Sydney Trains

Engineering System Integrity

Engineering Procedure
Common

PR A 00498

Detailed Site Survey (DSS) Survey and Drafting

Version 1.0

Date in Force: 23 February 2022

Prepared using: TP ESI 003 V2.0
Uncontrolled when printed

Approved by:	Associate Director Asset Management & Integration Asset Management	Authorised by:	Engineering Technical Publications Manager System Integrity

Disclaimer

This document was prepared for use by Sydney Trains and its intended recipient. The information in this document is protected by copyright and no part of this document may be reproduced, altered, stored or transmitted by any person without the prior consent of Sydney Trains.

All Sydney Trains engineering documents are periodically reviewed, and new editions are published. Between editions, amendments may also be issued. It is the document user's sole responsibility to ensure that document they are viewing is the current version, including any amendments that may have been issued. Errors or omissions in this document should be reported to sydneytrainsstandards@transport.nsw.gov.au.

Sydney Trains makes no warranties, express or implied, that compliance with the contents of this document shall be sufficient to ensure safe systems or work or operation.

Document control

Version	Date	Author/ Prin. Eng.	Summary of change
1.0	23 February 2022	Daniel Vonk, Amir Delaram, Ray Myler	First issue as Sydney Trains document.

Table of Contents

1 Introduction

Detailed Site Survey (DSS) plans provide an accurate representation of Sydney Trains and external agency services. They can be used to identify buried hazards, identify service owners, as base information for design and as a base for providing work as executed information. This procedure details the requirements for the survey and presentation of services data in a PDF and CAD/GIS compatible format.

Services data is required to be compatible with Autodesk AutoCAD Applications and the Sydney Trains Geographic Information System (GIS).

Refer to *PR D 78700 Working Around Electrical Equipment* for precautions to be observed when working around electrical equipment.

This procedure is supplemented by *T MU MD 00006 ST Engineering Drawings and CAD Requirements* and *T MU MD 00006 TI Technical Information for CAD and Engineering Drawings.*

1.1 Purpose

The purpose of this procedure is to achieve consistency for the collection and display of services and infrastructure data presented on DSS plans and within CAD files.

1.2 Scope

This procedure specifies Sydney Trains requirements for creating and updating DSS plans using survey measurements and CAD. In addition to the CAD requirements for plans, it also covers the management and the submission process for DSS Work As Executed (WAsEx) plans and CAD files.

1.3 Application

The requirements in this procedure apply to the survey and drafting of Sydney Trains DSS plans and associated CAD files for both new and Work As Executed (WAsEx) data to suit importing into Sydney Trains GIS systems and the preparation of plans for registration in the Sydney Trains VPR.

1.4 Reference documents

AS 4799 Installation of underground utility services and pipelines within railway boundaries

AS 5488 Classification of Subsurface Utility Information (SUI)

GL A 00512 Guide to Interpretation of Detailed Site Survey (DSS) – Plan Symbols and Numeric Route Codes

SMS-06-GD-3144 Guide to Excavation and Earthworks

T HR EL 20004 ST High Voltage AC and 1500 V DC Traction Power Supply Cable Infrastructure – Standards for Design and Construction

T HR CI 12190 ST Service Installations within the Rail Corridor

T HR EL 20004 ST High Voltage AC and 1500 V DC Traction Power Supply Cable Infrastructure – Standards for Design and Construction

T HR EL 20008 ST Underground Cables and Cable Enclosures – Location Data Recording

TMG 1310 Locating of Underground Services

T MU MD 00006 ST Engineering Drawings and CAD Requirements

T MU MD 00006 TI Technical Information for CAD and Engineering Drawings

1.5 Terms and Definitions

3D	3 Dimensional (i.e. having Easting, Northing and Elevation components)
AHD	Australian Height Datum
AutoCAD	CAD specific software by AutoDesk (technical equivalent may be substituted)
CAB	Control Area Boundary
CAD	Computer Aided Drafting
CCR#	Configuration Change Request number
DRN	District Reference Number - unique number assigned to all services search requests
DWG	AutoCAD CAD file format
DSS	Detailed Site Survey
GIS	Geospatial Information System
GNSS	Global Navigation Satellite System
ISG	Integrated Survey Grid
OHWS	Overhead Wiring Structure
PDF	portable document file format created by various software packages
MGA	Map Grid of Australia
Route	a service or collection of services utilising a single method of containment (e.g. signal cable in a ducted pipe)
Service	a single cable, pipe or asset belonging to an asset group (e.g. signal cable)
SFC	Surface Feeder Cable
Survey Control	survey marks and values adopted as a basis for the creation of a coordinated dataset
TAO	Technically Assured Organisation
TfNSW	Transport for New South Wales
USU	Underground Services Unit responsible for the management of DSS plans and CAD files
Vertex	A point where two or more line segments meet
VPR	Virtual Plan Room
WAX	New or modified information/objects that are shown in Pink on WAsEx Plans
WAsEx	Work as Executed; entire process of displaying installed, modified and deleted works by a project on plans

2 Survey

2.1 Survey Control for DSS Purposes

Survey control shown on DSS plans shall be supplied by Sydney Trains. The co-ordinate system used will be recognised State Co-ordinate systems (e.g. ISG or MGA and AHD) depending upon the current plan co-ordinate system or the current available survey control.

A listing of the Survey Control points adopted for the creation of the plan set shall be listed in the plan set, either placed on the Cover plans or on an information sheet immediately preceding the Cover plans.

Control not supplied by Sydney Trains may be used providing it is proven to be consistent with the Sydney Trains supplied dataset or sufficient data is collected to model and correct any differences between coordinate datums. Supplementary control points not supplied by Sydney Trains are not to be displayed or listed on DSS plans.

GNSS survey methodologies may be used provided that sufficient Sydney Trains supplied control marks are checked to confirm coordinate datums.

For areas where Sydney Trains survey control has been destroyed, or is not available, the DSS Survey Coordinator should be consulted.

2.2 Data collection

Data shall be collected using survey techniques and in certain circumstances accurate field measurements will be accepted.

Coordinate systems are to comply with Sydney Trains and endorsed Australian standards.

Positional data and attribute information is required to be recorded.

GNSS and remote sensing methods are allowed providing the required precisions are obtained. Ground truth points for each base station dataset (using existing control points and existing features) shall be observed to verify GNSS positions.

The semi major axis of the error ellipse relative to the Sydney Trains survey control for the coordinated positions is to be 50mm (3D) or less at the 95% confidence level.

2.3 Extent of survey

Data capture will commence from a significant reference feature, such as an overhead wiring structure, kilometre post, bridge or tunnel and finish at a similar significant reference feature. Data capture is to extend laterally to the limits of the rail corridor. Where the limit of the rail corridor is not easily defined then the extent of survey will be determined by the DSS Survey Coordinator. Where facilities and carparks adjoin the corridor the DSS Survey Coordinator shall be consulted on the extent of survey.

For WAsEx updates, if a project removes/changes elements that define the existing extents (i.e. makes corridor wider) then the project is to certify that any new area to be added to the CAB has been validated and surveyed for any new and existing services refer to Section 7.2.5.

Where Sydney Trains underground services exit the CAB they shall be surveyed to their termination to enable uploading to Sydney Trains GIS. Where the termination point is not in close proximity to the corridor contact the DSS Survey Coordinator for guidance.

2.4 Services feature data

The coordinated 3D location of all services and associated features (e.g. containment type) within the rail corridor shall be surveyed including, but not limited to, internal and external services for:

- Signals
- Communications
- Optic Fibre*[1]
- Electrical*[2]
- CCTV
- Sewage
- Water
- Gas
- Stormwater
- Fuel
- Any redundant services
- Vacant routes.

NOTE 1

Sydney Trains Optic Fibre cables shall be coded as Optic Fibre regardless of the discipline owner.

NOTE 2

Sydney Trains HV Underground Routes are required to be surveyed prior to backfilling. Refer to Section 2.5 Voltage and 1500v Traction. *T HR EL 20004 ST High Voltage AC and 1500V DC Traction Supply Cable Infrastructure – Standards for Design and Construction.*

Service routes shall be surveyed at angles of horizontal and vertical deviation, significant changes in the ground surface, termination points and at least every 20 metres where the route (and depth if applicable) follows a nominal straight path.

To produce compliant and complete information for service routes, the methodology employed must include field survey observations as well as recording of service and attribute information. It is important to note the following information may be required to be captured on site for each point on a service route:

- Service/containment position (easting and northing)
- Top of service/containment level (for depth calculation if underground)
- Finished Ground Level at service position (for display on plan and calculation of depth)
- Service Type (Comms, Signals, LV etc.)
- Status of Service (active or redundant)
- Containment of service (GST, GLT, pipe, direct buried etc.)
- Class of Method of Service Location (Class A or B).

2.5 High Voltage and 1500V Traction

The accuracy of the data for High Voltage and 1500V traction cables shall be recorded in accordance with the Transport for NSW (TfNSW) standards and are summarised below:

- *T HR EL 20004 ST High Voltage AC and 1500 V DC Traction Power Supply Cable Infrastructure – Standards for Design and Construction*
- *T HR EL 20008 ST Underground Cables and Cable Enclosures – Location Data Recording.*

Requirements during construction

The construction of cable routes shall allow for accurate location data recording of the as-built configuration of underground cables and cable enclosures.

- survey of cable and cable enclosures in trenches before the trenches are covered
- location recording capability of the equipment used with trenchless technology (e.g. bore logs – refer to Section 2.9 below for requirements of bore logs).

Refer to T HR EL 20004 ST and T HR EL 20008 ST or further information.

2.6 Above Ground Survey Feature Data

The coordinated 3D location of all above ground features located within the railway corridor shall be collected and included in the dataset.

Above ground Infrastructure includes but is not limited to:

- GST, GLT, pole routes, power poles or air lines
- Cable pits and cable turning chambers
- Service cabinets, signal boxes, relay rooms and location cases
- Trackside equipment including signals, train stops, points, warning lights, indicator lights, point indicators, level crossing lights and booms
- Cable heads and cable termination points
- Physical structures, especially those that help with interpretation and orientation e.g. buildings, platforms, Overhead walkways, bollards, columns
- Salient points of underline and overline bridges, ballast tops and bottoms, culverts, viaducts, drains and retaining walls (i.e. abutments, wing walls, inverts, soffits)
- Cuttings and embankments
- All fencing and access gate locations
- Vehicular access roads
- Overhead wiring structure (OHWS) locations (contact wire not required)
- All tracks, points and crossings
- Track running face
- Open Drainage Structures.

2.7 Classification of Underground Service Location Accuracies

Any location of an underground asset will be collected in relation to two positional attributes:

- DEPTH: in metres from top of route to ground level
- CLASS: an indicator of both vertical and positional accuracy.

The Depth attribute shall be recorded to one decimal place. Positive values indicate the distance down from finished surface level to top of route. A 'zero' or negative value indicates a service on ground or above and shall not be used.

The Class attribute is determined by the method used for determining the depth and position of the route. The Class attribute shall be in accordance with *AS5488 Classification of Subsurface Utility Information (SUI)* and summarised for use on DSS plans into following classes:

- Class A - validated by direct survey measurement of a potholed or exposed service
- Class B - using appropriate surface location technique (electronic detection) or techniques to determine the approximate position of subsurface services in three dimensions
- Class C - correlation of above ground features and approximate position of subsurface services in two dimensions where depth is unknown or not determined
- Class D - Unknown depth/unknown location.

Underground service routes where possible shall be captured to Class A accuracies. Where Class A is not possible then service routes shall be captured to Class B accuracies. Class C and D accuracies shall not be used on DSS plans. Where location and depths cannot be determined to meet the accuracy of Class A or B then services will be designated with the “U” descriptor in the service labelling.

Refer to Section 5.2.2.5 Un-located or unsurveyed service routes for further explanation and permissible use of ‘U’ routes.

Potholing may be used to accurately determine the position and depth of services. Potholing shall be conducted in accordance with *SMS-06-GD-3144 Guide to Excavation and Earthworks* and *SafeWork NSW – Work near underground assets - Guide 2007.*

The use of electronic locating equipment within the Sydney Trains heavy rail corridor is to be used in accordance with *TMG 1310 Locating of Underground Services*.

The Depth and Class attributes for routes shall be included in the drawing models as an attributed block attached to the service route, refer to Section 5.2.3 for more detail.

2.8 Infrastructure Naming and Annotations

Sydney Trains rail assets bearing identifiers shall have their name or number shown on the DSS plans. Such assets include, but are not limited to equipment and signalling rooms and cabinets, platforms, locations, buildings, OHWS, signals, pits, culverts, access gates, points and HV feeder numbers.

All identifiers shall be recorded in the field and applied to plans as text annotations. Refer to individual feature sections and Section 5.1.4.4 for more detail.

HV Feeder identifiers of all HV routes, except aerial (-106-), are required to be collected and displayed on plans parallel to the routes. Aerial HV Feeders shall be labelled at each attaching pole, refer to Section 5.3.5 for more detail.

2.9 Horizontal Directional drilling

Where a route has been installed utilising Horizontal directional drilling techniques the bore log shall be included with the WAsEx information.

Bore log sections shall be provided in CAD format on DSS Title blocks. The PDF renditions of the bore log will be registered with a unique CV number for submission to the VPR with reference to the bore log sheets added to the DSS plans.

3 DSS Plans

3.1 DSS Plan Types

DSS Plans are categorised into three types: Detail plans, Cover plans and Information sheets. These plans are combined to form a plan set. DSS plans have consistent layout and presentation requirements, to allow the user familiarity across all plans and plan sets.

