZ, then 91AB through approximately 91AZ and so on.
- Contents:
  Work done by Private Contractors. Utilities included are Electrical, Telephone, and TV.

Gas Books

- Numeric:
  Books in this series are numbered, starting at book 1 through approximately 281 and so on.

- Contents:
  Gas Mains

100 Scale Utility Map/Color Code:

- Black: TV & Electrical
- Green: Telephone
- Red: Gas

10 Scales of Downtown/Color Code:

- Red: Telephone
- Green: Gas
- Orange: Electrical
- Brown: Sewers & Storm Drains
- Yellow: Steam
- Black: Television

Appendix 3
Figure 7
Instructions – How to Read a Side Sewer Card

Definitions:

Unless otherwise noted, all measurements on side sewer cards are drawn to scale 1" = 50' and all measurements were taken using engineers tape which measures tenths and hundredths of a foot instead of inches. Example: 6.5 The # 6 is feet and the # 5 are tenths of feet or 9.37 the # 9 is feet and the #37 are hundredths of feet.

1) Indicates this is Lake City Card # 636 (LC-636). Lake City sewer district S/S Cards (Side Sewer Cards) on microfiche is a subset to the rest of the City S/S Cards. Look on your 400-scale map for the boundary.

2) This is the North Directional Marker.

3) Indicates this card provides information for the sewers ON 35th Ave NE. Looking at the street intersection to the north & south, you will note that this card covers the sewer system from NE 120th street to NE 123rd street.

4) This means that the elevations provided used County datum. To convert to the City of Seattle datum add 5.96' to elevations given.

5) Indicates the pipe in this run is Rubber Gasket Joints only.

6) This dashed line represents the location of the curb line. It may or may not exist in the street.

7) This line is known as the property line.

8) Dyed Conn. means that sewer dye was introduced into this buildings side sewer line to verify the existence of a connection into the city sewer main.

9) The dotted line from 12020 to the main sewer indicates that the side sewer was **installed without an** inspection and/or it is not known exactly where the side sewer runs. The dotted line is a close guess.

10) The 214 means that the side sewer intersects the property line here at 214 feet. This measurement was obtained by measuring directly over the 16" main sewer from the centerline of D/S M/H north for 214' then project a line 90° off the main line toward the property line. (see example below)

11) The number 6.5d indicates the side sewer is buried 6.5 feet deep at its intersection with the curb line. Measurement recorded at time of installation.

12) These numbers are invert elevation' rim elevation (above or below sea level) as measured at the M/H. The smaller # (150) is the M/H invert elevation. The larger # (167.2) is the top of the M/H casting rim elevation. To determine the depth of a M/H from the side sewer card simply subtract the invert elevation from the rim elevation. The difference is the M/H depth. (example: 167.2- 150 = 17.2)

13) Identifies this is as a 16” A.C. San. (or 16" diameter Asbestos Cement, Sanitary only Sewer) generally the pipe diameter will be noted above or below a line segment. Pipe type (in this case A.C.) may be shown next, followed by the pipe's function (in this case san) see the glossary of symbols for other designations.

Note: Not all side sewer cards note the pipe type and function.

14) This measurement, underlined twice, is the distance between M/Hs. In this example 345 feet, and is noted next to the U/S M/H. The circle to the left of the # is the symbol for a M/H.

Note: Distances measured along any pipe segment begin at the centerline of the D/S M/H or structure, unless otherwise indicated.

15) This is commonly known as a stub-out from the M/H. It may be of any length but in general it will not be more than 100 feet.

Note: If you find any stub-outs longer than 50 feet, report it to your crew chief. We will probably plan to add a M/H at the end of it.

16) This indicates an unused wye or tee at 311 feet from D/S of M/H. As you can see it does not connect to any building, but is available for future connection.

17) Here is one way to determine the direction of flow in the line notice the angle at which the side sewer connects to the main. In a gravity flow line this angle points to D/S or direction of flow. Another method is to compare invert elevations at U/S & D/S M/Hs, sewage flows toward the lower elevation. Also, flows are directed at larger diameter pipes.

18) This side sewer would be referred to as a community side sewer since it serves more than one building, in this example 12027 & 12023. The term common side sewer is more commonly used.

19) This shows that the side sewer from 12018 is connected to the 16" A.C. SAN. at 200' measured from the centerline of D/S M/H.

20) Here the 7d indicates that at the time the side sewer was installed, it was buried 7 feet deep at its intersection with the property line.

21) This Maintenance Hole with the letters DMH beside it indicates this is a Drop Maintenance Hole. Drop Maintenance Hole denoting an extreme change in the grade where sewage takes a sudden and extreme drop then leaves the M/H through pipes set at lower elevations. (see examples of inside & outside drops)

22) This is a reference to another 8/8 Card -No. LC 1259. In this example the address 12055 35th Ave NE has its side sewer connected to the main that is located on NE 123rd street. You will need to see that card for side sewer info.

23) This is the address of the building drawn here. Addresses are not always correct since sometime they are changed, however the building location is probably the best way to orient yourself if the address is different. For example you are looking at the fourth house from the street corner and the side sewer shows four houses, you probably have the right building, the address on the side sewer card has probably not been updated.

24) This line indicates the building's original foundation outline, and may or may not include later additions.

25) This is an engineering scale, to get the most accurate measurement use this one to make measurement on this 8/8 Card. Often reproductions create slight differences in scale so simply cut off the scale on the 8/8 Card and use it to take measurements.

Symbols on a Side Sewer Card

D/S Down Stream

U/S Up Stream

D/M/H Drop Maintenance Hole

M/H Maintenance Hole

STD/P Stand Pipe (or standing connection)

S/S Side Sewer

S/D Storm Drain

C/B Catch Basin

P/S Piped Sewer (Combination)

PSS Piped sanitary Sewer

PSD Piped Storm Drain

P/L Property Line

S/P Soil Pipe -Where cast iron comes through the house.

L/T Laundry Tray

D.I.P. Ductile Iron Pipe

FM Force Main

BBF below Bottom Floor

ABS Plastic sewer pipe

CIP Cast Iron Pipe

AC Asbestos Cement (Transit)

CWA Civil Works Administration -A King County Program (1920's- 1935) to verify locations of sewers - Do not assume locations of side sewers are valid as methods of locating are unknown.

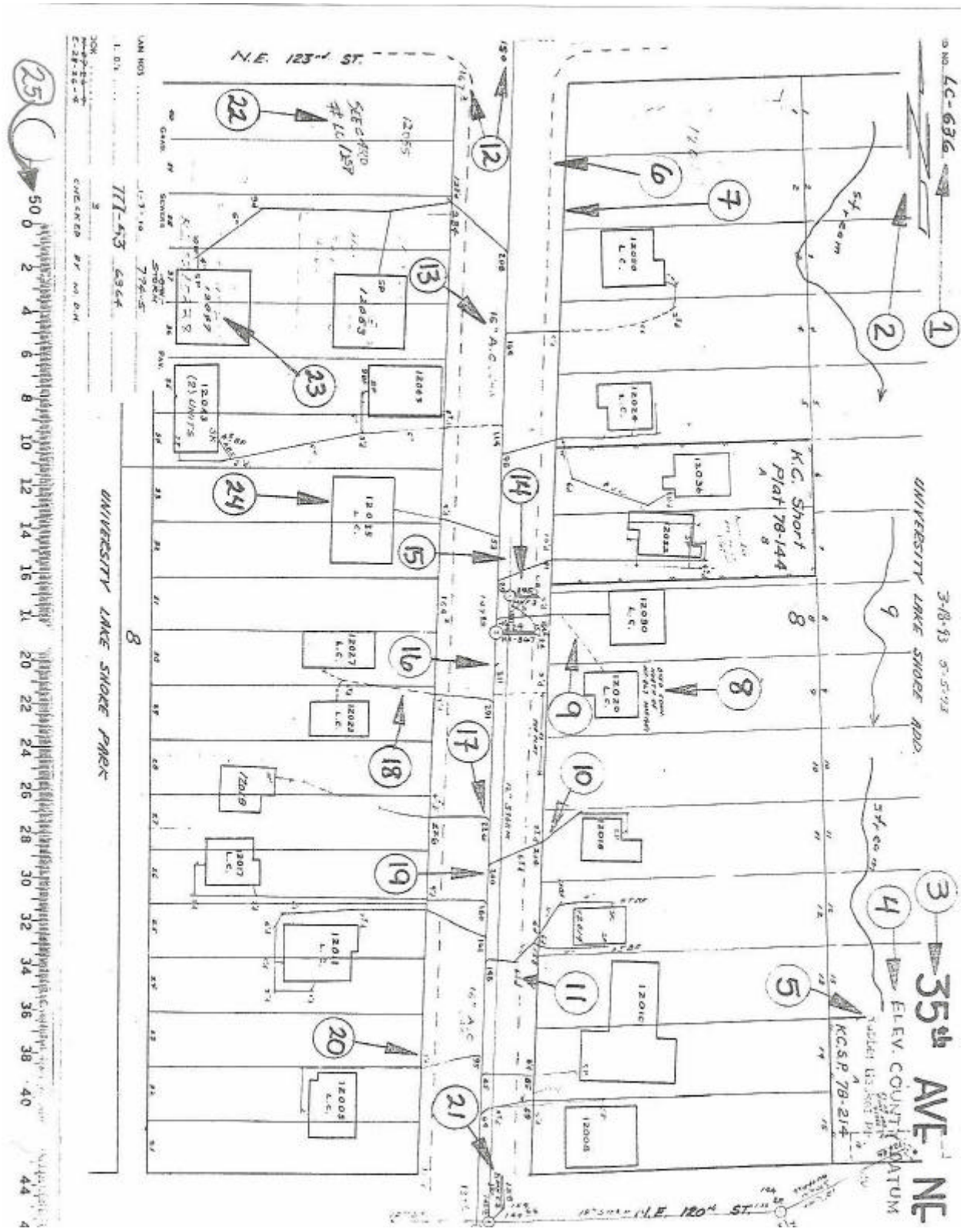
PE Polyethylene Pipe (Plastic)

PVC Polyvinyl Chloride (Plastic)