Cover plans provide identification of Detail plans; providing the extents, plan set sheet number and CV number of all Detail plans within that plan set.

Information sheets provide information not in the form of a Detail plan, including but not limited to sheets containing survey control schedule, legends for symbols used, warnings associated with services as well as other service information.

Detail Plans display all surveyed information including underground and aboveground services, their method of containments as well as aboveground infrastructure and corridor features.

The related Cover plans and Detail plans form a numbered DSS plan set (it may also include Information sheets). DSS plan sets are arranged in the following order

- Cover plans
- Survey Control Information (on Cover plan or separate Information sheet)
- Detail plans
- Separate detail diagrams (if required)
- Additional Information sheets (if required).

Additional Information sheets not forming part of the numbered DSS plan set may be referenced via notes in the drawing areas of plans.

All DSS plans shall be shown on DSS specific Title blocks that are available in a number of sizes and orientations.

Detail and Cover plans contain a drawing area with a view of surveyed information in orthographic plan view (top) whereas Information sheets typically contain tables, legends and other information types.

3.2 DSS Plan States

All DSS Plans exist in one of three states (Draft, Final or WAsEx) depending upon the information and/or changes applied to the plan as outlined in Table 1. The plan state is reflected in the title block as detailed in Section 3.6.1.

DSS Plan State	Plan Description
Draft	New plans yet to be finalised to VPR (i.e. prior to Revision A) Updates to existing plans that do not include WAsEx information (e.g. Template and Coordinate System updates)
Final	Plans ready for lodgement to the VPR and issuing to plan users
WAsEx	Existing Final DSS Detail and Information plans updated with WAsEx information

Table 1: DSS Plan States

3.3 Sheet Sizes and Orientations

Sheet sizes below are as per T MU MD 00006 ST Drawing Sheets definitions. DSS Title blocks exist only for the following sheet sizes and orientations:

- Landscape orientation: A3, A2, A1
- Portrait orientation: A2, A1.

Cover plans and Information sheets shall be shown on A3 landscape sheets.

Detail plans are preferred to be shown on A3 landscape sheets.

Where the lateral width of the surveyed area, which includes but may not be limited to the CAB, does not fit in the preferred Detail plan A3 landscape sheet drawing area then the plan size shall be increased to fit on a single sheet in the following order:

- A2 landscape
- A1 Landscape
- A2 portrait
- A1 Portrait.

If the width of the CAB is still unable to fit on an A1 Portrait sheet only then will the use of tiled sheets be considered.

The DSS Survey Coordinator shall be consulted on any size or orientation changes to an existing sheet for WAsEx purposes.

3.4 Reduction Ratios

The following scales are used on DSS plans:

- 1:2000
- 1:250
- 1:100.

Cover plans shall be shown at a scale of 1:2000.

Detail plans shall be shown at a scale of 1:250.

In areas of congested service information where the ability to accurately display detail at the scale of 1:250 is not achievable then the use of 1:100 shall then be used.

In smaller areas of congested information the use of 1:100 scale shall be applied through diagrams. Where congested information extends across large portions of an entire sheet then displaying the whole sheet at a scale of 1:100 shall be considered.

Where scales outside above-mentioned need to be considered then the DSS Survey Coordinator shall be consulted.

3.5 Text

All text placed on DSS plans shall comply with the requirements of Section 6.6 Text in T MU MD 00006 ST, being:

- text shall be upper case and consistent in size and placement
- text should not overlap with line or symbols
- text shall be readable with the title block at the bottom or with the sheet rotated 90° clockwise (i.e. title block on the right).

3.5.1 Readable Text Rotation

The readable rotation of text applies to both text and numeric line types which display a number. The readable rotation requirement of text is based upon presentation on the sheet. The determination of the readable rotation becomes subjective when approaching the vertical limits of readability, refer to Figure 1 to assist in determining the correct and acceptable readable rotations for all text on DSS Plans.

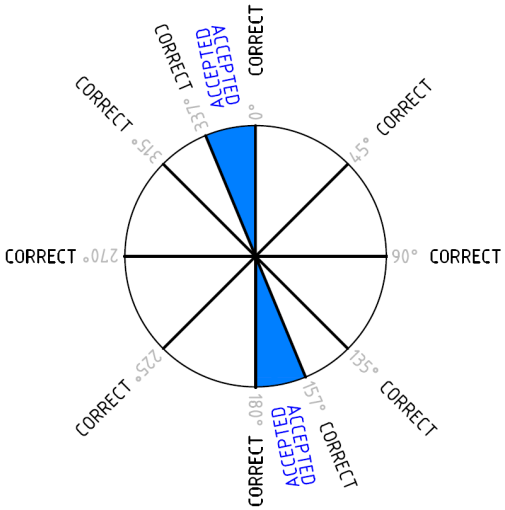


Figure 1: DSS Plan Readable Rotations

3.6 DSS Title block

Standardised versions of the DSS Title block are available for sheet sizes as listed in Section 3.3. DSS Title blocks are available from the DSS Template from the USU.

Refer to TMU MD 00006 ST Section 11.4 Title block for DSS drawings for information about the form, tags and requirements of the DSS Title block.

Refer to Section 7.3.1 about changes required to the DSS Title block for WAsEx purposes.

3.6.1 Title Block States

DSS Title blocks have three differing states (Draft, Final and WAsEx) aligned with the plan states listed in Table 1. Certain Title block fields are adjusted for each state. Refer to the figures below for examples of the field values for each Title block state.

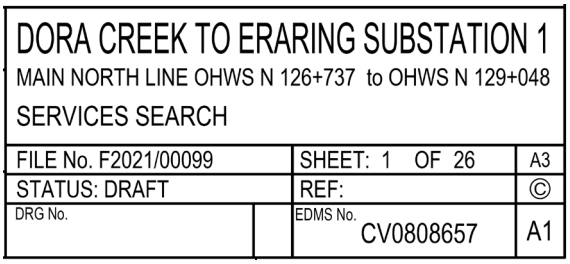


Figure 2: Draft Title Block Status

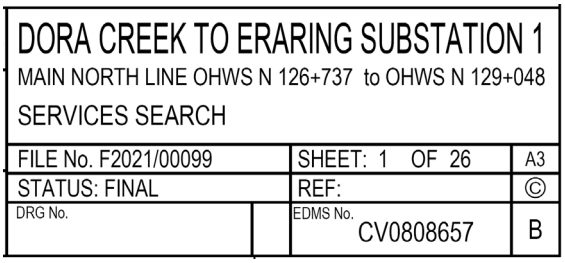


Figure 3: Final Title Block Status

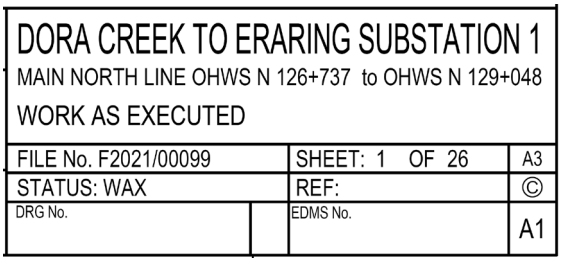


Figure 4: WAsEx Title Block Status

3.7 Drawing Area

The layout of DSS plans is based on basic requirements to ensure consistency across all Detail and Cover plans.

Each sheet is separated into two areas, the Title block and the drawing area.

Reduction ratios used for drawing areas are to comply with Section 3.4.

The drawing area for DSS Cover and Detail plans follow the requirements of T MU MD 00006 ST as well as the following elements:

- Orientation: tracks shall be drawn horizontally on the sheet, with Sydney on the left. Label the Sydney end of the tracks as 'From SYDNEY' and the other end as 'To XXXX' (where XXXX is the next railway station).
- Control Area Boundary (CAB); shown on Detail plans only, whole lateral width of the CAB shall fit into the drawing area.
- Linear Reference: OHWS are used as the primary linear reference for all DSS plans. Where possible OHWS labels shall be placed outside the CAB on the track downside, at a consistent offset to track and orientated perpendicular to the track.
- Notes: notes shall be placed outside the CAB along the bottom of the drawing area, preferably stacked above the title block.
- North point: placed outside the CAB in top left corner of sheet where possible.
- Centre of tracks aligned with centre of drawing area: the centre of the collection of tracks shall be centred in the drawing area. This shall be balanced against the area needed for the CAB to be shown wholly within the drawing area and the ability to meet the above rules.
- Coordinate Grid ticks: shown on Detail plans only, two Grid ticks shall be placed in the drawing area outside the CAB.

Where contradictions arise then items higher on the list above shall be given greater weighting. Where items are unable to be placed outside the CAB in their preferred position preference is given to placing the items in alternative locations outside of CAB and consistent to their specified position (e.g. if the OHWS labels could not be placed outside CAB on downside then first preference is to place the labels outside the CAB on the upside and if that is also not achievable then to place on the downside inside the CAB).

Refer to Appendix 8.4 for examples of Drawing Area arrangement.

3.8 Cover Plans

Cover plans are used to identify Detail plans in that DSS plan set and in some cases may be combined with Information sheets. Each Cover plan contains the DSS Title block and a drawing area.

The information shown in the drawing area of Cover plans is limited to surveyed data necessary for the identification coverage of DSS Detail plans. This includes:

- Detail plan information
  - Detail plans layout arrangement
  - Detail plan CV Reference Numbers
  - Detail plan sheet numbers
  - Adjoining DSS plan set information
- Surveyed Detail information
  - Rail Tracks
  - OHWS
  - Buildings
  - Bridges
  - Roads
  - Platform
- Text
  - OHWS Labels
  - Sydney and Next Station Labels
  - Station Labels
  - Road Names (e.g. Parramatta Road)
  - Major Building Labels (e.g. Blacktown Substation)
  - Major Topographical Features (e.g. Hawkesbury River)
- Notes
  - Read in Conjunction Notes
  - Superseding Notes
  - Area Specific Notes.

3.9 Information Sheets

Information sheets include, but may not be limited to, sheets containing:

- Schedule of Survey Control marks
- Legends for symbols used
- Warnings and Notes
- Bore logs.

Information sheets may exist for plans sets that are not directly included in the plan set and may be referenced via notations on the plans.

Some Information Sheets (such as Standardised Information Sheets) required to be read in conjunction with a DSS plan set may not be included in the DSS plan set. These Information sheets shall be noted on all affected sheets with the Information Sheet CV Numbers.

Examples of Standardised Information sheets are 'Detailed Site Survey (DSS) Warning and Notes' (CV0545705) and 'Detailed Site Survey (DSS) Legend' (CV0545706). These sheets are not included in the plan set numbering but are noted on the plan set to be read in conjunction with the plan set. Refer to Section 5.4.3.1.

Information sheets in certain circumstances can be combined with Cover and Detail plans.

3.10 Detail Plans

Detail plans display all surveyed information for the extents of the drawing area. This information includes but is not limited to:

- Service Routes and depth information
- Above ground infrastructure and service routes
- Topographical features
- Control Area Boundary
- Text, Labels and Notes.

More detail on the drawing area elements and standards is outlined throughout this document.

3.11 DSS Plan Colours

The colours shown in Table 2 are used on all DSS Plans. Additional colours shown in Table 3 are only used on DSS WAsEx plans.

Colour		Uses on all DSS Plans
Black		Existing infrastructure such as fences, buildings, platforms and tracks, text
Grey		Hatching, Grid ticks, selective linework, text
Blue		Existing internal (Sydney Trains) service routes & depth information, such as for signalling, communications, electrical, and civil
Green		Existing external agency service routes and depth information, including assets for external agencies eg: Water, Gas and Electrical
Yellow		Control Area Boundary (CAB)

Table 2: DSS Plan Colours

Colour		Uses on WAsEx Plans
Pink		Work as executed data identifying infrastructure or services installed or modified
Orange		Work as executed data identifying infrastructure or services removed

Table 3: Additional DSS WAsEx Plan Colours

3.12 DSS Plan Electronic Storage and File Naming Format

DSS plans are stored electronically in the PDF file format at full sheet size. Each sheet shall be stored separately.

Naming of the DSS plan PDF file will follow the structure as below:

EDMS Number	Revision level	Amendment level	Drawing orientation	File extension
1234567	_A	0	c or C	.pdf

For all DSS plan orientation the following shall be used

- lower case ‘c’ for landscape orientation
- upper case ‘C’ for portrait orientation.

The example below outlines the process to be followed for new plans where new CV numbers are being applied:

- Draft 1 DSS: 0123456__1c.pdf (Note: There are two underline characters - the second one is amendment level waiting to be filled during drafting stage of DSS)
- Draft 2 DSS: 0123456__2c.pdf (continue to increment for following drafts)
- Final new DSS: 0123456_A0c.pdf.

4 DSS Drawing Files

DSS Drawing files are composed of a drawing model and drawing sheets, referred to as layouts. A DSS Drawing file will contain a single model of surveyed information and multiple layouts. Each layout is to contain title block information, specified text, notes and a view of the model in orthographic plan view. Each layout in the drawing file will contain only a single DSS plan and collectively the multiple layouts shall contain all sheets of a DSS plan set.

4.1 DSS Drawing File Naming

The DSS Drawing file shall be named using the following format.

First OHWS Number starting with line two letter code	DSS Number	Job status	Last modified date	File extension
AB123+456	_F2012-12345	_FINAL	_12.12.2021	.dwg

4.2 Layout Naming

Layouts shall be named with a seven-digit string of format “XX_XXXX”, using two digits for the sheet number and the last four digits of the CV number separated by an underscore, as detailed below.

Sheet Number (to two digits)	CV Number (last four digits)
01	_1234

4.3 CAD Layers and Elements

Survey data shall be segregated into layers as per Table 4, where services and infrastructure are separated into differing classifications. Layers for service routes shall be as per TMU MD 00006 ST (Figures 112 & 113). Layers for all other features shall be alphabetic of the format listed in Section 6.9.1 of TMU MD 00006 ST.

All survey feature data produced within DSS CAD files will comply with the layer (level) names as determined from Appendix 8.1.

Alphanumeric Classification	Layer Names	Layer Contents	Permitted Entity types
Numeric	0	Control Area Boundary	Closed 2D Polyline
	1 to 196, 199	Sydney Trains Routes	3D Line, “DSS-DEPTH-ROUTE” block
	197	Large Pit Outlines	Circle, Closed 3D Polyline
	198	Small Pit Centroid Marker	3D Point
	200 and above	External Agency Routes	3D Line, “DSS-DEPTH-ROUTE” block
Alphabetic	RAILCAD template layers	Infrastructure and Topographical features	Blocks, text, mtext, 3D lines, 3D polylines, hatch, leader, multi-leader, circle

Table 4: DSS Layers

NOTE
Prefixes and suffixes for numeric layers are not permitted (i.e. layer to be ‘4’ not ‘04’ or ‘cable4’).

4.4 DSS CAD System Variables

The CAD file shall be defined and set-up by adopting the following Working Units:

Master units = metres (system variable name).

Direction = North (270°) and Clockwise.

In addition to the working units there are system variables that shall be set to ensure that the drawing file (and created pdf documents) present correctly.

System variable	DSS Setting	Variable Description
HPLINETYPE	1	Hatch pattern setting
EPDFSHX/PDFSHX	0	PDF Plotting setting
LTSCALE	10	Linetype scaling

Table 5: Required AutoCAD System Variables for DSS

4.5 Drawing File Colour Index

The colours used on DSS plans are described in Section 3.11 DSS Plan Colours. To achieve those colours on plans the following AutoCAD Index Colours shall be used in conjunction with the DSS Pen Assignment (.ctb) file for AutoCAD (ctb file to be applied in plot settings).

Plan Colour	Sample colour	AutoCAD Colour Index
Black		7
Grey		8, 253
Blue		5
Green		3
Yellow		2
Pink		6
Orange		30
Red		1

Table 6: DSS AutoCAD Colours

4.6 Line Styles

DSS plans use two types of Line Styles:

- Numeric based line styles; to be applied to numeric Service Route layers and objects.
- Alphabetic line styles; applied to RAILCAD defined layer objects.

The application of line types to objects is achieved primarily through applying line styles to layers, refer to Appendix 8.1 for Layer line styles.

4.6.1 Numeric Line Styles

Numeric based line styles exclusively exist of those used to display service route codes and include the ‘R’ and ‘U’ variants of each numeric line style.

Numeric based line styles are to meet the orientation requirements of text as shown in Section 6.6 of T MU MD 00006 ST.

4.6.2 Alphabetic Line styles

The Alphabetic line styles for use on DSS plans are available in DSS Template files and named:

- Continuous
- Awnings
- Ballast
- Bank
- CAB
- Concrete
- Fence
- Retaining Wall.

For application of line styles to features refer to Section 5.

4.7 Text Styles

Text Style definitions can be found in Appendix 8.2 and the DSS template file. Refer to Section 5 for application of Text Styles.

Template Text Style Name	CAD Space	Application
DSS-FRAM-LABL	Model	Sheet Numbers
	Paper	Next Station Labels
DSS-GNRL	Model	General descriptive labels (e.g. ACCESS ROAD), Notes, RL text, Route Annotations
	Paper	Notes
DSS-NAME	Model	Features with Proper Names (e.g. PARRAMATTA ROAD, CLYDE SUBSTATION, CENTRAL STATION), Diagram Identifiers
	Paper	Features with Proper Names (e.g. PARRAMATTA ROAD, CLYDE SUBSTATION, CENTRAL STATION), Diagram Identifiers
DSS-OHWS	Model	Overhead Wiring Structure Labels
	Paper	Overhead Wiring Structure Labels
DSS-OUTSIDE-SCOPE	Paper	“Outside DSS Coverage” Labels
DSS-TITLEBLOCK-1	Paper	Used in DSS Title block & Control Listing
DSS-TITLEBLOCK-2	Paper	Used in DSS Title block
DSS-TITLEBLOCK-3	Paper	Used in DSS Title block
DSS-TITLEBLOCK-4	Paper	Used in DSS Title block & Control Listing
DSS-TRACK	Model	Track Naming Labels
Standard	Model	DSS-DEPTH-ROUTE attributes, Numeric based line styles (routes)

Table 7: DSS AutoCAD Text Styles

5 DSS Drafting

The DSS Drawing file contains an as-built model of information (Model Space) and layouts (Paper Spaces) providing views of the model to be plotted to sheets. This section addresses the procedures and standards in producing a DSS as-built model and the layouts for creation of DSS plan sets.

5.1 The Model Space

5.1.1 Overview of Drawing Model Entities Reduced Levels (RLs)

The elevation component of entities in the model space fall under one of the three basic categories as outlined in the table below.

Category	RL Level of Entities	Entity Types
As-Built	Surveyed RL	All entities used to represent surveyed features and services should use the ground or feature RL of the object. RL Text
Base	RL 0.0	All Text (except RL text), Hatches, General Presentation Features (North Points, Grid Ticks, DSS Sheet Borders, etc.), Control Area Boundary, Leaders and Multi-Leaders
Un-surveyed/ Un-located or Aerial Services	RL-99	Service Routes ('U' routes) and As-Built Features that were not surveyed or were unable to be located. Overhead Services designated with Route Type 'Aerial'.

Table 8: Entity RL Categories

5.1.2 Draw order of Drawing Model Entities

The presentation of elements in the CAD file affects the final presentation of the plan. The draw order of objects is independent of the elevation of objects and layering and only affects display of overlapping objects when displayed in plan view. Figure 5 shall be referred to for the draw order of model space entities.

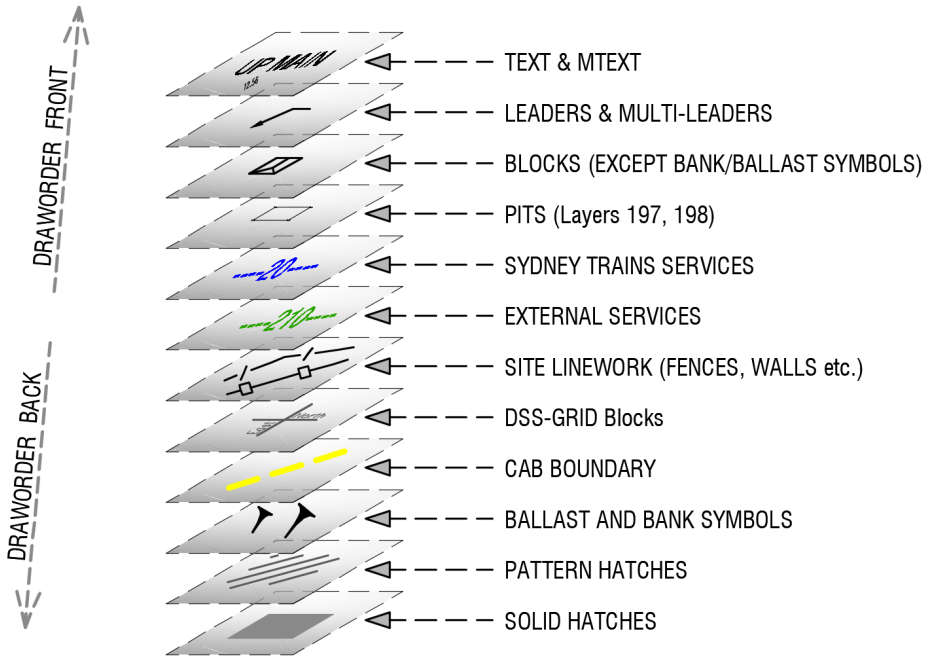


Figure 5: Entity Presentation Draw order

5.1.3 Coordinate Systems

All works shall be supplied in coordinate systems as advised by the DSS Survey Coordinator. Changes to coordinate systems are only to be undertaken as directed by the DSS Survey Coordinator.

5.1.4 Block Symbols

Most of the commonly found equipment in the rail corridor is represented by a block symbol. For identification of available DSS block symbols refer to *GL A 00512 Guide to Interpretation of Detailed Site Survey (DSS) Plan Symbols and Numeric Route Codes* for the DSS plan symbol with photographic examples of the feature.

DSS Block Symbols (except for DSS-DEPTH-ROUTE for service depths) do not contain any text attribute information about the block, any annotation of additional information about a block symbol is done through use of text beside the symbol.

5.1.4.1 Block Symbol Standards

The presentation of block symbols is consistent across most situations according to the standards listed in Table 9. Where an individual symbol deviates from the standards in Table 9 it is detailed in Section 5.3.

Block Property	Standard DSS Requirement
Easting and Northing of block insertion point	*Located/Surveyed position for centre of feature*
Elevation of block insertion point	*Surveyed Ground Level (or top of feature if ground level is inaccessible and top of feature is close to ground level)*
Layer	Refer to Section 5.2.3 & 5.3
Linetype	*ByLayer*
Block Scale	*1*
Annotative Scale	*On*

Table 9: DSS Block Symbol Standards

5.1.4.2 Connection of Block Symbols and Routes

Where a service connects to a block symbol the vertex of the service route lines shall be at the same 3D position as the insertion point of the block. Depth Tags are not to be placed at the insertion point of a block symbol (except for DSS-X symbol). Where an underground route connects to a block symbol a route depth shall be recorded approximately 1 metre from the structure to prevent overlap of the block symbol with the Depth Tag and survey cross when produced on the plan.

5.1.4.3 Display of RL Texts for Block Symbols

Most block symbols are not to show an RL text next to the symbol. The only symbols that are to show an RL next to the symbol are:

- Gates (DSS-GATE)
- Pits (DSS-12, DSS-13, DSS-72, DSS-86)
- Survey Shot Cross (DSS-X)
- Survey Marks (DSS-112).

5.1.4.4 Text Annotation of Block Symbols

For many symbols there may be associated unique identifiers for those features. This annotation shall be presented on a separate layer (typically with a suffix of "-TEXT" to the layer applied to the block symbol). Refer to the individual feature sections for block symbol annotation text layers in Section 5.2 for detail of annotations required for certain symbols.

5.1.4.5 Annotative Blocks and Rotations

Most DSS block symbols are set to scale according to the annotative scale and set to "Match orientation to Layout". This forces the symbol to orientate and size consistently in all viewports. There are a small number of block symbols which do not follow these standards, some of which have dynamic attributes which allow the modification of block display, such as rotation, scale and stretching. Where a symbol contains dynamic attributes the nature and setting of these attributes are addressed individually for each block in Section 5.2.

5.1.4.6 Multiple overlaying symbols

The overlaying of symbols is at times unavoidable. In areas where there are two or more symbols in close proximity and they are not clearly visible on a drawing text may be added to list the symbols. Text annotation shall be placed on layer F-MISC-TEXT and use DSS Common Format Text.

See below illustrations:

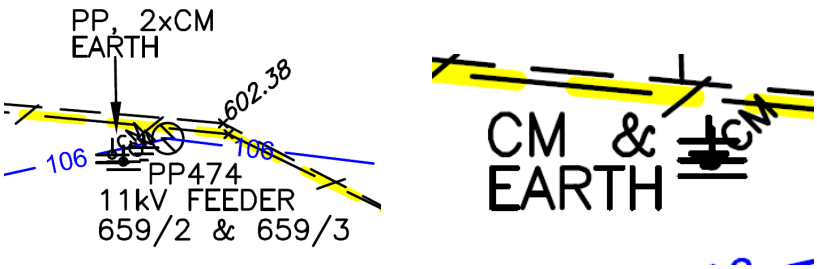


Figure 6: Overlapping Block Symbols

In extreme cases these can be further expanded through use of a diagram.

5.1.5 Linework

Features that aren't represented in the block library shall be represented as linework. All linework (except for large pit outlines) shall be drawn only using 3D lines with DSS-X symbols placed at endpoints of the line to signify that the feature was surveyed at that point. The insertion point of a DSS-X block and endpoint of corresponding linework shall be located at the same 3D position. Where a feature is made of multiple lines then the two lines shall meet at the same 3D position and only one DSS-X be placed at that 3D position.

With the exception of Pits, which are placed on layer '197' as a closed 3D Polyline, all features represented by linework shall be placed on the RAILCAD style layers used for DSS as outlined in Appendix 8.1, the DSS Template file and as detailed below in individual feature sections.

5.1.5.1 Display of RL Texts

Most linework is to display the RL next to the survey cross at the end points of the line. Some lines are not to display RLs as outlined for individual features throughout Section 5.3. In areas of dense survey capture the number of RL Texts displayed can be reduced.

5.1.6 Model Text Formats and Heights

Texts to be placed in the model space are those related to a feature and typically will be placed on a layer associated with that feature. The formatting of text entities in the model space shall be as per Table 10.