C/L Center Line

SSD Sub-Surface Drain

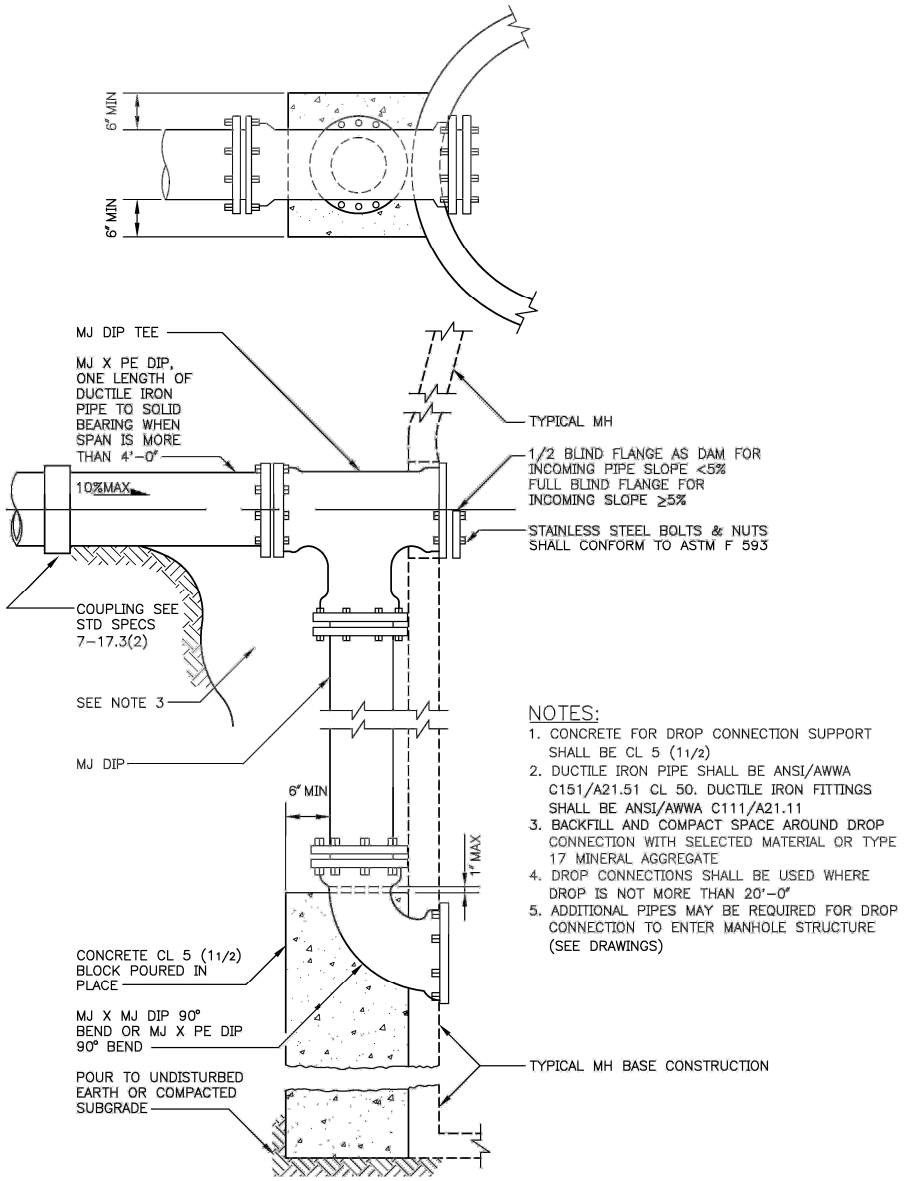
Side Sewer Card



Outside Drop Connection

STANDARD PLAN NO 233a

REV DATE: 2005

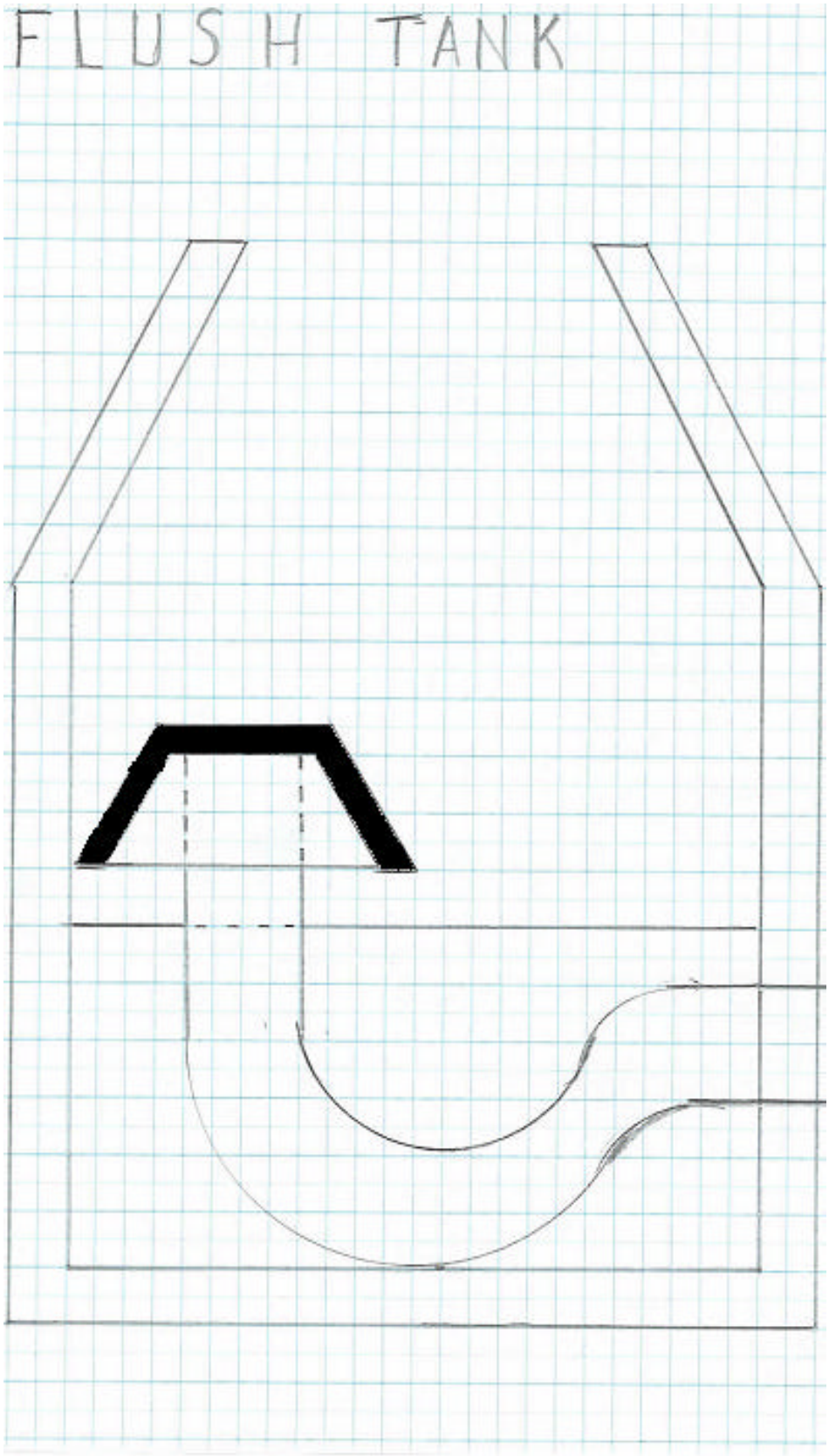


DUCTILE IRON OUTSIDE DROP CONNECTION

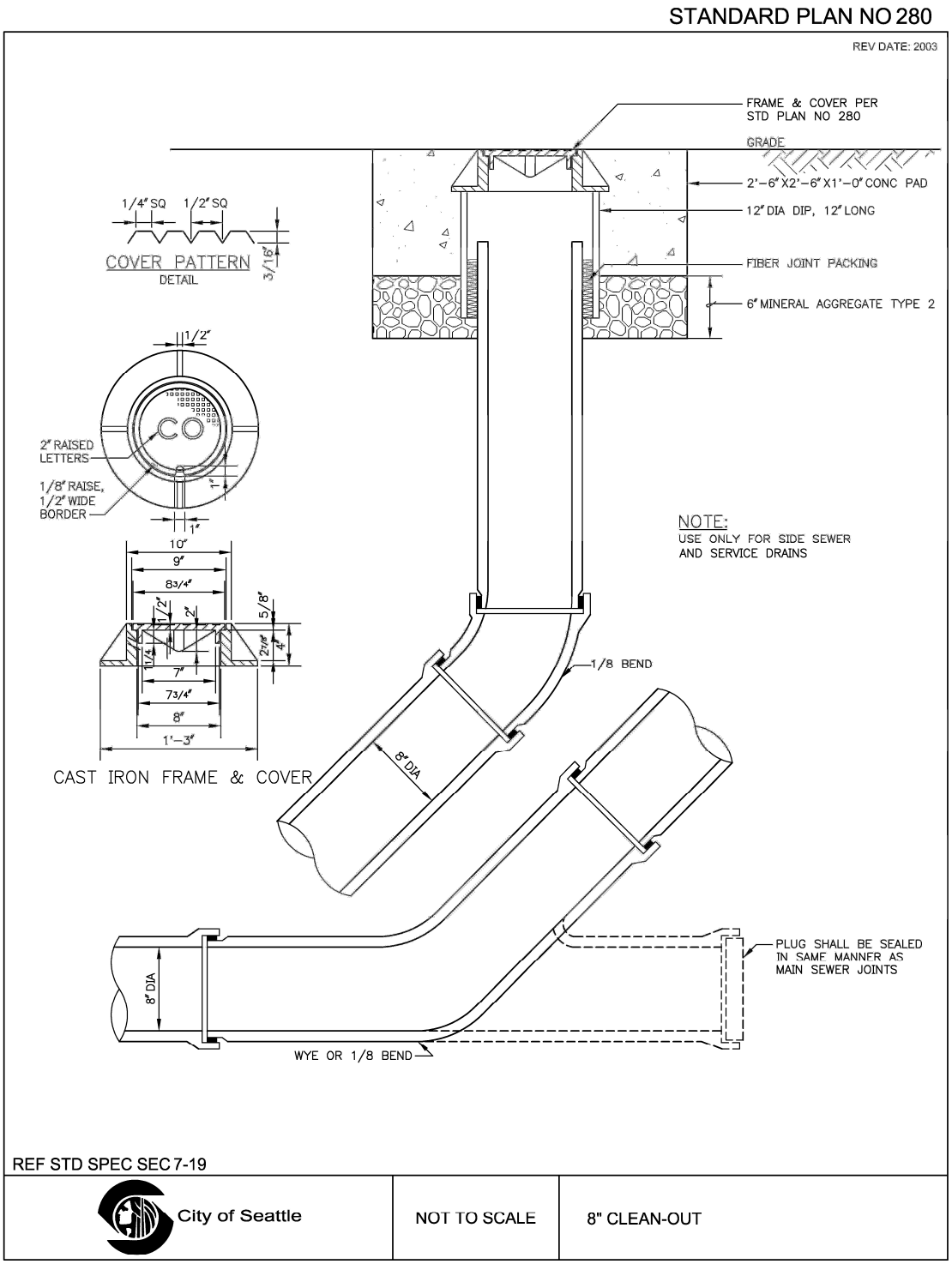
REF STD SPEC SEC 7-08

City of Seattle	NOT TO SCALE	OUTSIDE DROP CONNECTION

Flush Tank



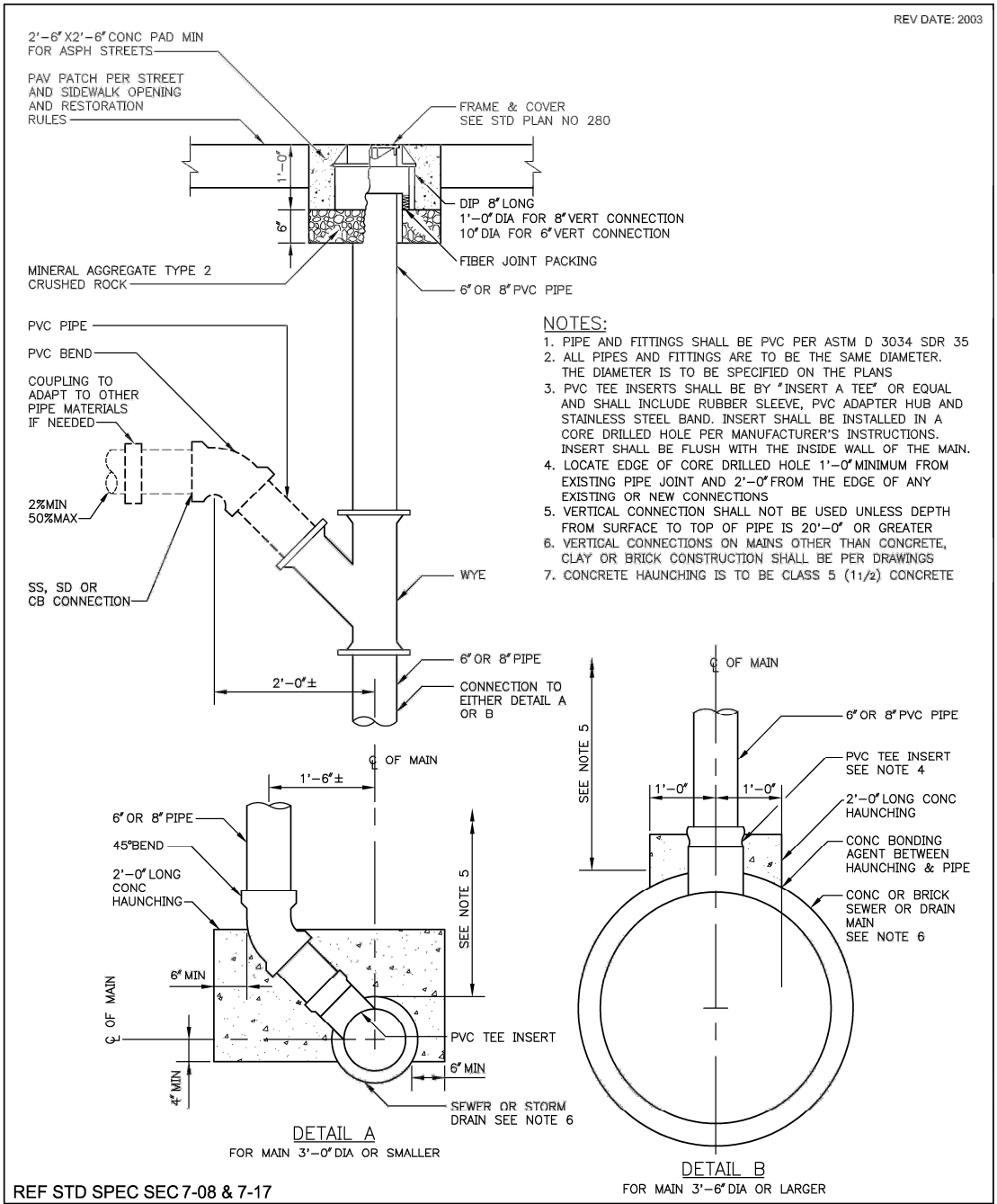
Lamp Hole


STANDARD PLAN NO 280
REV DATE: 2003
FRAME & COVER PER STD PLAN NO 280
GRADE
2'-6" X2'-6" X1'-0" CONC PAD
12" DIA DIP, 12" LONG
FIBER JOINT PACKING
6" MINERAL AGGREGATE TYPE 2
1/4" SQ
1/2" SQ
COVER PATTERN
DETAIL
3/16"
1/2"
CO
2" RAISED LETTERS
1/8" RAISE, 1/2" WIDE BORDER
1"
10"
9"
8 3/4"
1 1/2"
2"
5/8"
2 7/8"
4"
1 1/4"
7"
7 3/4"
8"
1'-3"
CAST IRON FRAME & COVER
NOTE:
USE ONLY FOR SIDE SEWER AND SERVICE DRAINS
1/8 BEND
8" DIA
8" DIA
PLUG SHALL BE SEALED IN SAME MANNER AS MAIN SEWER JOINTS
WYE OR 1/8 BEND
REF STD SPEC SEC 7-19
City of Seattle
NOT TO SCALE
8" CLEAN-OUT

Standing Connection

STANDARD PLAN NO 234

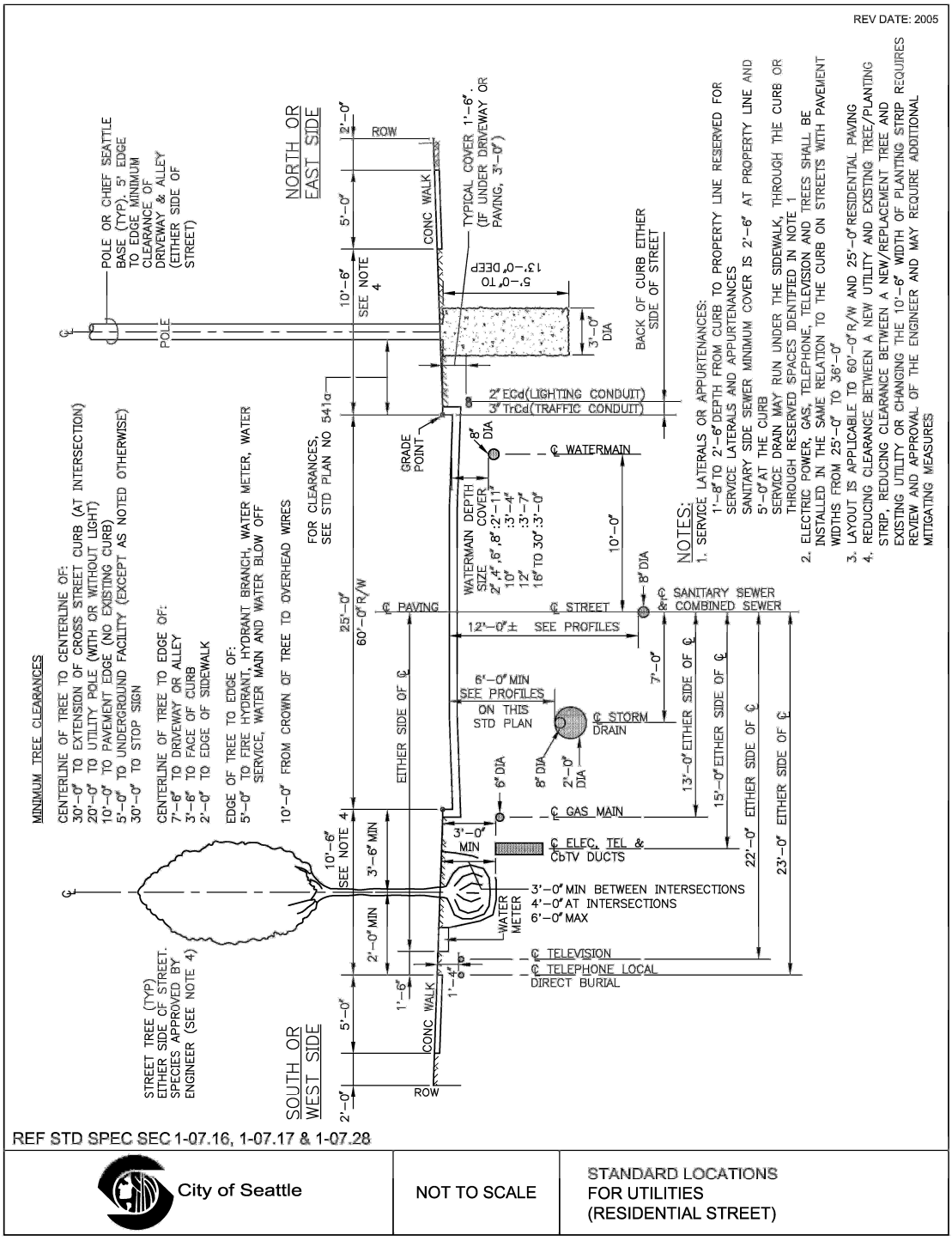
REV DATE: 2003



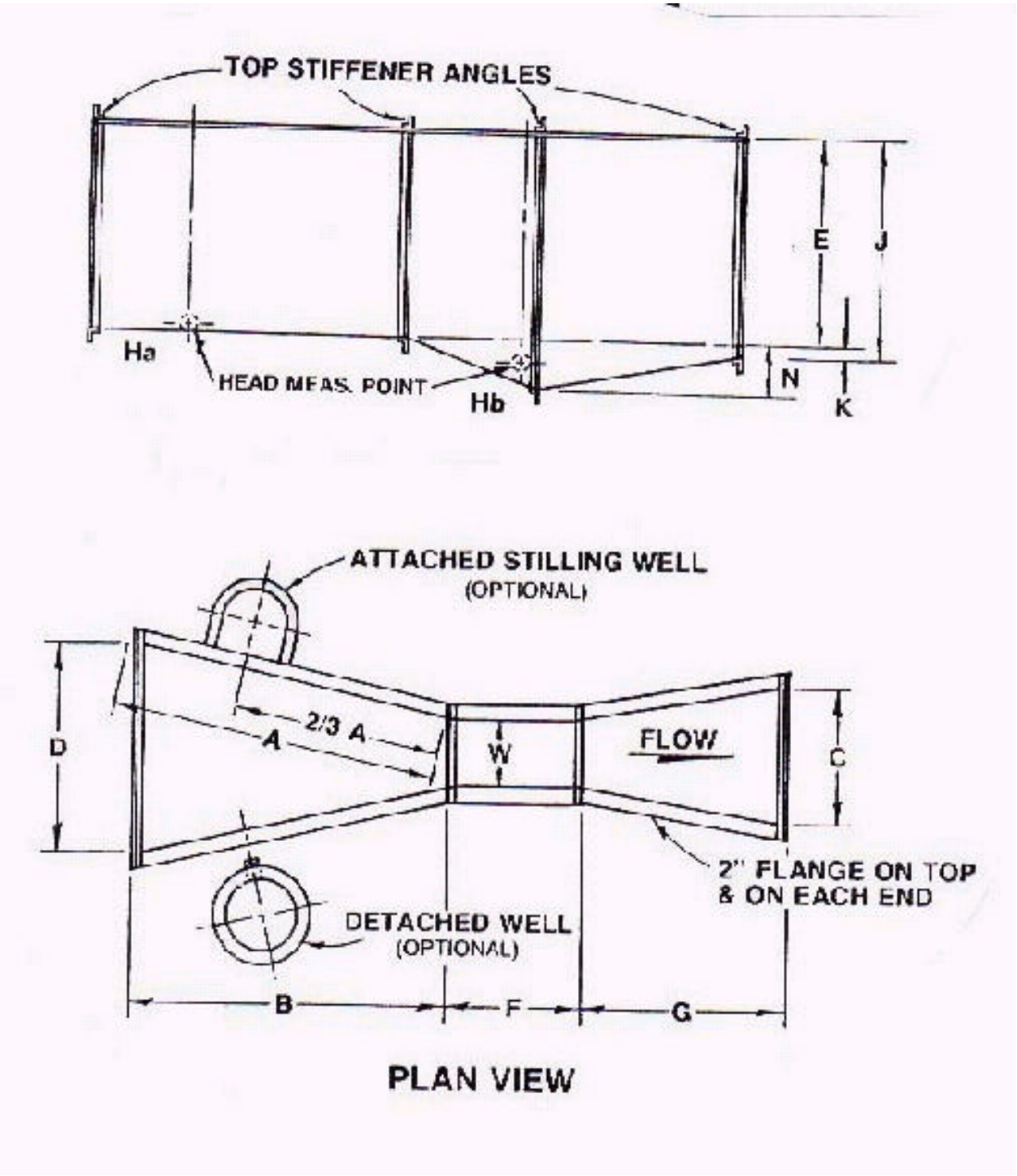
REF STD SPEC SEC 7-08 & 7-17

City of Seattle	NOT TO SCALE	6" OR 8" VERTICAL CONNECTION

Standard Locations



Parshall Flume



Glossary of Terms
Common to Wastewater Collection System Maintenance

Abandoned (a-BAN-dund)
A length, section or portion of a collection system no longer in service and left in place underground. A typical example is where a sewer line is being replaced and removing the old line is too costly, unnecessary and is often capped. Sometimes filled with grout.