Standard Text Format	Template Text Style	Standard Plotted Height	Uses
DSS Common	DSS-GNRL	2.0	General descriptive labels, Notes, block symbol annotation, route annotations
DSS Proper	DSS-NAME	3.5	Features with Proper Names (e.g. PARRAMATTA ROAD, CLYDE SUBSTATION, CENTRAL STATION)
RL Text	DSS-GNRL (with width factor 0.8 and obliquing 70°)	1.6	RL Text
Feature Specific	DSS-OHWS	2.5	Overhead Wiring Structure Labels
	DSS-TRACK	2.5	Track Labels
	DSS-FRAM-LBL	7	Sheet Number Identifiers

Table 10: Model Space Text Formatting

The standard plotted height column above applies to the height of the text when displayed at scale on the paper space.

5.1.6.1 DSS Common and DSS Proper Text

In the model space these two formats of text are used repeatedly for many different features and applications.

DSS Common format text is used for notes and annotations. Where DSS Common format text is referred to throughout this document the settings in Table 10 shall be used.

DSS Proper format text is used for features with Proper Names. Where DSS Proper format text is referred to throughout this document the settings in Table 10 shall be used.

5.1.6.2 RL Text

RL Text shall always be shown to two decimal places (with all trailing zeros shown) and at a rotation between 15 and 60 degrees from horizontal on the plan, preferably at 45 degrees as shown in Figure 7 (preferred alternate rotations shown in grey on diagram).

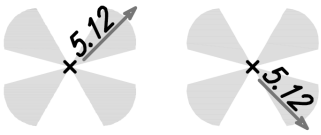


Figure 7: Preferred RL text Rotations

RL Text is primarily shown to:

- identify service route level when used in conjunction with a Depth Tag
- to assist in identifying topography
- for constructed features to act as a benchmark to assist relative measurement to other displayed levels.

RL Text shall be shown on fencing (at ground level) and along tops and bottoms of banks.

RL Text shall not be shown for features above ground level such as awnings and GST services.

RL Text may be shown at outside edges of ballast profile where it intersects with the natural surface, elevation should be captured on the natural surface. RL Text are not to be shown on the ballast shoulders.

Where RL Text is not required to be shown then the feature shall have the elevation surveyed and correctly applied in CAD files unless noted otherwise for that feature (e.g. aerial services).

5.1.7 Supplementary DSS Model Drafting Objects

A number of additional drafting objects in the model that are not considered as-built objects. The objects listed in this section shall all be placed at elevation zero (i.e. RL=0).

5.1.7.1 Control Area Boundary (CAB)

The CAB is a closed 2D Polyline on layer ‘0’ (at RL=0) which identifies the area of the DSS plan set which is considered to be controlled by Sydney Trains.

The CAB shall be defined by above ground features or offsets from above ground features. The CAB should be able to be identified in the field by users independently on each detail plan.

Layer ‘0’ is only to be used for the CAB (closed 2D Polylines) and shall not contain any other objects.

5.1.7.2 North Point

The North Point (DSS-NORTH block) shall be placed on layer R-GRID-NORTH, aligned with north and annotated with the co-ordinate system of the model, which is set using the custom properties of the block. A North Point is required to be placed within each DSS Sheet Border and placed in accordance with T MU MD 0006 ST. Refer to Section 5.4.4 for further information.

5.1.7.3 Grid Ticks

The Grid Tick (DSS-GRID block) shall be placed on the intersection of the 10m Grid Lines of the coordinate system (e.g. insertion point placed at 325120 E and 6258230 N) and aligned with north. Two grid ticks shall be placed within each Detail plan DSS Sheet Border. Grid ticks shall be placed outside the control area boundary where possible. Grid ticks shall be placed on layer R-GRID-SURV. Refer to Section 5.5.2 for further information.

5.1.7.4 DSS Sheet Border Block & Plan Set Sheet Numbers

For each main viewport on detail and cover sheets there shall exist a corresponding DSS Border Block symbol in the model space matching the coverage of the plan drawing area. DSS Border Blocks shall align exactly with the displayed area of the viewport for each sheet. Standard sized blocks matching all layouts (landscape and portrait) are available in the DSS Template File. DSS Border Block names are prefixed with “DSS-BORDER” and containing sheet size and scale (and orientation for Portrait borders).

All DSS Borders for scales of 1:100 and 1:250 (Detail plans) shall be placed on layer R-GRID-FRAM and borders for 1:2000 (Cover Plans) shall be placed on layer R-GRID-FRAM-OFF.

The plan set sheet number shall be placed inside the border for each DSS Border representing a detail sheet. Text for the sheet number shall be as per Section 5.6.2.3.

5.1.7.5 Notes in the Model Space

Notes are typically placed on the paper space. However, at least one note per area shall be placed in the model space where an Area Specific Note is required. Refer to Section 5.4.3.

5.2 Service Routes

5.2.1 Service Route Linework

The service routes are defined in TMU MD 00006 ST (Figures 112 & 113) where services and containment types are reduced to a numerical representation, referred to for DSS purposes as a ‘service route’ or ‘route’. Service route numbers are utilised within CAD files as both the layer name and as a linetype definition. The service route linetype is defined as the ‘ByLayer’ linetype for the corresponding layer (i.e. ‘1’ is used as the linetype for Layer ‘1’).

Each service route linetype has two other variants where the letter ‘U’ or ‘R’ is appended to the number. Therefore, three linetypes will exist for each service route, as shown in Figure 8 (for service route 8).

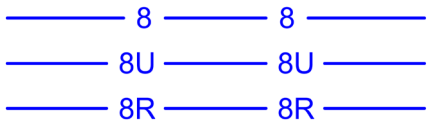


Figure 8: DSS Service Route Variations

The drawing of a service route lines is as per Table 11.

Line Component	DSS Requirement
Easting and Northing of endpoints	*Located/Surveyed position*
Elevation of endpoints	*Surveyed Ground Level (for routes below ground)* *or* *Top of Containment (if containment structure at or above ground level)* *or* *Un-located 'U' routes at RL -99.0*
Colour	*ByLayer*
Layer	*Route Number*
Linetype	*Route Number (ByLayer), or* *'R' or 'U' variant*
Linetype Scale	*1*
Lineweight	*ByLayer (Default (0.25mm))*

Table 11: DSS Service Line Standards

The reduction of survey information to the final presentation of service routes within a CAD file is illustrated in the figure below.

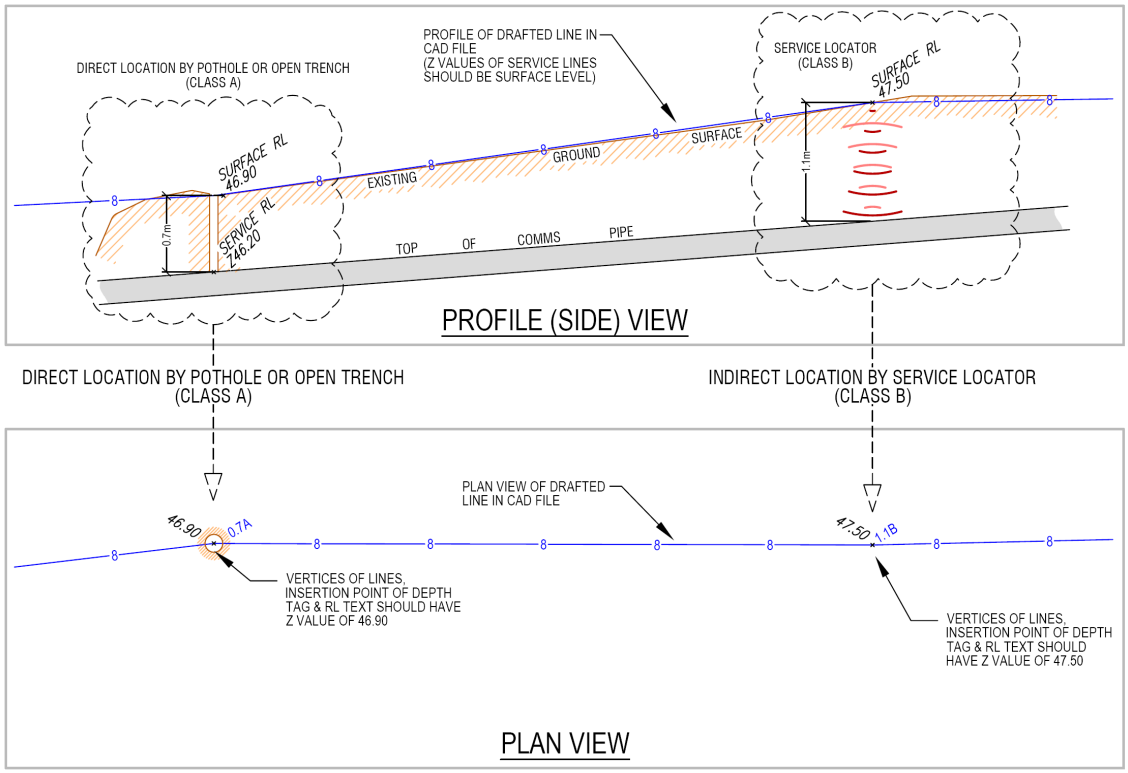


Figure 9: Service Route Line & Depth Tag Elevations & Calculations

5.2.2 Identifying Route Codes

5.2.2.1 Multiple Services Sharing a Common Route

Where multiple services share a common route, the route shall be located and categorised uniquely according to GLA 00512 *Guide to Interpretation of Detailed Site Survey (DSS) – Plan Symbols and Numeric Route Codes.*

The trench and trough methodology is used to determine whether multiple services should be combined to a single route descriptor. A combined route descriptor is used when services are located in the same "trough" (eg. GST or GLT) or have been laid together in a single "trench" (e.g. Direct buried services, ducted pipes or underbores).

5.2.2.1.1 Services in Trenches

For trenches, where multiple pipes containing the same service are laid together at the same depth in the same trench (within 0.5 metres of each other) the route shall be shown as a single route. For example, if signal cables and communications cables in ducted pipes were laid in the same trench at the same depth they would be shown as -12- (example A in Figure 10) However, if they not are laid together (i.e. separated by more than 0.5 metres) they would be shown individually as -4- and -8- respectively (examples B & C in Figure 10).

The application of the trench method is not applied when routes cross each other only for a short distance.

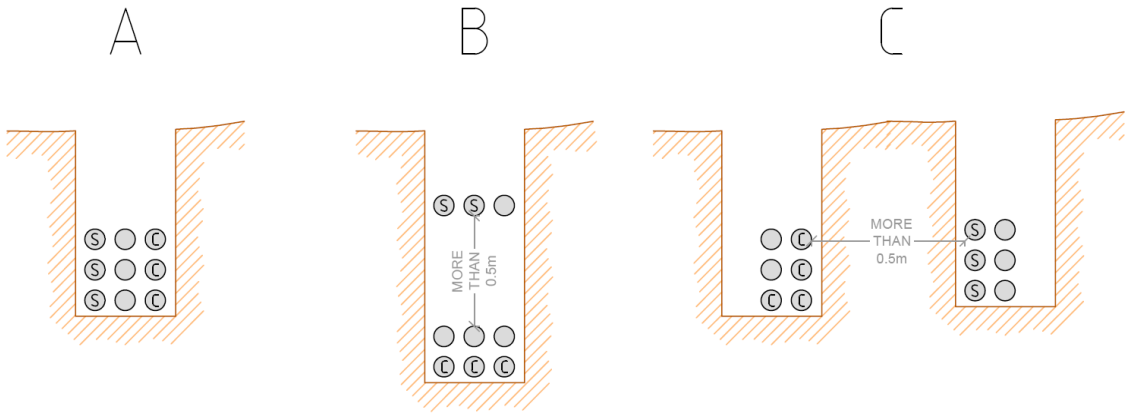


Figure 10: Examples of Services in a Trench

5.2.2.1.2 Services in Troughs

For troughs, only when services are placed together within a single trough shall it be considered a combined route and a combined route descriptor used for all the services in that trough. All troughs shall be individually surveyed for their entire length and shown separately, including all vacant troughs.

For example, where signal cables and communications cables have been placed in separate galvanised steel troughs on the same posts then this would be shown by both a -2- and -6- route respectively on top of each other where if they were both located together in one single trough then they would be shown as a single -10-.

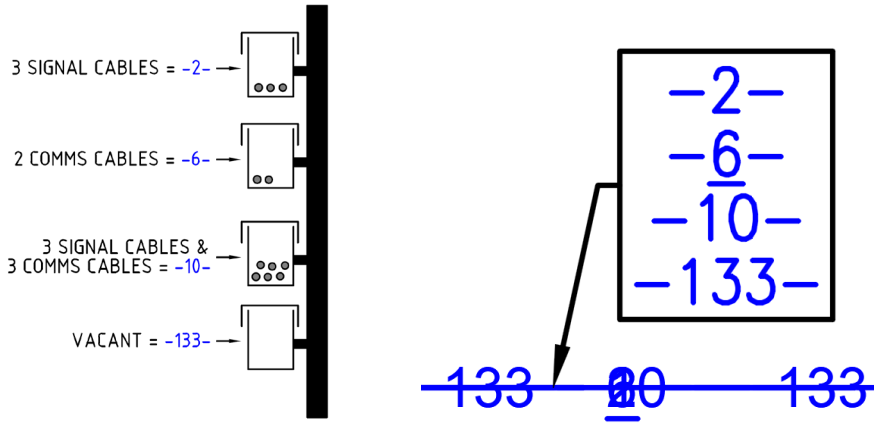


Figure 11: GST Trough Side View and Plan Example

5.2.2.2 Vacant service routes

Vacant route codes shall be used for empty stand-alone containments only. When spare vacant pipes are in the same trench (within 0.5m of other services) as existing services then they are not to be shown as a vacant route code. All vacant troughs (GST & GLT) shall be surveyed and shown individually.

For example, five pipes laid in a trench where three contain communications cable and two are vacant would be represented by a single -8- route.

Stand-alone vacant routes reserved for future services can be identified by the use of a note on the face of the plan stating the reservation for the specified service, i.e. “NOTE: -132- IS RESERVED FOR COMMUNICATIONS”. This cannot be applied to vacant containments installed with existing routes and the note shall be removed once any service has been added to the route.

Where all services have been removed from a route and the containment retained then the plan must be updated to reflect that the route is now vacant.

5.2.2.3 Redundant service routes

Redundant services are identified by the suffix ‘R’ after the route number and should be placed on the layer of origin. For example, a redundant signals route -4R- should be placed on layer 4 (with linetype as -4R- applied to line).

A route is only to be identified as redundant if all services of that type in that route are redundant. For example, if one signalling cable is redundant but there are other live signalling cables in that same route then the route is not considered redundant and the route code shall not be displayed as redundant.

Where all services of a certain type in a combined route are redundant then that service shall be excluded from the grouping of services (by trench and trough method) and shown as its individual service route appended with “R”. For example, if communications, optic fibre and signalling cables were in a trench and all of the signalling becomes redundant then the route would be shown as a -4R- and -32- route, where both routes occupy the same alignment and would be annotated with a Route Box.

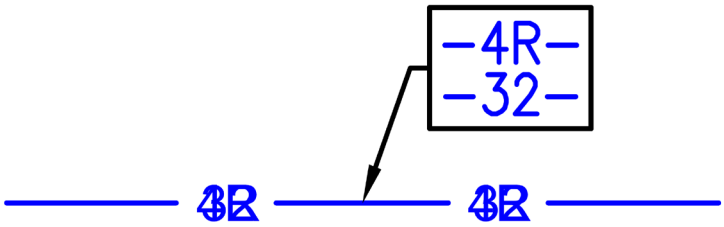


Figure 12: Redundant Service

Refer to Section 7.2.2 for applying redundant services to WAsEx plans.

5.2.2.4 Unidentified Service routes

Services found that cannot be identified shall be shown as route code -199-. Services unable to be identified must be considered as live.

5.2.2.5 Un-located or unsurveyed service routes

Services that are known to be in an area, but are not able to be accurately located or surveyed, are given a 'U' suffix and should be placed on their respective layer. For example, an un-located sewer main should be shown as -221U- (using -221U- linetype) and should be placed on Layer 221.

The 'U' signifies that the position of that particular service is approximate only, and should be validated by potholing prior to carrying out any design or excavation works.

Where an unsurveyed service is also redundant then it shall be shown using the 'U' designator in the linetype and annotated parallel to the route with "REDUNDANT" text on layer F-MISC-TEXT using DSS Common Format Text. If insufficient space then a leader and text (or multileader) stating it is redundant may be used, i.e. "-9U- IS REDUNDANT".

'U' routes will not be used/accepted for new installations and should only be used when absolutely necessary for previously unrecorded services.

5.2.3 Route Depths

Where a depth for a route has been obtained (as required by Section 2.4) the block symbol "DSS-DEPTH-ROUTE" shall be used to display the depth. Depths on routes are shown by the use of two blocks placed at the same 3D position as a route line vertex (or endpoint) in the model file:

- the Depth Tag (DSS-DEPTH-ROUTE) and
- the Survey Cross (DSS-X).

The Depth Tag Block will always relate to a service route line, placed on the same layer as the route and be positioned at the vertex (or endpoint) of the corresponding route linework.

The Survey cross is used to identify the location of the route at which the depth was obtained.

The requirements and standards of each block is detailed below and shown in Figure 9.

5.2.3.1 Depth Tag Block (DSS-DEPTH-ROUTE)

The Depth Tag Block contains two attributes, depth and class. The block and attributes shall be created using the requirements in Table 12 and Table 13.

Depth shall be shown in metres to one decimal place. Any leading and trailing zeros shall be shown (i.e. “0.1” not “.1” and “1.0” not “1”). Positive values indicate the vertical distance from ground level to the top of route. Zero and negative values shall not be used in Depth Tag Blocks.

Class is determined as per Section 2.7 Classification of Underground Service Location Accuracies. The block shall be created using the following requirements in Table 12 and Table 13.

DSS-DEPTH-ROUTE Block Property	DSS Requirement
Easting and Northing of block insertion	*Located/Surveyed position of service (at corresponding service line endpoint)*
Elevation of block insertion	*Surveyed Ground Level (same elevation as end point of service)*
Colour	*ByLayer*
Layer	*Corresponding Route Number*
Linetype	*Continuous*
Block Scale	*1*
Annotative	*On*

Table 12: Depth Tag Block Standards

DSS-DEPTH-ROUTE Attribute Property	DSS Requirement
Layer	*F-MISC-TEXT*
Colour	*ByBlock*
Text Style	*Standard*
Justification	*Middle Left*
Plotted Height	*1.8 (plotted height)*
Width Factor	*1*
Elevation of Attribute	*Matching Block Symbol*

Table 13: Depth Tag Attribute Standards

5.2.3.2 Presentation of Route Depths

For each display of a route depth there are three entities required to be placed in the model;

- "DSS-DEPTH-ROUTE" block; containing the depth and class attributes to be displayed
- "DSS-X" block; identifies where route depth was obtained
- RL Text; obtained at time of survey, enabling estimation of service RL.

The two attributes shall have with the same rotation and be aligned. The DEPTH attribute shall precede the CLASS attribute when read (e.g. shall read 0.1B).

The rotation of the two attributes in the DSS-DEPTH-ROUTE block and the ground RL text is preferred to be between 15 and 60 degrees from horizontal on the sheet, with the RL text and attributes forming a 'V' shape pointing toward the DSS-X block as shown in Figure 13.

When shifting the position of depth route attributes the insertion point of the block must always be retained at the vertex (or endpoint) of the route line. The elevation component of the attributes shall match the elevation of the insertion point of the block.

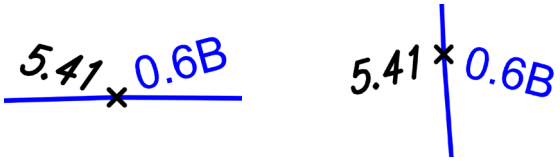


Figure 13: Preferred Method of DSS Depth Tag and RL Text Arrangement

Where the preferred arrangement in Figure 13 is unable to be achieved due to other features then the position of the texts shall be on the one side of the line and parallel with each other. The Depth Tag is the dominant member of the pair and shall be placed closest to the survey cross, with the RL Text either staked or aligned with the Depth Tag.

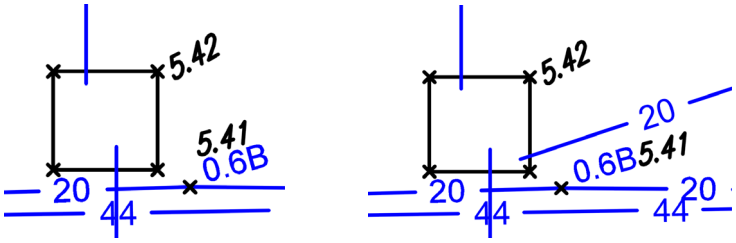


Figure 14: Alternate Method of DSS Depth Tag and RL Text Arrangement

Where insufficient space exists to place the Depth Tag and text adjoining the survey cross then a leader shall be used (placed on F-MISC-TEXT layer) to identify which survey cross the depth relates.

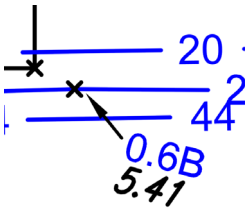


Figure 15: Distant method of DSS Depth Tag and RL Text Arrangement

In areas of congested detail where the ground is flat (typically footpaths or platforms) the requirement to display a RL text for each depth can be reduced. RL text may be omitted where another RL text shown is within close proximity and is not more than +/-50mm different from the level of the DSS-DEPTH-ROUTE.

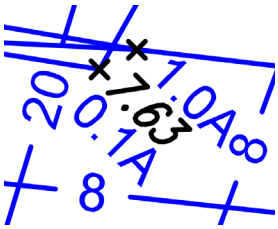


Figure 16: Reduction of RL Texts for Depth Tags

5.2.4 Route Termination End Points

Routes should typically be located and surveyed for their full length. The start and end of routes should occur at a feature shown on the DSS represented by either a block symbol or by linework. There are three differing scenarios depending upon the feature at which the route terminates. For each of the three scenarios below no survey cross should be shown at the termination point (end point of the line).

Termination Feature	Route Linework End Point
Block symbol	Route end point is to attach to the insertion point of the block symbol.
Large Pit (defined by linework)	All routes entering a pit shall extend past linework to the inside of the large pit, refer to Section 5.3.10 for more detail.
Above ground Linework feature (building, stairs, column, Loc etc.)	Route end point is to stop at the linework edge of the structure.

Table 14: Route Termination End Points

5.2.4.1 Exceptions to Surveying/Locating Full Length of Routes

There exists some circumstances where routes do not terminate at a feature. Where the routes do not terminate at a feature then a note shall be annotated to the end of the route, except for the following situations;

- ‘U’ route that was no longer able to be located or surveyed
- ‘R’ routes (and abandoned routes) where part of the route or terminating feature has been removed
- previously unrecorded services in the vicinity of works, which are recorded as a 199 route

Routes along structures (such as overline walkways, stairs and canopies) suspended above ground level shall terminate on the plan at the point they run up the feature. This shall be identified using either the edge of linework or block symbol termination methods above. A note may be added on 'F-MISC-TEXT' using DSS Common text to note the service "RUNS UP" the feature. Examples include but are not limited to:

- services that run up a column or building wall
- services that run up station overline walkways and stairs
- services along canopies and awnings.

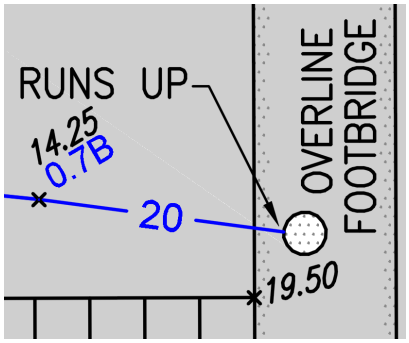


Figure 17: Example of Service to above ground suspended feature

5.2.5 Route Annotation

There are two types of route annotations used to annotate DSS routes that are either not displayed or illegible, they are route texts and route boxes. Where a route is too short to display the route number in the linework then a route text annotation may be required to be placed. Where there is insufficient space to place a route text or if multiple routes need to be listed then a route box (using a multileader entity) shall be placed.

5.2.5.1 Route Texts

Route Texts are the preferred annotation method for annotating a single short route. Route Texts shall only contain a single route number and the text entity shall be:

- the same colour as the route
- placed parallel and adjacent to the route
- on the F-MISC-TEXT layer
- using DSS Common text format.

Route Texts shall be shown for short lines where placement improves the identification of the route. Where a route change occurs at either end of a short line then a Route Text shall be placed (Figure 18). Where the route is displayed and the same on either side of a short route line (Figure 19) then a Route Text is not required.

Route Text is not to be used to identify multiple routes. In these circumstances a route box shall be used.

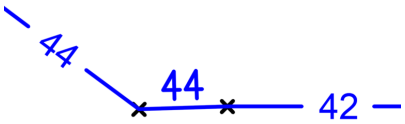


Figure 18: Route Text Annotation Required

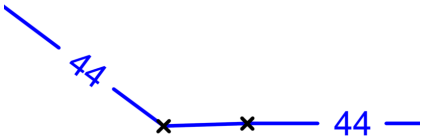


Figure 19: Route Text Annotation Not Required

5.2.5.2 Route Boxes

Where multiple routes overlap or space is insufficient to place a single route text annotation then a text box shall be used, with a multileader entity listing the routes. The list is to contain the route number with a dash placed on either side of the route number in the colour of the route, with one route per line.

Routes shall be listed based on either their occurrence from top to bottom or left to right across the plan. If that is unable to be identified then routes shall be listed in numerical order from smallest at top of list. The route box shall be rotated so that the text is horizontal on the sheet.

For application of Route Boxes in WAsEx Plans refer to Section 7.2.3.

Figure 20: Route Box Annotations

5.3 As-Built Features

As-built features shall be drawn and annotated in the model space. All Features shall be placed on alphabetic layers as defined in Appendix 8.1. Alphabetic layers shall be of the format listed in Section 6.9.1 of TMU MD 00006 ST. The sections below have grouped features based on the major element of their layer name.

5.3.1 Bridge Features (F-BRDG* Layers)

Bridges are categorised as either ‘overline’ or ‘underline’ bridges. Any bridge over the existing track is considered ‘overline’ and all others are considered ‘underline’ bridges.

5.3.1.1 Linework

The linework for bridges is separated into two groups:

- the outline of the bridge structure; linework placed on layer F-BRDG
- supporting structures of bridges; linework placed on the layers 'F-BRDG-ABUT', 'F-BRDG-PIER' or 'F-BRDG-FTGS'.

For overline bridges the outer edge of the bridge for position and deck level for elevation must be shown on the 'F-BRDG' layer. Where the overline bridge is outside DSS coverage there is no need to show linework features on the bridge deck (e.g. roads, fencing etc). Any supporting structures that sit within DSS Coverage shall be surveyed at ground level and placed on the appropriate supporting structure layer as listed above.

For underline bridges the outer edge of the bridge for position and deck level for elevation must be shown on the 'F-BRDG' layer.