Aerobic
A condition in which atmospheric or dissolved oxygen is present in the aquatic (water) environment

Air Blower
A device used to ventilate maintenance structures and lift stations

Air Gap
An open vertical drop or vertical empty space, between a drinking (potable) water supply and the point of use

Air Test
A method of inspecting pipes for leaks. Inflatable or similar plugs are placed in the line and the space between these plugs is pressurized with air. A drop in pressure indicates the line or run being tested has leaks

Anaerobic
A condition in which atmosphere or dissolved molecular oxygen is NOT present in the aquatic (water) environment

Angle of Repose
The angle between a horizontal line and the slope or surface of unsupported material such as gravel, sand or loose soil. Also called the NATURAL SLOPE, this is the condition at which no slough occurs and in general deals with excavations.

Appurtenance (a-PURR-ten-nans)
Machinery, appliances, structures and other parts of the main structure necessary to allow it to operate as intended but not considered part of the main structure.

Arch
The curved top of a sewer pipe or conduit.

Asphyxiation
An extreme condition often resulting in death due to a lack of oxygen and excess carbon dioxide in the blood from any cause

Auger
A sharp tool used to go through and break up or remove various materials that become lodged in sewers. Generally corkscrew in shape **Back fill**
(1) Material used to fill a trench or excavation.