Where the underline crossing area is outside DSS coverage (typical situation for most road crossings) then the only supporting structure and feature shown should be the extents of the abutments to identify where the underline crossing is situated.

Where the track is elevated for an underline crossing inside the DSS coverage (typical of most small creek crossings) then all the supporting structures shall be surveyed and displayed.

5.3.1.2 Text Labels

Overline (OLB) and Underline (ULB) Bridges for road crossings shall labelled with the road name and suffixed with either "OLB" or "ULB" (e.g. "PACIFIC HIGHWAY OLB") using DSS Proper format text and parallel with the bridge crossing.

Edges of the bridge shall be annotated with "BRIDGE EDGE" if hatch edging (see Hatching below) is not used. Where hatch edging is used there is still a requirement to place an annotation to reference whether the bridge is overline or underline.

Any bridge that is not a road crossing shall be descriptively labelled (e.g. "CONCOURSE" or "PEDESTRIAN OVERLINE WALKWAY") using DSS Common format text. Where the descriptive label is near both sides of the structure edge linework then the placement of "BRIDGE EDGE" labels are not required.

Enclosed supporting structures (piers and footings) shall be labelled using DSS Common format text if not hatched.

Abutments shall always be labelled, even if using hatch edging, using "ABUTMENT" or "ABUT" in DSS Common format text if unable to fit the entire word.

5.3.1.3 Hatching

Bridge elements may be hatched as per the properties listed in table below. Hatching shall be placed inside closed linework areas to identify the supporting structures (e.g. piers and footings). Edging of linework for bridge decks and abutments may also be applied to assist in delineating structures.

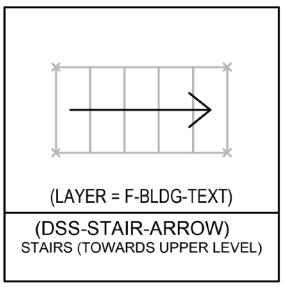
Property	Value
Layer	F-BRDG-HTCH
Pattern Name	DOTS
Angle	90° (in viewport UCS)
Scale	0.4 (at 1:250)
Elevation	0

Table 15: Bridge Hatch Properties

5.3.2 Building Features (F-BLDG* Layers)

5.3.2.1 Block Symbols

The DSS-STAIR-ARROW block symbol shall be placed on the F-BLDG-TEXT layer. The Stair symbol is a dynamic block with two grip points and pointed in the ascending direction of the stair case and scaled and positioned to be entirely within the staircase.



5.3.2.2 Linework

External corners of buildings shall be surveyed with the elevation captured to be the ground level (external to the building) at the corner.

Stairs shall be surveyed at ground level of the bottom step and top of the top step only for each flight of steps. Linework shall be placed on F-BLDG-STAR. Indicative Stairs shall be shown by parallel lines at a minimum spacing of 0.6 metres for each flight of stairs. Indicative stair line endpoints shall match the elevation of outside lines at the point of intersection with outside line, see Figure 21. Intermediate stair landings shall be placed on F-BLDG-STAR layer. A separate DSS-STAIR-ARROW block shall be used for each flight of stairs.

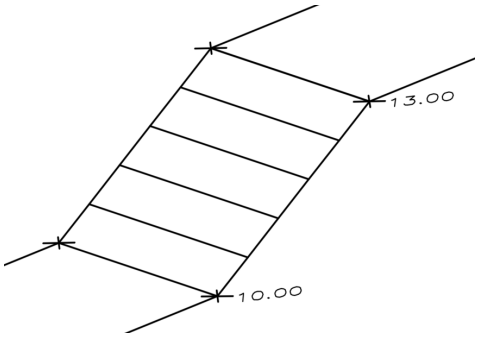


Figure 21: 3D Perspective View of Stairs

Awnings shall be surveyed at their external outline only and height recorded to be top level of the awning structure at that point. RL text for awnings are not be shown on the plans. Small tropical roofs over equipment are not required to be surveyed. Supporting posts of awnings are not required to be surveyed unless a shown service route runs up the post.

Lift shafts shall be placed on the F-BLDG layer, hatched as building and labelled with "LIFT" using DSS Common format text.

5.3.2.3 Text Labels

Buildings shall be labelled with either their name using DSS Proper format text (e.g. COWAN SUBSTATION) or descriptively (e.g. "BRICK BUILDING") using DSS Common format text.

5.3.2.4 Hatching

Buildings and Awnings shall be hatched as per Table 16. Where buildings are external to the corridor and only part of the building has been surveyed then the building shall be edged with hatch. Awning hatches are to exclude the area of buildings within the hatch.

Text and Depth Tags within building and awning hatches shall be masked from the hatch by being included as boundary objects of the hatch.

Hatch Property	Value
Layer	F-BLDG-HTCH
Linetype	For Awnings: Awnings For Buildings: ByLayer
Pattern Name	ANSI31
Angle	90° (in viewport UCS)
Scale	0.25 (at 1:250)
Elevation	0

Table 16: Building & Awning Hatch Standards

5.3.3 Communications Features (F-COMS* Layers)

5.3.3.1 Block Symbols

The following blocks shall be placed on the 'F-COMS' layer.

			
DSS-6 (ANTENNA)	DSS-8 (TELEPHONE)	DSS-159 (CCTV CAMERA)	DSS-162 (P.A. SYSTEM SPEAKER)

Where a phone (DSS-8) is attached to a signal post and a Railway Signal (DSS-101) is displayed then the phone symbol is not required to be shown. Presence of a phone will be indicated by attachment of a communications service route to the signal.

5.3.4 Drainage Features (F-DRAN* Layers)

Drainage features are considered to be any drainage structure that has been created, used and maintained by Sydney Trains (or others) for the management of water flow, excluding piped drainage.

5.3.4.1 Block Symbols

The following blocks shall be placed on the 'F-DRAN' layer (unless noted otherwise on the table below).

	 (LAYER = F-DRAN-TEXT)		
DSS-12 (DRAINAGE PIT (<1m))	DSS-12-LARGE (DRAINAGE PIT (>1m))	DSS-13 (DRAINAGE INSPECTION PIT (FLUSH POINT))	DSS-161 (HEADWALL (<1m))

Elevations of Block Symbols to be centre of top of pit or top of ballast cage if grate/lid of pit is inaccessible.

Small headwalls shall be represented by DSS-161 symbol, where the headwall symbol attaches to a route the insertion point of the headwall shall be at the same 3D position as the route. The headwall symbol shall be rotated to match the actual orientation of the structure.

For placement of the 'DSS-12-LARGE' symbol refer to Section 5.3.10 The 'DSS-12-LARGE' symbol shall be scaled and rotated to fit the size of the pit linework.

Services inside a large drainage pit do not need to connect to the 'DSS-12-LARGE' symbol insertion point.

5.3.4.2 Linework

For headwalls with a top or side greater than 1 meter, the end points and changes of directions of wings and headwall top shall be surveyed and 3D lines used to draw whole headwall using F-DRAN layer.

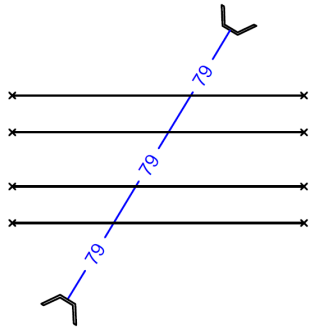


Figure 22: Alignment of Headwall symbols

F-DRAN layer shall be used for open drainage lines. Drainage features are not limited to those constructed of concrete but include those constructed of rock, earth and other material.

Where the banks of open drainage structures are greater than 1 metre in height then the tops and bottoms shall be surveyed and displayed as banks as per Section 5.3.7 as well as annotated with text placed on F-DRAN-TEXT using DSS Common format text.

Where the banks of open drainage structures are less than 1 metre in height only the outside edges of the feature shall be surveyed and an annotation placed between the lines as per Figure 23.

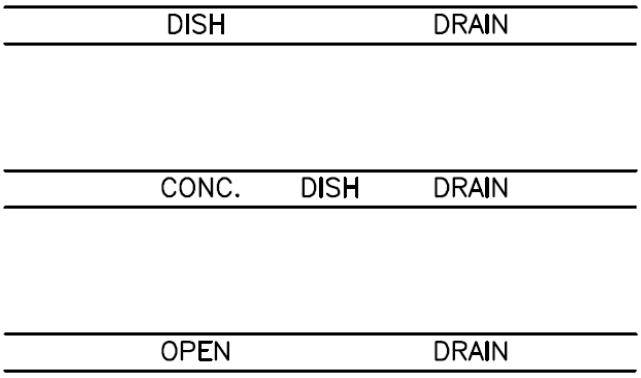


Figure 23: Annotation of Drainage Structures

Where the drainage feature is less than 0.5 metres in width (i.e. grated drains), a single centreline of the object may be used. A note will be added parallel to the line in F-DRAN-TEXT layer.

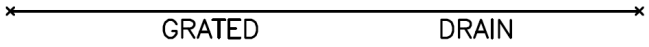


Figure 24: Annotation of minor Drainage structures

Piped drainage lines are the only drainage features not to be placed on 'F-DRAN' layers, they are treated as routes and placed onto -80- for Sydney Trains assets and -235- for external assets.

Box Culverts less than 0.5 metres in width shall be surveyed at the centre of the obvert and represented by route -79- for Sydney Trains assets and route -235- for external assets. Where the Box Culvert is greater than 0.5 metres in width the extents of the Box Culvert obverts shall be surveyed and represented by linework on F-DRAN layer and annotated with a note.

5.3.4.3 Text Labels

All drainage linework on F-DRAN layer shall be labelled with text parallel to the linework using DSS Common format text and placed on the F-DRAN-TEXT layer. Where both outside edges of the feature are shown the text is preferred to be placed centrally between the linework.

For headwalls without wings represented as a single F-DRAN line a descriptive note placed on F-DRAN-TEXT will be added to show the line is headwall.

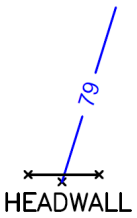


Figure 25: Annotation of Headwall

5.3.5 Electrical Features (F-ELEC* Layers)

5.3.5.1 Block Symbols

The following symbols shall be placed on the F-ELEC layer (unless noted otherwise).

DSS-17 (NEGATIVE BUS BAR)	DSS-77 (LIGHT)	DSS-79 (POWER POLE)	DSS-80 (ELECTRIC LIGHT POLE)	DSS-81 (POWER & LIGHT POLE)

DSS-82 (POWER & TRANSFORMER POLE)	DSS-132 (EARTH TERMINAL)	DSS-140 (TRANSFORMER(<1m))	(LAYER = F-ELEC-TEXT) DSS-140-LARGE (TRANSFORMER(>1m))	DSS-163 (POWER POLE & JUNCTION BOX)

DSS-164 (LIGHT & GUARD INDICATOR)	DSS-165 (LIGHT & CCTV)	DSS-166 (LIGHT & P.A. SYSTEM SPEAKER)	DSS-167 (LIGHT & CCTV & P.A. SYSTEM SPEAKER)

OFFICIAL

Power and light poles should be surveyed at ground level with elevation of symbol to represent ground level at base of the pole and position to be centre of the post.

Aerial routes that connect to pole symbols should connect to the insertion point in regards to horizontal position but are to retain the elevation requirement of aerial routes (i.e. RL -99.0).

5.3.5.2 Linework

Transformers with a side greater than 1 metre shall be represented by linework on 'F-ELEC' with the 'DSS-140-LARGE' dynamic block symbol insertion point as well as scale and rotation parameters set using diagonally opposite corners of linework.

Service route linework for any services entering the transformer shall terminate at the edge of the linework as per Table 14.

5.3.5.3 Text Labels

Sydney Trains Power poles and feeders shall be labelled on the plans. Identifiers should be added preferably under the symbol. Rotation of text should be horizontal on the sheet. If more than one feeder is connected to power pole, all should be listed under the symbol. In congested areas power pole numbers can be shown away from the symbol with an arrow leader pointing to the power pole symbol.

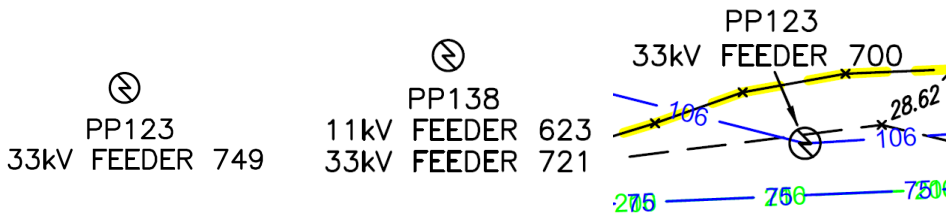


Figure 26: Annotation of Powerpoles

Non-aerial HV Routes are required to be labelled with feeder identifiers, the identifiers shall be placed parallel and adjacent to the route using DSS Common format text on layer 'F-ELEC-TEXT'.

5.3.6 Miscellaneous Features (F-MISC* Layers)

5.3.6.1 Linework

If a feature cannot be represented by any other feature group only then can it be placed on the F-MISC layer. Consideration should be first given to using the F-SITE layer if a specific feature group is not identified.

5.3.6.2 Text Labels

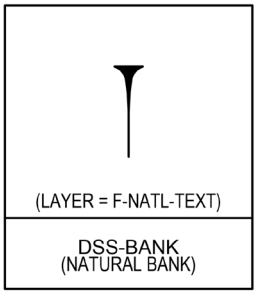
Any feature linework on F-MISC must be descriptively labelled on the 'F-MISC-TEXT' layer.

The F-MISC-TEXT layer is also utilised for annotation of services and routes. It is used for text related to identification of single and multiple routes as described in Section 5.2.5.

5.3.7 Natural Surface Features (F-NATL* Layers)

5.3.7.1 Block Symbols

The DSS-BANK block shall be placed on the F-NATL-TEXT Layer.



The Bank (DSS-BANK) symbol is a dynamic block with a secondary grip point defining rotation and length of the symbol.

The Bank symbol shall be placed between linework to define areas of sloped embankment. The insertion point of the Bank symbol should be placed onto the top of bank linework and the secondary grip point shall be placed onto the bottom of bank linework. The rotation of the Bank symbol shall be perpendicular to the top of bank linework at the point of insertion. They shall be placed every 10-20 metres and placement and number of symbols placed may be altered due to congestion of information and for users to identify the direction of fall on embankments. The Bank symbol is not to be used on vertical cuttings.

The Bank symbol may be placed on linework other than top of bank where that feature linework is at the top of the embankment. For example, where a fence is at the top of embankment there is no requirement to duplicate the fence line with a top of bank line and the Bank symbol may be shown from the fence line.

5.3.7.2 Linework

The F-NATL layer is used to display changes in topography, used to display features such as:

- Top and bottom of banks
- Top and bottom of cuttings
- Natural watercourse banks.

5.3.7.3 Text Labels

For vertical cuttings the top and bottom of the cutting shall be labelled on the ‘F-NATL-TEXT’ layer.

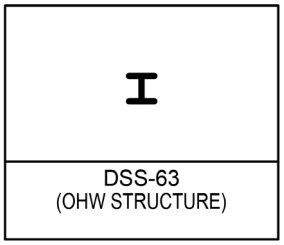
Where the feature forms part of the CAB and/or if only a top or bottom of a feature is able to be surveyed then the feature shall be labelled on the ‘F-NATL-TEXT’ layer.

The labelling of features replaces the need to place DSS-BANK symbols.

5.3.8 OHWS Features (F-OHWS* Layers)

5.3.8.1 Block Symbols

The DSS-63 block symbol (OHWS symbol) can be rotated to match the actual orientation of the structure, typically aligned to the track. The OHWS Symbol shall be placed on layer F-OHWS.



5.3.8.2 Text

OHWS Text labels for OHWS are used as the primary linear reference for all DSS Plans. OHWS Labels are to match the labels shown on the structure and will generally be of the form "**OHWS XX 12+345**" (e.g. OHWS HB 15+123). OHWS Labels shall use DSS-OHWS text style as per Section 5.1.6 and be underlined.

Where possible OHWS labels shall be placed according to the following:

- outside the CAB on the track downside
- at either a consistent horizontal alignment on the sheet or consistent distance from track
- aligned and rotated perpendicular to the track or parallel to OHWS portal.
- rotated to read right on the page (meet the requirements of Section 3.5.

All OHWS labels shall be shown on Cover and Detail Plans.

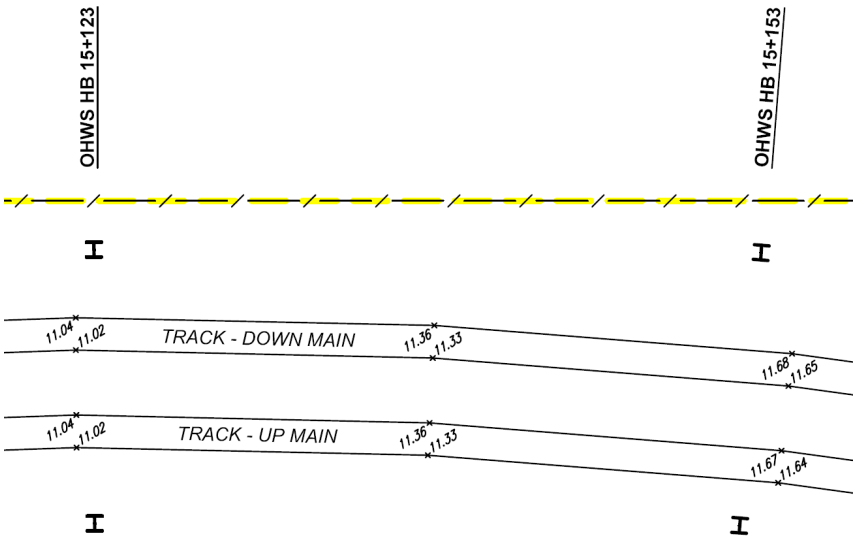


Figure 27: Placement of OHWS Labels

In congested areas labels may need to be aligned in multiple rows or omitted, consult DSS Survey Coordinator in these circumstances.

5.3.9 Parking Features (F-PRKG* Layers)

5.3.9.1 Linework

F-PRKG shall be used for delineation of Sydney Trains owned carpark areas. Linework shall be simplified to show only the bounding extents of the car parking area showing an outline based on either back of kerb lines and/or extents of sealed areas. Internal island areas (e.g. garden areas, kerb islands) are also to be surveyed and shown using F-PRKG layer.

Internal layout line marking (e.g. for car parking spaces) are not required to be shown.

5.3.9.2 Text Labels

Areas of car parking are to include the label “CAR PARK” placed centrally DSS Common format text. Descriptive labels related to linework for internal areas (e.g. “GARDEN” for garden areas) to be labelled on F-PRKG-TEXT layer using DSS Common format text.

Linework outline of parking area shall be labelled with KERB (for back of kerb) or the descriptive feature if not back of kerb (e.g. BITUMEN) using DSS Common format text.

5.3.10 Pit Features (197, 198 and F-PIT-SML Layers)

The presentation of pits is determined by the longest side length or diameter of the pit. The length of the side determines whether the pit is presented as a block symbol or as linework. To determine the correct presentation Table 17 shall be used.

Pit Description	Linework	Block symbols used
Large Rectangular pit (with any side greater than 1 metre)	Closed 3D Polyline (elevations of vertexes at pit lid level)	DSS-X placed at all surveyed corners (plus centred DSS-12-LARGE symbol for Drainage Pits)
Large Round Pit (diameter greater than 1 metre)	Circle (elevations at pit lid level)	DSS-X placed at surveyed points (plus centred DSS-12-LARGE symbol for Drainage Pits)
Small Pit (all sides less than 1 metre or diameter less than 1 metre)	None	DSS-72 or DSS-12, DSS-13, DSS-86

Table 17: Pit Classification

All large pit linework shall be placed on layer 197.

For all small pits (i.e. all block symbols listed in table above) a 3D Point shall be placed on Layer 198 (GIS requirement). A 3D point entity shall be placed at the insertion point of all small pit block symbols listed in Table 17.

For small pits the block symbol DSS-72 shall be used unless otherwise defined below for drainage or sewer.

For all pits there must be at least one RL shown on the plan.

Refer to *GL A 00512 Guide to Interpretation of Detailed Site Survey (DSS)*

Plan Symbols and Numeric Route Codes for examples of pits.

Where a pit has a unique identifying number a text label shall be placed on layer 'F-PIT-TEXT' adjacent to the pit using DSS Common format text.

5.3.10.1 Routes and Pits

Routes that enter a pit are shown differently depending if a small or large pit is shown. Routes that do not enter a pit but go underneath the pit are to be represented by a continuous route line that does not break within the pit line work for a large pit or connect to the insertion point of a small pit.

Large Pits

To show a route entering a large pit (defined by linework) an endpoint of the route line must be inside the pit linework. Endpoints of routes inside a large pit are not to be used to display a DSS-X symbol or Depth Tag. Where an underground route enters a pit a Depth Tag shall be shown approximately 1 metre from the pit.

Small Pits

To show a route entering a small pit (defined by block symbol) an endpoint of the route shall be connected to the insertion point of the block. Endpoints of routes at the pit block symbol are not to display a DSS-X symbol or Depth Tag. Where an underground route enters a pit a Depth Tag shall be shown approximately 1 metre from the pit.

Vacant Pits

Where there are no routes entering a large pit, then a text label of "PIT" shall be added inside the vacant pit. The text label shall be placed on layer 'F-PIT-TEXT'.

5.3.10.2 Drainage Pits

For all large drainage pits the block symbol DSS-12-LARGE shall be placed at the centre of the pit and at the same elevation as a vertex of the pit.

For small drainage pits the 'DSS-12' shall be used or 'DSS-13' for inspection pits and flush points.

5.3.10.3 Sewer Pits

For all large sewer pits text shall be displayed at the centre of the pit. An 'S' text on 'F-PIT-TEXT' shall be placed at the centre of the pit using DSS Common format text with elevation placed at RL 0.

For small sewer pits the 'DSS-86' symbol shall be used.

5.3.11 Platform Features (F-PLFM* Layers)

5.3.11.1 Linework

The outline of platforms shall be surveyed every 10-15m along the trackside coping edge. Walkways and access areas at rail level are not considered to be platforms.

5.3.11.2 Text

Platforms shall be labelled with their Platform identifier (e.g. "PLATFORM 1"), where possible labels will be placed in vertical alignment on the sheet with the track labels and parallel to the coping edge inside the hatched area using DSS Common format text.

A Station Name label shall be placed on each hatched Platform area for each DSS Detail Plan Sheet Border using DSS Proper format text and rotated horizontal to the sheet. Labels shall be placed in vertical alignment with track labels and platform identifiers where possible.

5.3.11.3 Hatching

Platforms shall be hatched (as a solid grey hatch) to cover the hardstand area from the coping edge. The hatch area is to exclude areas of buildings, lifts and other areas that are not of hardstand base of the platform, such as gardens. Platform Hatching is to use the following properties.

Property	Setting
Pattern name	SOLID
Layer	F-PLFM-HTCH
Annotative	No
Elevation	0

Table 18: Platform Hatch Properties

5.3.12 Retaining Wall Features (F- RETG* Layers)

5.3.12.1 Linework

DSS Plans requires surveying of topographical changes within the corridor. Height and position of retaining walls may require either top or bottom or both elevations to be surveyed.

For low retaining walls (walls less than 0.5 metre in height) only the most relevant side of the retaining wall is required to be surveyed on the natural surface.

For larger retaining walls (more than 0.5 metre in height) two lines shall be captured, surveyed on the natural surface level at both top and bottom of the retaining wall. Where the trackside face of the retaining wall is a defining feature of the Control Area Boundary and extent of survey then only that side needs to be surveyed.

5.3.12.2 Text

Where the displayed linework for the retaining wall is too short to display linetype on the plan then annotation of RET. WALL shall be placed using DSS Common format text.

5.3.13 Road Features (F-ROAD* Layers)

5.3.13.1 Linework

The display of road features on DSS plans are to give an indication of the road surface area. Only a single string at back of kerb is required to be surveyed and shown. On sealed roads where the feature surveyed is not the back of kerb it shall be annotated.

For access roads within the corridor the edges not required to be surveyed where other surveyed features and ballast define the approximate extents. If the edge of the road is required to be surveyed then it shall be placed on F-ROAD-ACES.

Please note that kerbs and edge of sealed areas inside a carpark are considered Parking Features, refer to Section 5.3.9.

5.3.13.2 Text

Where gazetted roads adjoin or cross the corridor and CAB then the road shall be labelled using DSS Proper format text, regardless of the display of road linework. Where road uses an overline or underline bridge to cross the corridor they shall be labelled as per Section 5.3.1.2.

Internal Access roads shall be labelled with “ACCESS ROAD” using DSS Common format text and placed on F-ROAD-TEXT. Labels shall be centred and aligned with road defining linework. On sealed roads where the outline located is not back of kerb then it shall be annotated with a description of the feature used (e.g. edge of bitumen).

5.3.14 Signalling Features (F-SIGL* Layers)

5.3.14.1 Block Symbols

The block symbols below shall be placed on the F-SIGL Layer.

				
DSS-92 (IMPEDANCE BOND)	DSS-94 (RAILWAY TUNING UNIT)	DSS-96 (RAILWAY WARNING LIGHT)	DSS-97 (POINT EQUIPMENT)	DSS-98 (TRAIN STOP)

				
DSS-100 (SURFACE FEEDER CABLE)	DSS-101 (RAILWAY SIGNAL)	DSS-102 (RWY LEVEL CROSSING)	DSS-138 (POINT INDICATOR)	DSS-139 (GUARD INDICATOR)

		
DSS-146 (BOOT LEG RISER)	DSS-175 (BALISE (CONTROL))	DSS-176 (BALISE (FIXED))

For a Railway Signal (DSS-101) if a phone is attached to the signal post then the phone symbol (DSS-8) is not to be shown. Presence of a phone will be indicated by attachment of a communications service route to the signal.

OFFICIAL

All Guard Indicators (GI) shall be shown, even when mounted from roofs and awnings. Services feeding GIs mounted from roofs and awnings are not required to be shown as per Section 5.2.4.1.

The Surface Feeder Cable (SFC) insertion point shall be placed at the end of signal service or junction box. For distances up to 3 metres a single SFC shall be shown, for over 3 metres multiple SFC symbols shall be shown, where multiple SFC are used they shall all be placed at the same elevation (same as attachment point to service or junction box).

Surface Feeder Cables are not required to be shown where one end of the SFC connects to the rail.

Surface Feeder Cables may be used for services other than signalling.

5.3.14.2 Text

Railway Signals shall be labelled with “SIG XXXX” where XXXX represents the signal name (eg. Signal SH12 will be labelled “SIG SH12”). Label is to use DSS Common format text and be underlined, horizontal to sheet and placed adjoining the symbol.