(2) The act of filling a trench or excavation usually after a pipe or some type of structure has been in the trench or excavation.

Backwater Gate
A device installed at the end of a drain or outlet pipe to prevent the backward flow of water or wastewater. Generally used on sewer outlets into streams to prevent flow during times of flood or high tide. Also called a TIDE GATE.

Backwater Valve
Also called a BACKFLOW PREVENTER. This device is installed on side sewer lines generally to prevent a surcharge in the main line from rising up into buildings.

Balling
A method of hydraulically cleaning a sewer or storm drain by using the pressure of a water head to create a high cleansing velocity of water around the ball. In normal operation, a cable restrains the ball while water washes past the ball at high velocity. Special sewer cleaning balls have an outside tread that causes them to spin or rotate, resulting in a “scrubbing” action of the flowing water along the pipe wall

Bar Rack
A screen composed of parallel bars (either vertical or inclined) placed in a sewer or the waterway to catch debris. The screening may be raked from it either by hand or automatically.

Bedding
The prepared base or bottom of a trench or excavation on which a pipe or other underground structure is supported. Refers to the type of granular material placed directly around the pipe.

Bell and spigot Joint
A form of joint used on pipes that have an enlarged diameter or bell at one end. a spigot at the other that fits into and is laid in the bell. The joint is then made tight by lead, cement, rubber O-ring or other jointing compounds or materials.

Blockage
(1) When a collection system becomes plugged and the flow backs up it is said to have a BLOCKAGE. ,

(2) The place and cause of a blockage, Example: Fifty-one feet from a specific maintenance hole and a grease blockage.

(3) Partial or complete interruption of flow because of some obstruction in a sewer.

By-Pass
A pipe, valve, gate, weir, trench or other device designed to allow all or part of a wastewater flow to be diverted from usual channels of flow. Sometimes refers to a special line to allow conveying flow around a facility or device that needs maintenance or repair. Generally accomplished with aid from pumps but may also be done by gravity and/or head pressure.

Catch Basin
A chamber or well used with storm or combined sewer for removing grit that might other wise enter and be deposited in sewers. Also, see STORM- WATER INLET and CURB INLET.

Cleanout Two-way
A Cleanout designed for rodding or working a snake into a pipe in either direction. Most often application is in building lateral pipes (side sewers) at or near a property line.

Collapsed pipe
A pipe that has one or more points in its length that have been crushed or partially crushed by exterior pressures or impacts.

Combined Sewer or system
A sewer or wastewater collection system intended to receive both sanitary wastewater and storm or surface water runoff.

Commercial contribution
Liquid and liquid carried wastes generated by commercial establishments and dumped into the wastewater collection system. Used in this context, commercial contributions are distinct from domestic and industrial sources of wastewater contributions. Examples of high yield commercial sources are laundries, restaurants and hotels.

Concentric M/H Cone section
Cone tapers uniformly from barrel to M/H cover.

Contamination
Introduction into water of any microorganisms, chemical, wastes or wastewater in a concentration that makes the water unfit for its intended use.

Confine Space
A space that:

1. Is large enough and configured that an employee can bodily enter and perform assigned tasks

2. Has limited or restricted means for entry or exit (for example, Tanks, silos. Storage bins, hoppers, vaults and pits are spaces that have limited means of entry.

3. Is not designed for continuous employee occupancy

Cross Connection
(1) A connection between a storm drain system and a sanitary collection system.

(2) Less frequently used, a connection between two sections of a collection system to handle anticipated overloads of one system.

(3) A connection through which a supply of potable water could be contaminated or polluted.

Crown
Refers to the highest point of the inside diameter of a pipe, laid horizontally.

Curb Inlet
A chamber or well built at the curbline of a street to admit gutter flow to the storm water drainage system.

Dead End Maintenance Hole (D/E M/H)
The upstream most MIH on a given collection system branch.

Deflected
1. Pipe that has been forced out of round by external pressure. Mainly applicable to fiber and plastic pipes where backfill compaction has resulted in unequal pressures to pipe wall.

2. Pipe whose direction has been changed either to the left, right, up or down

Degradation (de-grah-DAY-shun)
The conversion of a substance to simpler compounds. For example: the degradation of organic matter to carbon dioxide and water.

Destroyed Pipe
Pipe that has been damaged, decomposed, deflected, crushed or collapsed to a point that it must be replaced.

Detention
The delay or holding of the flow of water and water carried wastes in a pipe system. This can be due to a restriction in the pipe, a stoppage or a dip. Also the time water is held or stored in a basin or wet well.

Detritus (de-TRY-tus)
The heavy coarse material carried by wastewater. Also, called **GRIT.**

Downspout
In plumbing the water conductor from the roof gutters or roof catchment to the storm drain or other means of disposal. Also, called a **ROOF LEADER** or **ROOF DRAIN.**

Downstream (D/S)
The direction of water flow toward the lower part of a sewer collection system.

Dragline
A machine that drags a bucket down the intended line of a trench to dig or excavate the trench. Also used to dig holes and move soil or aggregate.

Drop Joint
A sewer pipe joint where one part has dropped out of alignment. Also called a **VERTICAL OFFSET** or **OFFSET JOINT**

Drop Maintenance Hole (DMH)
Where an inlet pipe to a maintenance hole enters the maintenance hole structure, above the bottom or invert of the M/H and the flow from the pipe is allowed to fall or drop into the M/H. Usually the flow drops through a pipe into the M/H's channel via an **inside** or **outside** drop pipe. (See schematics} **Dry Well**
A dry-room or compartment in a lift station near or below the water level where the pumps are located.

Eccentric Manhole Cone
Cone tapers non-uniformly from barrel to manhole cover with one side usually vertical

Effluent (EF-lou-ent)
Wastewater or other liquid-raw partially or completely treated-flowing from a basin, treatment process or treatment plant.

Egress
A term used to describe the 1st pipe on the downstream side (outflow) of a maintenance structure

Ex-filtration (EX-£ill-TRAY-shun)
Liquid wastes and liquid carried wastes that unintentionally leak out of a sewer pipe system and into the environment.

Flow Line
1. The top of the wetted line, The water surface or the hydraulic grade line of water flowing in an open channel or partially full conduit

Force Main
A pipe that conveys wastewater under pressure from the discharge side of a pump to a point of gravity flow.

Grade
(1) The elevation of an invert at the bottom of a pipeline, canal, culvert, sewer, or similar conduit.

(2) The inclination or slope of a sewer, conduit, stream channel, or natural ground surface. Usually expressed in terms of the ratio, percentage numbers, units, vertical rise or fall per unit of horizontal distance.

Gravity Flow
Water or wastewater flowing from a higher elevation to a lower elevation due to the force of gravity. The water does not flow due to energy provided by a pump. Whenever possible wastewater collection systems are designed to use the force of gravity to convey waste liquids and solids.

Ground Water
Subsurface water occupying the saturation zone, from which wells and springs are fed. In a strict sense the term applies only to water below the water table. Also called **pyretic** water and/or **pleuritic** water.

Ground Water Depth
The distance of the ground water table below the surface at any selected location.

Ground Water Elevation
The elevation of the groundwater table above mean sea level at any selected location.

Ground Water Table
The average depth or elevation of the ground water over a selected area.

Handhole Trap
A device made of pipefitting used to prevent sewer gases from escaping the branch or lateral sewer and entering into a building sewer.

Head
A term used to describe the height or energy of water above a point. A head of water may be measured in either height (feet) or pressure (pounds per square inch **PSI).**

Hydro-Brake
A device placed at the discharge end of a storage structure (egress) to control the release of water or wastewater into the D/S potion of the system.

Ingress
A term used to describe the 1st pipe on the upstream side (inflow) of a maintenance structure

Infiltration
The seepage of ground water into a sewer system, including service connections. Seepage frequently occurs through defective or cracked pipes, pipe joint , connection or manhole walls.

Invert
The lowest point of the channel inside a pipe or M/H

Kite
A devise for hydraulically cleaning sewer lines. Resembling an airport windsock and constructed of canvas-type material, the kite increases the velocity of a flow at its outlet to wash debris ahead of it. Also called a parachute

Lamp Hole
A small vertical pipe or shaft extending from the surface of the ground to a sewer. A light (or lamp) may be lowered down the pipe for the purpose of inspecting the sewer

Lamping
Using reflected sunlight or a powerful light beam to inspect a sewer between two adjacent manholes. The light is directed down the pipe from one manhole. If it can be seen from the next manhole, it indicates that the line is open and straight.

Lateral Sewer
Also known as **SIDE SEWER.** This pipe collects wastewater from individual homes or buildings. Then discharges into a branch or other sewer on its way to the sewage treatment plant.

Lift station
Is a wastewater pumping station that lifts the wastewater to a higher elevation when the continuance of the sewer at reasonable slopes would involve excessive depths of a trench. It also raises wastewater from areas too low to drain into available sewers. These stations may be equipped with air-operated ejectors or centrifugal pumps. Sometimes called **PUMP STATIONS**, the term **PUMP STATION** is usually reserved for a similar type of facility that is discharging into a long **FORCE MAIN**. While a lift station has a discharge line or a force main only up to the D/S gravity sewer.

Longitudinal Crack
A crack in a pipe or pipe section that runs lengthwise along the pipe.

Lubriflushing
Bearings are grease lubricated, the relief plug is removed and a proper amount of lubricant is added to the bearing at the lubrication fitting. Run the pump and expel excess lubricant.

Main Line
Branch sewer that collects wastewater from building sewers and service lines.

Mandrel (MAN-drill)
(1) A special tool used to push bearings in or to pull sleeves out.

(2) A gauge is used to measure for excessive deflection in a flexible conduit.

Maintenance Hole (M/H)
An opening in a sewer provided for permitting workers or equipment to enter or leave a sewer.

Maintenance Hole casting (or frame)
A metal ring or frame with a ledge to accommodate the cover or lid and is usually at the surface of the ground or street.

Outfall
(1) The point location or structure where wastewater or drainage discharges from a sewer, drain or other conduit.

(2) The conduit leading to the ultimate disposal area.

Parshall flume
A specially constructed flume of channel used to measure flows in open channels

Root, Sewer
Any part of a root system of a plant or tree that enters a collection system.

Root curtain
Refers to roots (of a plant or tree) hanging down from the arch of the pipe similar to a curtain.

Sand Catcher Maintenance Structure
A structure in which the inflow line drops sewage and heavier materials into a sump. The heavier material displaces the lighter sewage, which continues downstream. Occasional removal of the heavier material is required.

Smoke Test
A method of blowing smoke into a closed off section of a sewer system to locate sources of inflow.

Snake
A Stiff Flexible cable that is inserted into sewers to clear stoppages.

Soap Cake or Soap Build Up
A combination of detergents and greases that accumulate in sewer systems and build up over a period of time. Which in turn causes sewer restrictions and/or blockages.

Soil Displacement,
Generally accompanies silting of a sewer system. Where infiltration is taking place and silt is carried into a sewer system. Such silt or soil is removed from the ground around the sewer pipe and the result is soil displacement.

Soil Pipe
A type of wastewater or service connection pipe made of a low grade of cast iron usually found at the foundation of a residential or commercial property.

Static Head
When water is not moving the vertical distance (in feet) from a point to the water surface.

Stoppage
(1) When a sewer system becomes plugged and the flow backs up it is said to have a stoppage. See **BLOCKAGE.**

Storm Collection System
A system of gutters, catch basins, yard drains, culverts and pipes for collecting and transporting storm waters from one point to another. Excluding domestic and industrial wastes.

Storm Runoff
That portion of the total runoff that reaches the point of measurement within a relatively short period of time after the occurrence of precipitation. Also called **DIRECT RUNOFF.**

Storm Sewer
A sewer that carries storm waters and surfaces street wash and other wash waters or drainage. Excluding domestic wastewater and industrial wastes. Also called a **STORM DRAIN.**

Storm Water
The excess water running off from the surface of a drainage area during and immediately after a period of rain. It is that portion of the rainfall and resulting surface flow more than that can be absorbed through the infiltration capacity of the surface of the catch basin.

Storm Water Inlet
A device that admits surface waters to the storm water drainage system. Also see **CURB INLET** and **CATCH BASIN.**

Stringers
Horizontal shoring members' usually square rough cut timbers that are used to hold solid sheeting, braces or vertical shoring members in place. See **WALERS.**

Surcharge
Sewers are surcharged when the surface of the wastewater in maintenance holes is above the top or crown of the sewer pipe. The sewer is under pressure or a head, rather than at atmospheric pressure.

Surfaced Void
Where silting has taken place to a degree that a void is caused in the subsoil, and through successive cave-ins the void reaches the surface of the ground.

Suspended Solids
Solids that either float on the surface of or are in suspension in water, wastewater, or other liquids that are largely removable by laboratory filtering.

Tag Line
A line, rope or cable that follows equipment through a sewer so the equipment can be pulled back out if it encounters an obstruction or becomes stuck. Equipment is pulled forward with a pull line.

Tap
A small hole in a sewer where a wastewater service line from a building is connected (tapped) into a lateral or branch sewer.

Telemetering Equipment
Equipment that translates physical measurements into electrical impulses that are transmitted to dials or recorders.

Tide Gate
A gate with a flap suspended from a free-swinging horizontal hinge. Usually placed at the end of a conduit discharging into a body of water having a fluctuating surface elevation. The gate is usually closed because of outside water pressure but when the water head inside the pipe is large enough to overcome the water pressure, the weight of the flap or the friction of the hinge the gate will then open. Also called a **BACKWATER GATE.**

Tide Valve (Red Valve)
One-piece construction (stiff rubber type material) formed so that one end fits over the end of a pipe and the other end is flat but centered. Usually placed on the end of a conduit discharging into a body of water having a fluctuating surface elevation. The valve is usually closed because of it's design and/or outside water pressure, but will open when the water head inside the pipe is large enough to overcome pressure. **(RED VALVE** is a product name)

Trap
(1) In a wastewater collection system of building plumbing codes require every drain connection from an appliance or fixture to have a trap. The trap in this case is a gooseneck that holds water to prevent vapors or gases from a collection system from entering a building.

(2) Various other types of special traps are used in collection systems such as a **GRIT TRAP** or **SAND TRAP.**

Trunk Sewer
A sewer that receives many tributaries branches and serves a large territory. See **MAIN SEWER.**

Turbidity
(1) A condition in water or wastewater caused by the presence of suspended matter. Resulting in the scattering and absorption of light rays.

(2) An analytical quantity usually reported in arbitrary turbidity units figured out by measurements of light diffraction.

Undermined
(1) A condition where the bedding support under a pipe or M/H is removed or washed away. Conditions leading to or causing this are believed to be the presence of excess water during backfill. Other causes are horizontal boring operations, excavations adjacent to the pipe or maintenance hole and ex filtration or infiltration at drop joints.

(2) Where a broken section of pipe is carrying away soil leaving a void. The surfaces are said to be **UNDERMINED.**

Undisturbed Soil
Soil at any depth that has not been excavated or disturbed by excavation or construction.

Uprights
Vertical shoring members that are part of a shoring system used to prevent cave-ins of excavations.

Upstream (U/S)
The direction against the flow of water or toward the higher part of a sewer or collection system.

Walers (WAY-lers)
Horizontal shoring members usually square rough cut timbers that are used to hold solid sheeting, braces or vertical shoring members in place. See **STRINGERS.**

Wastewater
The used water and water-carried solids from a community that flow to a treatment plant. Storm water, surface water and ground water infiltra- tion also must be included in the wastewater that enters a plant. The term SEWAGE usually refers to household wastes but this word is being replaced by the term **WASTEWATER.**

Wayne Ball
A spirally grooved inflatable semi-hard rubber ball designed for hydraulic cleaning of sewer pipes. See **BALLING** or **SEWER BALL.**

Well Point
A perforated metal tube or screen attached to a jetting or driving head end designed to permit the entrance of water. A well point is jetted or driven into place. Well points are generally used to pull ground water levels down so that excavations can be performed.

Wet Well
A compartment or room in which wastewater is collected and the suction pipe of a pump may be connected. Also a submersible pump may be located in a wet well.

Appendix 3
Figure 8
Base Map Work Orders

The intent of Figure 11 is to provide access to the online base map work orders. They should be used for informational purposes only and added to every base map research file.

The following is an excerpt from the instructions for administrators to login to the SPU Engineering Support online survey/base map work orders. These instructions are intended to allow base map supervisors or leads to add input the work orders. DO NOT MAKE CHANGES TO THESE BASE MAP WORK ORDERS.

*** It is anticipated that a read only version will be created in the near future.

Login in as an Administrator

Browse to: http://www.nobleconsulting.net/Workorder/

Begin by entering the Username: *admin* and the password: *1234*.

Appendix 3
Figure 9
Instructions – Printing a Survey Point List

The survey point list may be printed out while working in an LDT session. Go to the "**Points"** pulldown menu. Go to **"Point Management"** and then "**Point Group Manager**. Open your point group. Click on "**Manager"**, then **"Print"**.

Appendix 3
Figure 10
Pipe Size Chart

This section provides pipe size charts that cover most of the circumstances encountered while creating a base map. One chart covers sizes of ductile iron pipe and the other covers concrete pipe.

Class 52 Ductile Iron Pipe

Size		Wall Thickness		OD		10 scale	20 scale
inches	feet	inches	feet	inches	feet		
4	0.33	0.29	0.024	4.80	0.40	-	-
6	0.50	0.31	0.026	6.90	0.57	1/20	-
8	0.67	0.33	0.027	9.05	0.75	3/40	-
10	0.83	0.35	0.029	11.10	0.92	5/60	-
12	1.00	0.37	0.031	13.20	1.10	1/10	1/20
14	1.17	0.39	0.032	15.30	1.27	5/40	2/30
16	1.33	0.40	0.033	17.40	1.45	3/20	3/40
18	1.50	0.41	0.034	19.50	1.62	8/50	4/50
20	1.67	0.42	0.035	21.60	1.80	9/50	1/10
24	2.00	0.44	0.037	25.80	2.15	13/60	6.5/60
30	2.50	0.47	0.039	32.00	2.67	8/30	4/30
36	3.00	0.53	0.044	38.30	3.19	16/50	8/50
42	3.50	0.59	0.049	44.50	3.71	11/30	11/60
48	4.00	0.65	0.054	50.80	4.23	17/40	8.5/40
54	4.50	0.73	0.061	57.10	4.75	24/50	12/50

Concrete Pipe

ID		Wall Thickness		OD		10 scale	20 scale
inches	feet	inches	feet	inches	feet		
6	0.50	1.00	0.08	-	0.67	2/30	-
8	0.667	1.005	0.088	-	0.85	5/60	-
10	0.835	1.25	0.104	-	1.04	2/20	-
12	1.00	2.00	0.17	-	1.33	4/30	2/30
15	1.25	2.25	0.19	-	1.63	5/30	5/60
18	1.50	2.50	0.21	-	1.92	2/10	2/20
21	1.75	2.75	0.23	-	2.21	11/50	5.5/50
24	2.00	3.00	0.25	-	2.50	5/20	5/40
30	2.50	3.50	0.29	-	3.10	3/10	3/20
36	3.00	4.00	0.33	-	3.70	11/30	11/60
42	3.50	4.50	0.375	-	4.25	13/30	13/60
48	4.00	5.00	0.42	-	4.84	24/50	12/50
54	4.50	5.50	0.46	-	5.42	16/30	8/30
60	5.00	6.00	0.50	-	6.00	6/10	3/10
66	5.50	6.50	0.54	-	6.58	20/30	13/40
72	6.00	7.00	0.58	-	7.16	36/50	18/50
78	6.50	7.50	0.63	-	7.76	31/40	16/40
84	7.00	8.00	0.67	-	8.34	25/30	25/60
90	7.50	8.50	0.71	-	8.92	18/20	18/40
96	8.00	9.00	0.75	-	9.50	19/20	19/40

Appendix 3
Figure 11
PSE Gas Map Request Form

This section discusses the excel document used to order gas maps. A copy of an example and the template is provided for reference.

The template is located in our common directory and can be found under “P:\Tr\ATr\BASEMAP\Research”. The document name is “PSE Gas Map Request Form.xls”

Open the file and fill out the information. Then email to the address specified on the document. When a request area exceeds more than one ¼ section, use the second workbook named “PSE Request Page 2”. It can be accessed by clicking the tab located on the bottom left of the document.

PUGET SOUND ENERGY

External Request Form

Fax Request to:
Maps & Records
Fax (425) 456-2515
Phone (425) 456-2511
email: MapRequest@pse.com for forms

Please allow 3 to 8 working days delivery.

Fax 206-684-7396

Date 9/16/2004 Phone 206-233-7805 Ext. _____

Utility Information Requested: _____ **Electric** X **Gas**

Contact Name Dean Huber
Contact email: dean.huber@seattle.gov
Agency/Firm City of Seattle Public Utilities
Address: 700 5th Ave, Suite 4900 PO Box 34018
Seattle, WA 98124-4018

Project Type: X Public Improvement _____ Private Development _____ Other

Is Project Related to Sound Transit? _____ Yes X No

Project Name: Golden Gardens Slide Area

Project Location/Site Address: Please include cross street before and after requested address:
Golden Gardens Dr NW from Loyal Ave NW to park entrance. View Ave NW from Loyal Ave NW to Golden Gardens Dr NW.

County: King **Required: City & Zip Code** Seattle 98117
City **Zip**

REQUIRED* 1/4 Sec(s), Township, Range: can be found in The Thomas guide

1/4 Section SE 34 Township 26 Range 3
Example ***SW*** ***30*** ***T29N*** ***R5E***

If more than one Section fill out attached sheet -- see page 2.

Detail Project Description (I.e., road widening with stormwater improvement: Residential Plat; etc.)
Drainage improvements to eliminate roadway slide.

Utility relocation required for project? (Yes, No or Unknown) unknown

Delivery: X Mail _____ Call when ready -- Will Pick-Up

PUGET SOUND ENERGY

External Request Form

Fax Request to:
Maps & Records
Fax (425) 456-2515
Phone (425) 456-2511
email: MapRequest@pse.com for forms

Please allow 3 to 8 working days delivery.

Fax _____

Date _____ Phone _____ Ext. _____

Utility Information Requested: _____ **Electric** _____ **Gas**

Contact Name _____

Contact email: _____

Agency/Firm _____

Address: _____

_____

Project Type: _____ Public Improvement _____ Private Development _____ Other

Is Project Related to Sound Transit? _____ Yes _____ No

Project Name: _____

Project Location/Site Address: Please include cross street before and after requested address:

_____

_____

County: _____ **Required: City & Zip Code** _____

City **Zip**

REQUIRED* 1/4 Sec(s), Township, Range: can be found in The Thomas guide

1/4 Section _____ Township _____ Range _____

Example ***SW*** ***30*** ***T29N*** ***R5E***

If more than one Section fill out attached sheet -- see page 2.

Detail Project Description (I.e., road widening with stormwater improvement: Residential Plat; etc.)

_____

_____

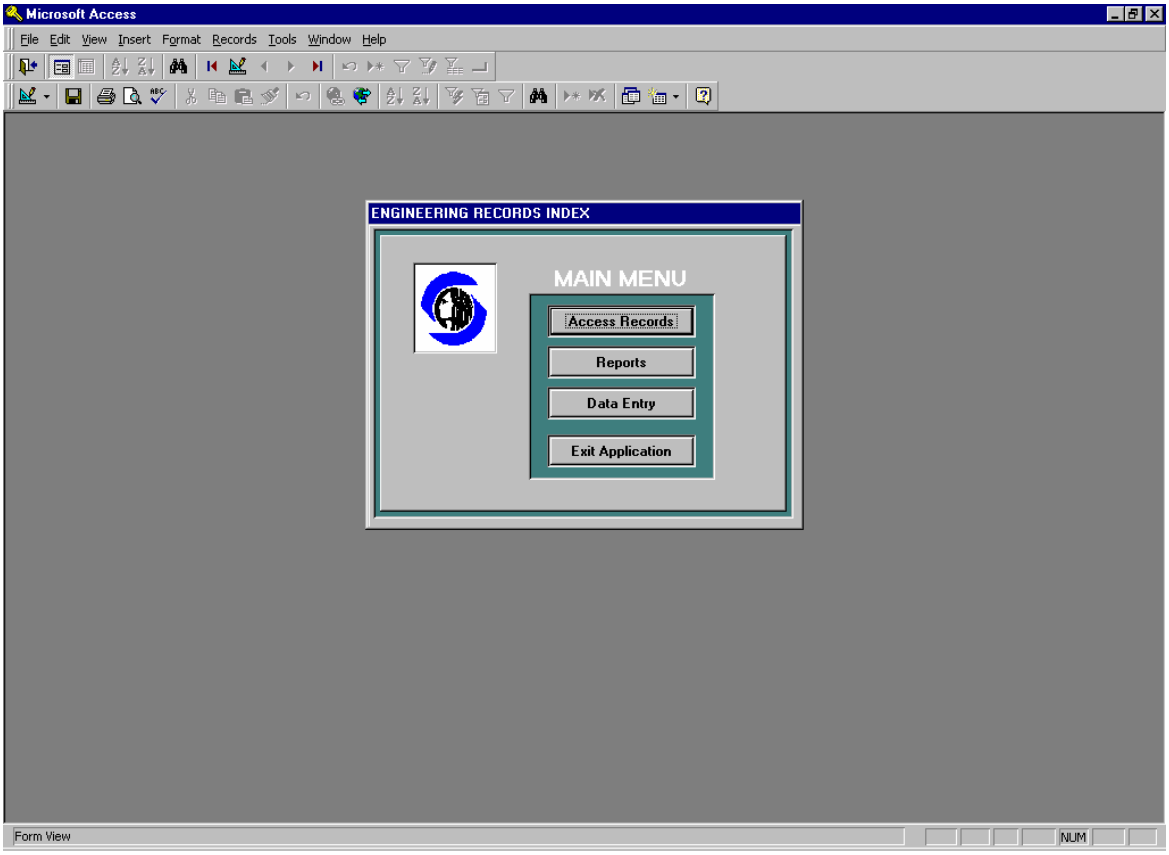
Utility relocation required for project? (Yes, No or Unknown) _____

Delivery: _____ Mail _____ Call when ready -- Will Pick-Up

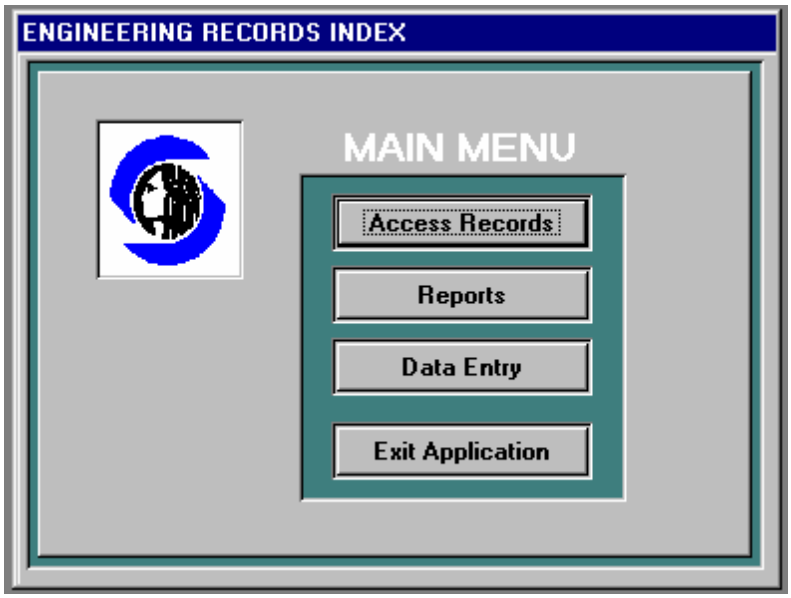
Appendix 3
Figure 12
Instructions – Engineering Records Index

The Engineering Records Index, formerly known as the Water Department Improvement Database can be found at **N:\ERI\Eri.mdb**.

Program opening window:

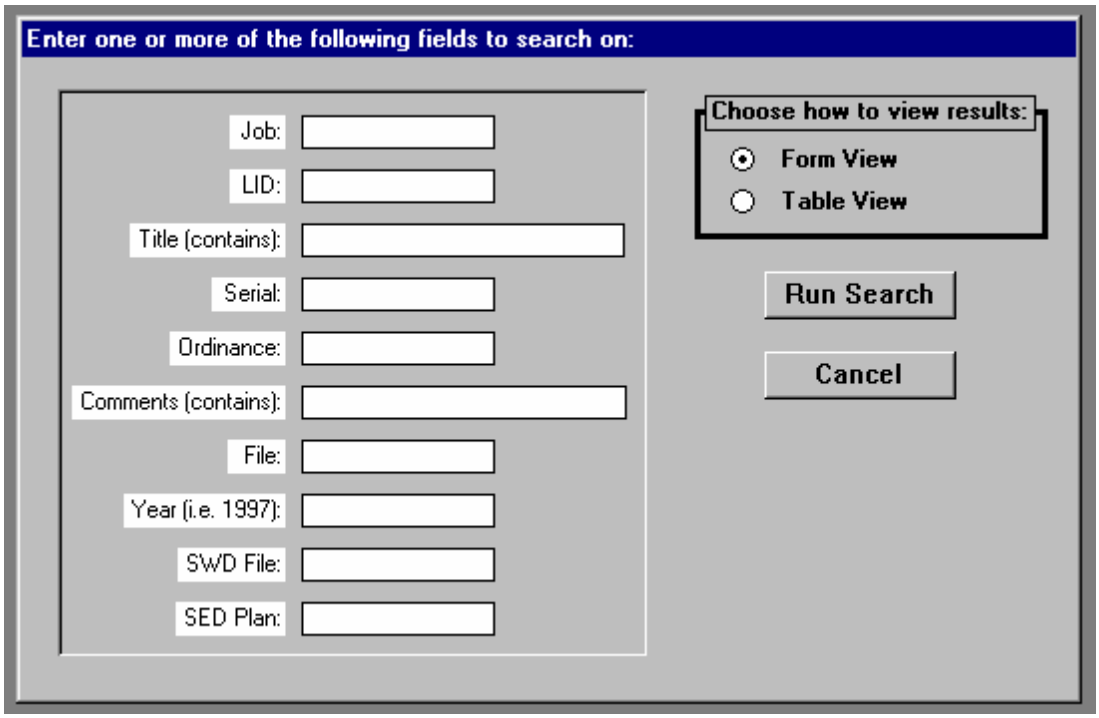


Main Menu:



“Access Records”, opens the window for doing searches.
“Reports”, opens window for printing the entire Engineering Records Index.
“Data Entry”, opens window for entering new data into Index. (Requires password.)
“Exit Application”, closes the program.

Access Records:
This is where you enter the items you want to search for.



Description of items:

Job – A project number that was assigned under the old system (sometimes referred to as “4-digit job numbers”), or a project number assigned under the new CFMS system (CIP & Non-CIP numbers, 88xxxx or 8x.xxx)

LID – Local Improvement District number; projects funded and constructed by an LID will have a number assigned. Projects are no longer added to this system.

Title – The project title or, in some cases, the geographic location of the project. Most project titles include the geographic location and the actual work involved (ie: Install Hyd, Cut & Cap WM, etc…) This index is mainly concerned with geographic location when it comes to the title. In the case of projects having to do with facilities (ie: Maple Leaf PS, Interbay PS, etc…) the facility name appears in the title. Some project files and drawings deal with pipe and appurtenance specifics and a geographic location does not apply. In these cases, the basic item appears first in the title with a description following (Ex. – a 6” CIP, for 16” Wood Pipe”).

Serial: Serial numbers are only assigned if a drawing number has been assigned (see below).

Ordinance: ordinance number; projects constructed under an ordinance will have a number assigned. Some ordinance numbers are considered “blanket” numbers and will have several projects constructed under it. Project files are no longer added to this system.

Comments (contains): This field should contain any information that will clarify the project in any way. This could be information concerning the geographic location of the project or specifics about the actual construction, design or study of a project. Corss-references to other projects and other file “types” should also be included in this field.

File: A designation code which can be used to physically locate a project file or drawing.

A = Facilities file (filed alphabetically)
D = Drawing file
J = Job number file (old system)
L = LID file
O = Ordinance file
W = General WM & Appurtenance file (CIP, Non-CIP, miscellaneous)

Year: The year that the project came into service or the year that the study was done, etc…

SWD File: This number is assigned to drawings in the drawing file. The number itself may contain a combination of numbers and letters used to locate and retrieve a drawing.

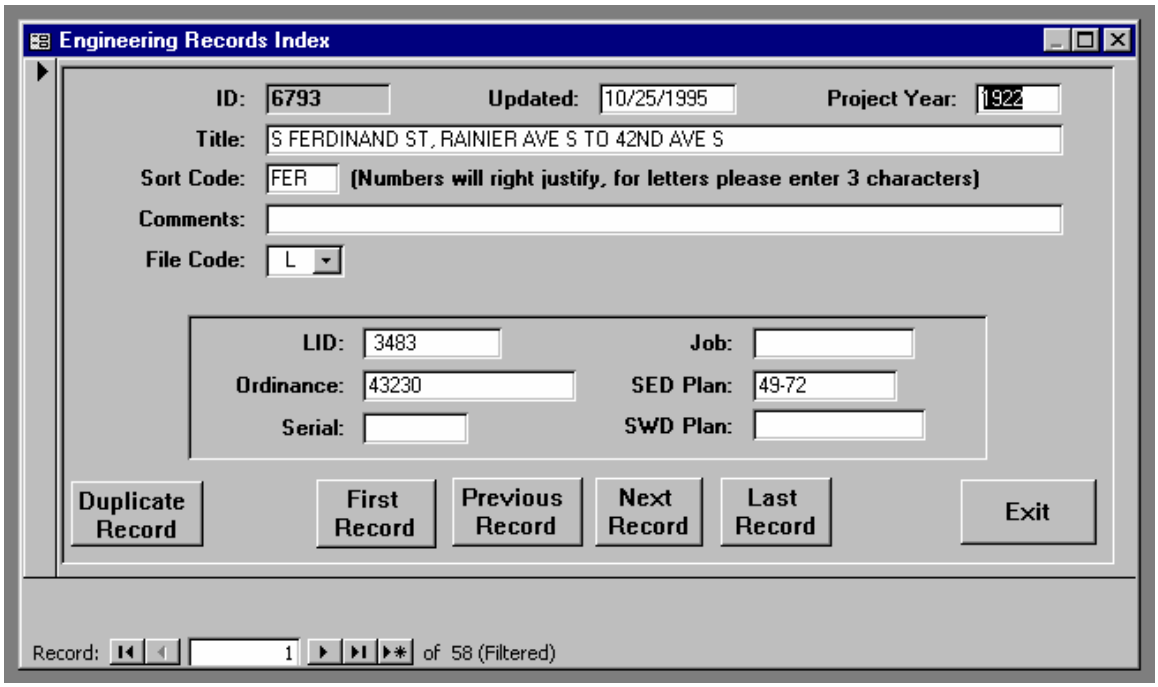
SED Plan: SED (Seattle Engineering Dept.) Vault Plan number (VPI); assigned to original plans that are filed in the vault.

Doing Search:
You can enter search criteria in any box or combination of boxes. When entering data into multiple boxes the search will only return those items that match all search criteria exactly. Wild card characters do not work in searches and search text is not case sensitive.

Any boxes requiring a number, only return an exact match while the boxes that accept text will return all records with the included text. Example entering "22" for "Job:" will only find job number 22. Entering "roy" in the "Title" box will return all records containing the characters "roy", including "Roy", "Fauntle**roy**" and "McEl**roy**".

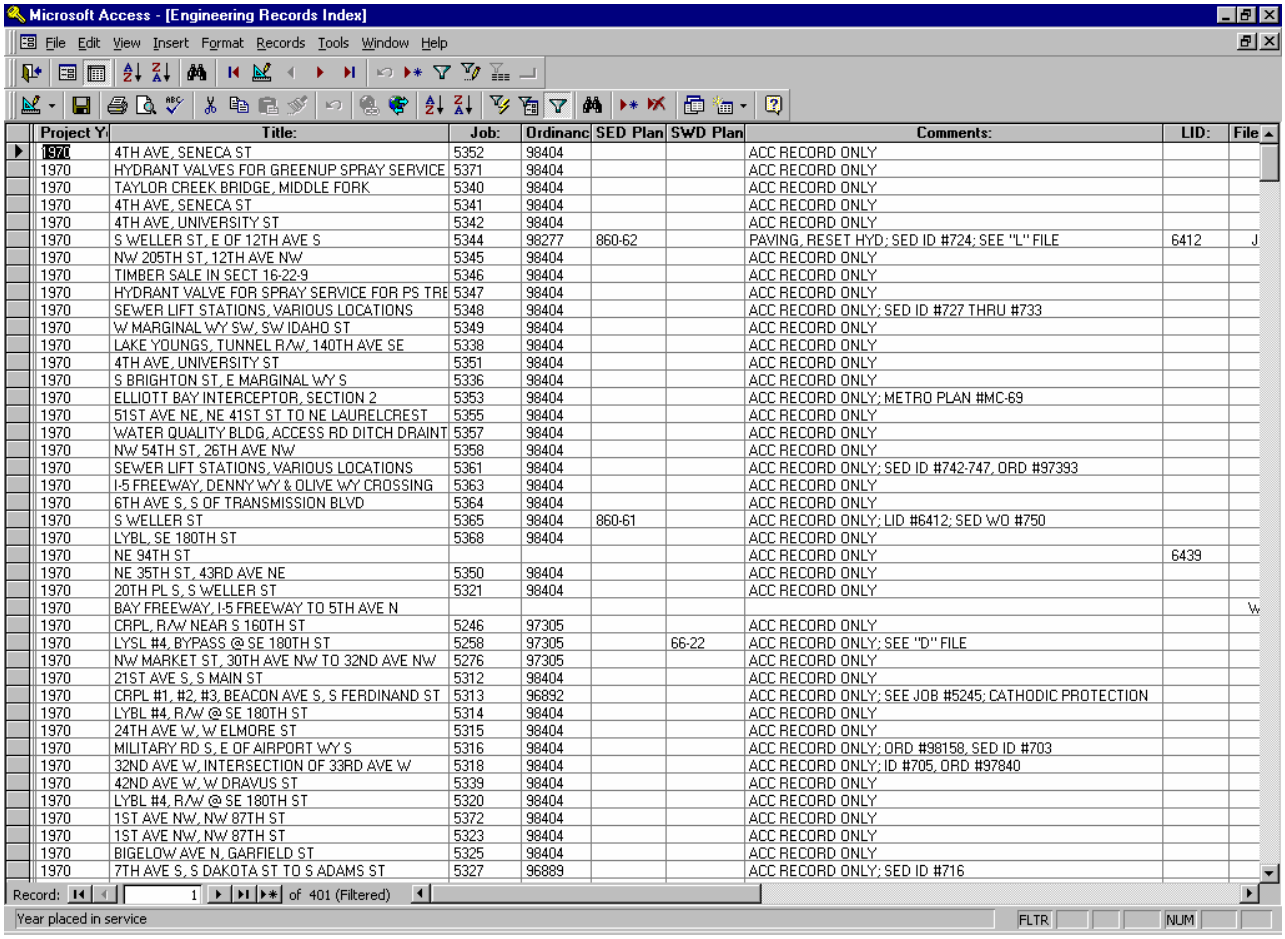
There are two ways to view the search results, Form View and Table View.

Form View:



Form View gives you the ability to move forwards and backwards through the results while viewing one record at a time.

Table View gives you a list of all the search results:



Project Y	Title:	Job:	Ordinanc	SED Plan	SWD Plan	Comments:	LID:	File
1970	4TH AVE, SENECA ST	5352	98404			ACC RECORD ONLY		
1970	HYDRANT VALVES FOR GREENUP SPRAY SERVICE	5371	98404			ACC RECORD ONLY		
1970	TAYLOR CREEK BRIDGE, MIDDLE FORK	5340	98404			ACC RECORD ONLY		
1970	4TH AVE, SENECA ST	5341	98404			ACC RECORD ONLY		
1970	4TH AVE, UNIVERSITY ST	5342	98404			ACC RECORD ONLY		
1970	S WELLER ST, E OF 12TH AVE S	5344	98277	860-62		PAVING, RESET HYD; SED ID #724; SEE "L" FILE	6412	J
1970	NW 205TH ST, 12TH AVE NW	5345	98404			ACC RECORD ONLY		
1970	TIMBER SALE IN SECT 16-22-9	5346	98404			ACC RECORD ONLY		
1970	HYDRANT VALVE FOR SPRAY SERVICE FOR PS TRE	5347	98404			ACC RECORD ONLY		
1970	SEWER LIFT STATIONS, VARIOUS LOCATIONS	5348	98404			ACC RECORD ONLY; SED ID #727 THRU #733		
1970	W MARGINAL WY SW, SW IDAHO ST	5349	98404			ACC RECORD ONLY		
1970	LAKE YOUNGS, TUNNEL R/W, 140TH AVE SE	5338	98404			ACC RECORD ONLY		
1970	4TH AVE, UNIVERSITY ST	5351	98404			ACC RECORD ONLY		
1970	S BRIGHTON ST, E MARGINAL WY S	5336	98404			ACC RECORD ONLY		
1970	ELLIOTT BAY INTERCEPTOR, SECTION 2	5353	98404			ACC RECORD ONLY; METRO PLAN #MC-69		
1970	51ST AVE NE, NE 41ST ST TO NE LAURELCREST	5355	98404			ACC RECORD ONLY		
1970	WATER QUALITY BLDG, ACCESS RD DITCH DRAINT	5357	98404			ACC RECORD ONLY		
1970	NW 54TH ST, 26TH AVE NW	5358	98404			ACC RECORD ONLY		
1970	SEWER LIFT STATIONS, VARIOUS LOCATIONS	5361	98404			ACC RECORD ONLY; SED ID #742-747, ORD #97393		
1970	I-5 FREEWAY, DENNY WY & OLIVE WY CROSSING	5363	98404			ACC RECORD ONLY		
1970	6TH AVE S, S OF TRANSMISSION BLVD	5364	98404			ACC RECORD ONLY		
1970	S WELLER ST	5365	98404	860-61		ACC RECORD ONLY; LID #6412; SED WO #750		
1970	LYBL, SE 180TH ST	5368	98404			ACC RECORD ONLY		
1970	NE 94TH ST					ACC RECORD ONLY	6439	
1970	NE 35TH ST, 43RD AVE NE	5350	98404			ACC RECORD ONLY		
1970	20TH PL S, S WELLER ST	5321	98404			ACC RECORD ONLY		
1970	BAY FREEWAY, I-5 FREEWAY TO 5TH AVE N							W
1970	CRPL, R/W NEAR S 160TH ST	5246	97305			ACC RECORD ONLY		
1970	LYSL #4, BYPASS @ SE 180TH ST	5258	97305		66-22	ACC RECORD ONLY; SEE "D" FILE		
1970	NW MARKET ST, 30TH AVE NW TO 32ND AVE NW	5276	97305			ACC RECORD ONLY		
1970	21ST AVE S, S MAIN ST	5312	98404			ACC RECORD ONLY		
1970	CRPL #1, #2, #3, BEACON AVE S, S FERDINAND ST	5313	96892			ACC RECORD ONLY; SEE JOB #5245; CATHODIC PROTECTION		
1970	LYBL #4, R/W @ SE 180TH ST	5314	98404			ACC RECORD ONLY		
1970	24TH AVE W, W ELMORE ST	5315	98404			ACC RECORD ONLY		
1970	MILITARY RD S, E OF AIRPORT WY S	5316	98404			ACC RECORD ONLY; ORD #98158, SED ID #703		
1970	32ND AVE W, INTERSECTION OF 33RD AVE W	5318	98404			ACC RECORD ONLY; ID #705, ORD #97840		
1970	42ND AVE W, W DRAVUS ST	5339	98404			ACC RECORD ONLY		
1970	LYBL #4, R/W @ SE 180TH ST	5320	98404			ACC RECORD ONLY		
1970	1ST AVE NW, NW 87TH ST	5372	98404			ACC RECORD ONLY		
1970	1ST AVE NW, NW 87TH ST	5323	98404			ACC RECORD ONLY		
1970	BIGELOW AVE N, GARFIELD ST	5325	98404			ACC RECORD ONLY		
1970	7TH AVE S, S DAKOTA ST TO S ADAMS ST	5327	96889			ACC RECORD ONLY; SED ID #716		

Table View includes the following data:
Project Year, Project Title, Job No., Ordinance No., SED Plan No., SWD Plan No., Comments, LID No., File Code and Sort Code.

Appendix 4
Research Resources

Resource	Source	Comments
Virtual Vault	SPU InWeb	Accessed thru Internet Explorer icon on SPU desktop.
Plans	Virtual Vault or Engineering Records Vault 47th Floor KT	• Vault Plan Index (VPI) maps are located on the wall. • Note black Page # in the square • Check each page for plan #s within a few blocks of your base map location • Make a Vault Check-out slip for each plan (**see Appendix 3**) • Locate plans and replace with check-out slips • If a plan is missing, check for a microfilm • If plan is checked out, call number on slip and ask to copy it Option: Submit list of plans to Vault staff and ask them to pull plans
Existing Manually-drawn Base Maps	Virtual Vault or Engineering Records Vault 47th Floor KT	• Base Map Index book is located in Vault • Find base map location page # on index at front of book • Note base map reference # of any existing maps in base map location • Copy existing base maps on scanner (ask for help if needed) • Carefully re-file existing base map (or leave on cabinet for re-filing by staff) Option: Existing base maps can also be found using the Virtual Vault
Existing CAD Base Maps	Virtual Vault or P:\Drive	• **P:\BasemapArchive\Basemap_Inventory.mdb** for existing CAD base map. CAD base maps are filed by region in **P:\BasemapArchive\Region?** The index map for base map regions is found in front of existing base maps book (see above) • Most existing CAD base maps have been added to the Virtual Vault
Engineering Plans		• VPI maps are located on wall. • Note black Page # in square • Check each page for plan numbers within few blocks of base map location • Make a Vault Check-out slip for each plan (**see Appendix 3l**) • Locate plans and replace with check-out slips • If a plan is missing, check for a microfilm • If plan is checked out, call number on slip and ask to copy it Option: Submit your list of plans to the Vault staff and have them pull plans
Microfilm of Engineering	Virtual Vault or Engineering Records Vault 47th Floor KT	• All plans Vault are also available on microfilm • All Survey Field books are available on microfilm • If you need help using microfilm machine, ask Vault staff for assistance

Resource	Source	Comments
City of Seattle ¼ Section Maps	Engineering Records Vault 47th Floor KT or Tiff images on P:\Qsec	• ¼ section index maps are located behind the vault counter • ¼ section maps are located in filing cabinets behind the vault counter • If the folder is empty, request missing maps from the attendant • Notify the attendant if you take the last map
Cloth Water Maps	Engineering Records Vault 47th Floor KT	• These plans show very old watermains that could still be there. There is no index for these plans. You just have to guess • Ask vault staff or Steve Law for assistance
Side Sewer Cards	Street Use 37th Floor KT	• Drawers are behind the customer counter on 37h floor • Locate a Side Sewer Card for each block in your base map location • Locate both sides of each side street that intersects your base map location • If Side Sewer Card ends at an intersection, pull card for next block • Replace card with a burnt-orange card from very front each drawer • Copy front and back of each card, being careful to keep pairs of copies together. Use duplex feature of copier-if possible. • Place cards in box at east end of drawers for re-filing by staff • Two good sources for additional help with side sewer cards are Joe Taskey and Joe Caasi in Street Use
Side Sewer Permits	Street Use 22nd Floor KT	Any type of side sewer work involves a permit from the City. Often with the permit is additional information including sketches and drawings. The backside of the side sewer card lists permits related to that portion of street. These permits are kept on file by the City on the 37th floor and can be pulled and copied
Sewer Maps	Engineering Records Vault 47th Floor KT	• These maps are located in Vvault • Use ¼ section map numbers • Use these maps for reference only • These maps have Vault index references, but not been recently updated
Drainage Maps	Engineering Records Vault 47th Floor KT	• These maps are located in Vault • Use 1/4 section map numbers • Use these maps for reference only • These maps have vault index references, but not been updated in years
Sewer & Drainage Map	Engineering Records Vault 47th Floor KT	• These books look like water book • There is an index on first page of book • Go to your page. Drainage is on left side and sewers are on right side • These pages come from GIS

Resource	Source	Comments
Survey Books	Engineering Records Vault 47th Floor KT	Use 3 ways to locate Survey Field Books for your base map area 1. From surveyor who did base map survey. They have pulled Field Books for area 2. Find Survey Field Book # on ¼ section map for base map area 3. Use Survey Field Book index cards in the Vault. Filed by street location, they locate all Field books for an area If you cannot locate Field Book in Vault, it look for checkout card in space where the Field Book is filed. Arrange either to borrow Field book from whomever checked it out or check to see if Field Vook is available on microfilm. ***(Include survey description codes list from LDD manual.)***
Inspector's Books	Engineering Records Vault 47th Floor KT	• Some of inspector's books are located in the vault • The rest of the books are located in a different place. You must ask Vault staff to order it. It takes 1 day. • Many City's plans have construction inspector's record books on file. Plans have inspector's book number listed in title block area. Book contains daily notes by inspector during construction. May also be sketches and drawings
Plat Books	8th Floor Municipal Bldg	Use for locating specific information on plats within the city.
Utility Index Maps	Street Use 37th Floor KT Behind counter	• North and south pull-down maps with numbers located next to utility books. • Pull the numbered utility 1/4 section map from the cubbies. • Copy the utility 1/4 section map, and label the copy with its map number. • If map is missing, check with Curtis Marsten to see if he has it or can locate it.
Utility Books	Street Use 37th Floor KT Behind counter	• Pull books referenced on map • Fill out and replace with a check-out card • If you copy and label the referenced pages (rather than take the book), be sure to copy 1st page of job (with description and date). L abel each page with the book #. And color copies to identify work properly • Ask Fred White or Rex Straton if any new utility permits have been recorded • If book is missing, check with Ernesto to see if he has it
Utility Index Cards	Street Use 37th Floor KT	This is an additional record of franchise utilities. Located in Street Use near Utility maps. Ask Fred White or Rex Stanton where they are. Organized by street, they list older utilities that may or may not be on other utility maps/books
10 Scale Downtown Utility Maps	Street Use 37th Floor KT	Because utilities are so dense in the downtown area, there are special 1"=10' utility maps for the downtown area.

Resource	Source	Comments
Sky bridges, Utilidors, Underground Tunnels, Fiber Optic Systems	Street Use 37th Floor KT	These are records of other miscellaneous utilities. Located in Street Use near the Utility maps. Ask Fred White or Rex Stanton where they are.
Profiles	Engineering Records Vault 47th Floor KT	• Find the location on the VPI maps on the wall. • Note the black page # in square. • In the VPI plans book locate that page # for "Profiles". • Note all profiles needed. • Make a Vault check-out slip for each profile (**see Appendix 3**) • Locate profile(s) and replace with check-out slips, or ask attendant • If a profile is missing, check for a microfilm in the drawers
Area Ways	Street Use 37th Floor KT	If questions about area ways, contact John Zavis or SDOT Structural
Private Contract Inspection	Street Use 37th Floor KT	Used as a secondary resource
Water Book	Engineering Records Vault 47th Floor KT	• The water book is located in Vault • In front of book is an index. Use it find your area • Undo book screw locks • Carefully remove page • Copy and label base map location area
Ordinance/ Easement Books	City Clerk's Office	• Typically provided by Survey • On a rare occasion we will have to put in the ordinance or easement
Aerial Topography Map	Engineering Records Vault 47th Floor KT	• These will eventually be scanned and added to Virtual Vault. • Use the quarter section map numbers. • Copy and label aerial photo location • Leave map on drawers for re-filing by staff. • Images taken in 1970 must be superceded by 1999 photos

Resource	Source	Comments
Aerial Photos	ArcView	• These will eventually be scanned and added to Virtual Vault. • Seattle was aerial color photographed in 1999. Images are available using either Mr Sid program or ArcView on your computer. From Mr Sid, you can save image as a TIF file for importing into AutoCAD
Engineering Records Index	SPU6\VOL1\APPS\Prod\SPUmdb\ERI\eri.mdb	Formerly known as Water Dept. Improvement Database. Engineering Records Index allows searching and listing projects by many criteria. Plans for projects are stored in Dexter Horton, 6th floor vault area. **See Appendix 3, Figure 18.**
Gas Maps	Puget Sound Energy	PSE company handles natural gas for Seattle area. PSE keeps updated maps of their natural gas system. Copies of these maps are available from PSE by sending a Gas Map Request form. See form attached.
GIS	GIS Map Counter 20th Floor KT	
King County Metro Plans	King Street Center 4th Floor	For any plans or information regarding with Metro contact Jeff Suiter at 684-1302
King County Plans	King County Admin Building 9th Floor	For any plans or information for King County contact Minnie at 296-6548
WSDOT Plans	15700 Dayton Ave N Seattle, WA 98133-9710	• For plans or info about state ROW plans: contact Jim Johnson at 206 440-4026. You must have an appointment. • Seattle lies within WSDOT's Northwest District. The district office is located at 15700 Dayton Avenue North, Seattle, WA 98133-9710, (206) 440-4000. WSDOT plans are available from the district office
Seattle City Light	36th Floor KT	For any plans or information about SCL contact Norm Dodge at 684-3945
Amtrak	National Railroad Passenger Dept 303 S Jackson St Seattle, WA 98104	For any plans or info about railroad: contact Fred Fielder at 382-4146
Seattle Steam	1325 4th Ave Suite 1440 Seattle, WA 98101	For any plans or info about steam: contact Randy Erickson at 623-63
SDOT Intersections	39th Floor KT	
Traffic Circles	Susan Almachar	
Parks Dept	RDA Bldg 3rd Flr 800 Maynard Ave Seattle, WA 98104	For any plans or information regarding parks department contact Jim Deymonaz at 684-8826 or contact Rex Allen at 684-7034

Glossary

- **ABANDON (ABAN)** A pipe or a structure that is no longer in use.
- **AS BUILT** A term normally applied to documentation and design plans following completion of construction reflecting the final modifications to the original design.
- **BASEMAP** A map of existing conditions.
- **CASTING** A covering and access for manholes or vaults, usually visible at ground level.
- **CAPITAL IMPROVEMENT PROJECTS (CIP)** Projects that improve the City's interests.
- **CONCENTRIC** **H**aving a common center.
- **CONTROL** The arrangement of imaginary lines from a known position to a known position that mange the location of items in a given area.
- **CONTROL LINES** Imaginary lines that are located between control points.
- **CONTROL POINTS** **M**arkers placed in the ground by survey in relationship to other known and established survey markers.
- **COORDINATE SYSTEM** The expression of location by the number of units, up or down and left or right of a known origin.
- **WORLD COORDINATE SYSTEM** For the purpose of base mapping, the "World" coordinate system is used, where the up and down are north and south and left and right are east and west.
- **CULVERT** A pipe like structure that drainage water passes through. Its ends are usually visible above the ground.
- **DATUM** Any numerical or geometrical quantity or set of such quantities which serve as a reference or base for other quantities.
- **DESCRIPTOR** The description of a surveyed point.
- **DUCT** For base map terminology**,** a duct is a pipe like structure containing numerous conduits and encased in concrete or a like substance.
- **EASEMENT** A nonpossessing interest held by one person in land of another whereby the first person is accorded partial use of such land for a specific purpose. An easement restricts but does not abridge the rights of the fee owner to the use of his land.
- **EASTING** The X value of coordinates in the world coordinate system.
- **FIELD CHECK** A visual check of a base map project area conducted for the purpose of verifying the surveyed points, clarifying the surveyed points, and locating any features that may have been missed.
- **UTILITY BOOKS** An as-built record of utility improvements that are permited
- **UTILITY PERMITS**
- **GIS** Geographical Information Systems - A computer mapping program where land characteristics and/or demographic information stored in a database can be displayed and plotted with specific features assigned unique colors, linetypes, text styles, etc.
- **INSPECTORS BOOK** A book containing notes and data collected by construction inspectors during construction.

- **INVERT ELEVATION** A measurement taken at the inside bottom of a pipe in a sewer/drainage system.
- **LUMBERMAN'S CRAYON** A piece of waxy chalk used for marking temporary control points on sidewalks while conducting a field check.
- **LUMINARE** The light on the end of a light pole.
- **MEASURE DOWN** A measurement taken from the top of the rim on a structure to the top of a pipe or valve.
- **MONUMENTS** A permanently placed survey marker such as a stone shaft sunk into the ground to mark a survey point.
- **NORTHING** The Y value of coordinates in the world coordinate system.
- **PLANFORM** A spreadsheet used to catalogue research documents.
- **POINT DATABASE** Survey point data stored in LDT (our survey software).
- **PROFILE VIEW** A vertical section taken along a proposed alignment that shows existing grade, existing underground utilities, and the proposed design.
- **PUBLIC-RIGHT-OF-WAY** Land dedicated to public use and ownership.
- **QUARTER SECTION MAP** One-fourth of a normal section as defined by the (USPLS) United States Public Land Survey, formed by dividing a section into four parts by lines connecting the opposite quarter section corners, and containing 160 acres as near as may be.
- **RESEARCH FOLDERS**
- **RESEARCH RESOURCES**
- **RIGHT OF WAY** The strip of land over which facilities such as highways, roadways, or power lines are built.
- **SCOPE** A document used at the project's inception to define it's intent, the area to be improved, the cause or need for the improvement, and the course of action to be taken along with other pertinent information.
- **SIDE SEWER CARDS** Cards that show side sewer connections from the main line to the property line.
- **SPU ENGINEERING RECORDS VAULT** The location of SPU's Engineering Records
- **SPU VIRTUAL VAULT** The automated version of the SPU's Engineering Records Vault
- **STATIONING** The assignment of a linear measurement from a control point (survey marker) to a control point along a control line.
- **SURVEY** The orderly process of determining data relating to the physical characteristics of the earth.
- **SURVEY CONTROL LINES** Survey control lines provide the horizontal or vertical position data.
- **SURVEY CONTROL MARKERS** A material object such as a monument or a tack that marks the location of a survey control point.
- **TIC** A symbol we use to indicate that a pipe ends.
- **TILDE** A symbol we use to indicate that a pipe continues on.
- **TOE** A survey shot at the bottom of a slope.

- **TOP** A survey shot at the top of a slope.
- **TOPOGRAPHICAL FEATURES** Graphic representation of the surface features of a place or region on a map, indicating their relative position and elevations.
- **TRIANGULATION** A method used on field checks to find an object by using two known objects.
- **UTILITY EASEMENT** A nonpossesing interest held by one party (The City) in the land of another for the purpose of accessing, maintaining or improving a subsurface utility.
- **VACATION ORDINANCE** A City ordinance that vacates the land for public use.
- **VIRTUAL VAULT** The online source of finding plans, base maps, and condominium plans.

WHITE SPACE An open area on your drawing that you put text in.