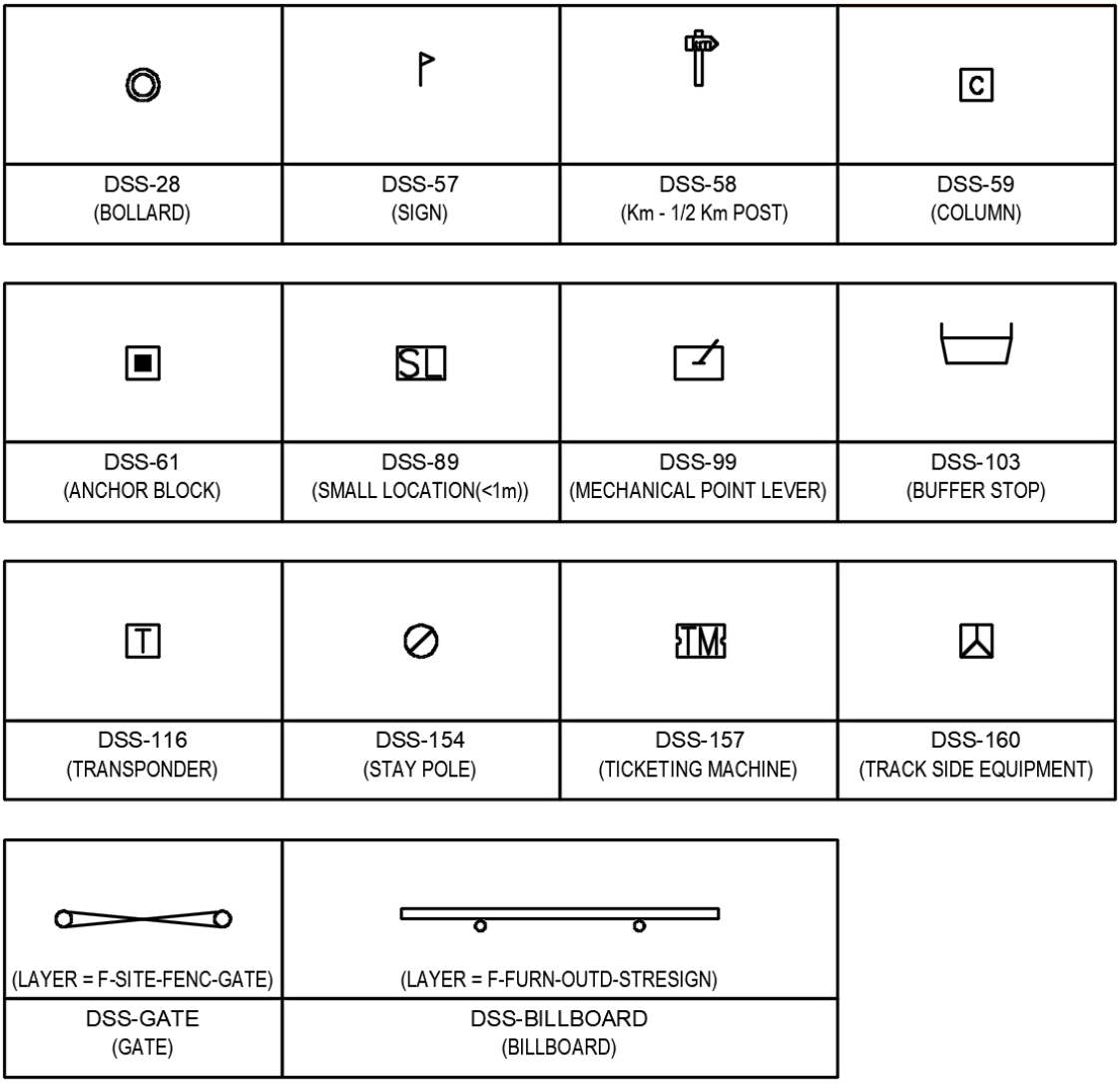
Turnout and catch points shall be labelled by either field identification or as per Worksite Protection Planning Diagrams. Labels shall use DSS Common format text and be of form “XXX PTS” (where XXX represents points number - e.g. “502A PTS”). Labels shall be placed in the four foot at the points or adjoining if required for clarity.

RL Text shall not to be shown against any block symbols shown in Section 5.3.14.1.

5.3.15 Site Features (F-SITE* Layers)

5.3.15.1 Block Symbols

The block symbols below shall be placed on the F-SITE Layer, unless noted otherwise.



The DSS-GATE, DSS-BILLBOARD and DSS-103 (buffer stop) block symbols are dynamic blocks defined by two grip points. A DSS-X symbol shall not be shown at either grip point for these symbols.

Ticketing machine symbol (DSS-157) is for ticket vending machines only and not used for Opal Card Readers. Opal Card Readers shall be displayed using a bollard symbol (DSS-28) and are identifiable by connection of a Station Data route to the bollard symbol.

5.3.15.2 Linework

The F-SITE layer is used to show linework of constructed features in the corridor that are not covered in any of the specific feature sections. They include but are not limited to:

- Walkways
- Hi Rail Pads
- Level Crossings
- Ramps
- Hardstand areas around features

All linework features drawn on layer F-SITE shall be annotated with a descriptor, using DSS Common Format text.

Fences shall be surveyed at ground level and placed on the F-SITE-FENC layer. Fences are not required to be annotated with a descriptor.

Where a fence line closely matches the edge of a staircase, ramp or elevated structure (such as bridges and concourses) fence lines shall not be shown, only the edge of the main structure shall be shown.

For concrete at ground level (such as for walkways, slabs and surrounding service cabinets) the layer F-SITE-CONC may be used. The linetype for concrete has an etched side of lines used to delineate which side is concrete slab. The use of F-SITE-CONC layer and linework replaces the need to label the area as concrete.

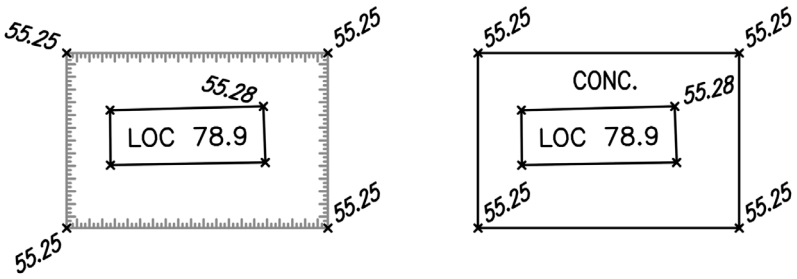


Figure 28: Concrete Linework and Annotation Examples

Service Cabinets (e.g. signal and comms locations) with any side greater than 1 metre shall be surveyed at the external corners (at ground level) and annotated with “LOC” text inside the closed linework using DSS Common Format text and placed on layer ‘F-SITE-TEXT’.

5.3.15.3 Text Labels

All linework on layer F-SITE shall be annotated with a descriptive label to identify the feature.

F-SITE symbols shown above may be annotated with descriptive labels DSS Common format text.

Symbol DSS-58 (km post) shall be annotated with “XXkm” (where XX represents the track kilometrage) using DSS Common Format text.

All Service cabinets shall be annotated with their identifiers (where possible) using DSS Common format text and prefixed with LOC (e.g. LOC 78.9). For large service cabinets the identifier is preferred to be placed within the linework. If the identifier is placed outside the linework then LOC text shall be placed inside the linework.

5.3.16 Survey Features (F-SURV* Layers)

5.3.16.1 Block Symbols

The block symbols below shall be placed on the layer F-SURV-SYMB.

	
DSS-112 (SURVEY MARK)	(SURVEY SHOT CROSS)

Survey Control Marks shall be shown using the Survey Mark symbol (DSS-112) and annotated with text label matching the name in the “MARK” column on Survey Control Listing from the Cover or Information Sheet. Only Survey Control from Sydney Trains shall be shown on DSS Plans as per Section 2.1.

The survey cross symbol (DSS-X) is required to be shown at all linework features that were surveyed, placed at the 3D surveyed position co-incident with the vertex or endpoint of the linework. Not all survey point crosses are required to display RL text adjoining the point. The presentation of RLs is dependent upon the feature shown and addressed for each feature throughout Section 5.3. Features that were not surveyed shall not show a survey cross and the survey cross should not be shown on features placed at RL -99 or RL 0.

5.3.16.2 Text

Survey Control Marks shall be labelled with the Mark Name and the RL. The mark text label shall match the control listing, be placed horizontally on the sheet and be DSS Common Format text plus underlined and placed on layer F-SURV-TEXT. A RL text shall be placed adjoining the Survey Mark symbol.

5.3.17 Track and Ballast Features (F-TRAK* Layers)

5.3.17.1 Block Symbols


(LAYER = F-TRAK-BLST-TOP)
DSS-TRACK-BALLAST (BALLAST TEARDROP)

The ‘DSS-TRACK-BALLAST’ dynamic block symbol shall be placed along ballast tops and extended to the ballast toe. The symbol shall typically be placed on the midpoint of ballast top lines, aligned perpendicular to the top line and extend to the toe line. Placement and frequency may be altered as required to assist users to identify the ballast shoulders.

5.3.17.2 Linework

Rail tracks are shown primarily as a reference to assist in positioning and to assist in relative height determination for other information on the plans. Tracks shall be surveyed in pairs (i.e. one shot on each rail) every 20-25 metres on straight sections of rail and every 10-15 metres on curved sections. There is no requirement to survey check rails in the four foot and similarly there is no requirement to significantly increase the number of survey positions taken through turnouts and cross overs.

The ballast shoulders shall be surveyed and shown, shoulders of ballast shall be surveyed at corresponding points surveyed for tracks.

Ballast shoulders shall be separated onto 'F-TRAK-BLST-TOP' (top of ballast shoulder) and 'F-TRAK-BLST-BOTM' (toe of ballast) layers and where toe of ballast adjoins natural surface then the 'F-TRAK-BLST-BOTM' linework shall be annotated with RL text. No RL text should be shown for ballast in all other circumstances.

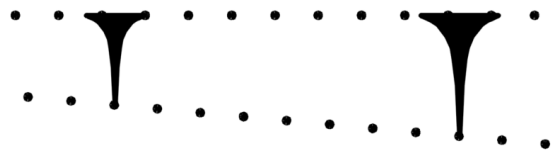


Figure 29: Ballast Shoulder Placement

5.3.17.3 Text

Tracks shall be labelled "TRACK – XXX" where XXX denotes the track as per the Worksite Protection Planning Diagrams, available through RailSafe website.

Track labels shall be formatted as per Table 10 using "DSS-TRACK" text style and be placed on layer F-TRAK-TEXT. Track labels shall be centred between and rotated parallel to the track linework for which they refer. A minimum of one label per track shall be placed inside each DSS Sheet Border block and track labels shall be aligned vertically and centrally within each DSS Border where possible.

RL text shall be shown for each surveyed point on the track, preferably in the four foot. In congested areas a single RL text may be used on straight sections of rail where both tracks are at the same elevation.

5.3.18 Tunnels Features (F-TUNL* Layers)

5.3.18.1 Linework

The outline of the internal extent of underground tunnels and pedestrian subways shall be shown on DSS Detail and Cover plans. Where possible the outline should be surveyed. The F-TUNL layer shall be used to display the outline of the internal extents of the tunnel feature as well as the portal face of a tunnel.

DSS coverage stops at the portal of railway tunnels, service routes shall be located up to the railway tunnel portal and the extents of the portal opening of the tunnel shall be located at ground level and approximate alignment of internal tunnel faces shall be shown.

5.3.18.2 Text

Tunnels shall be labelled with their name if available (e.g. LANE COVE TUNNEL) using DSS Proper format text. If a name is not applied then a descriptive label (e.g. PEDESTRIAN SUBWAY) using DSS Common format text shall be applied.

If services inside the tunnel are outside DSS coverage then an Area Specific note shall be shown.

RL Text is not required to be shown for tunnels but may be shown for the floor of the tunnel if available.

For larger tunnels the external linework shall be annotated with descriptive text (e.g. EDGE OF TUNNEL) using DSS Common format text.

5.3.19 Utilities Features (F-UTIL* Layers)

5.3.19.1 Block Symbols

Features on 'F-UTIL' layers are service related features that do not fall under specific Feature Layers and can potentially be related to many service types, both external or Sydney Trains. Their owner/maintainer may be identifiable by connection of a route to the symbol.

				
DSS-1 (AIR EQUIPMENT)	DSS-16 (JUNCTION BOX(<1m))	DSS-32 (HIGH PRESSURE OIL MARKER)	DSS-36 (HIGH PRESSURE GAS MARKER)	DSS-39 (GAS EQUIPMENT)
				
DSS-40 (RMS TRAFFIC LIGHT)	DSS-54 (CABLE MARKER)	DSS-73 (OPTIC FIBRE MARKER)	DSS-86 (SEWER PIT (<1m))	DSS-88 (SEWER VENT PIPE)
				
DSS-117 (TELSTRA CABLE MARKER)	DSS-118 (TELSTRA DISTRIBUTION PILLAR)	DSS-133 (WATER HYDRANT)	DSS-134 (WATER METER)	DSS-135 (WATER TAP)
				
DSS-137 (STOP VALVE)	DSS-145 (GAS PIPELINE MARKER)			

5.3.19.2 Text Labels

Annotative Labels may be shown against any of the block symbols to provide more detail as to the feature they represent (e.g. placement of the "VALVE" beside DSS-39 block to show type of gas equipment).

5.4 The Paper Space (Layouts)

Layouts contain the title block and view of drawing model (called a viewport). The paper space also contains certain text and notes. The position and display of most elements on the paper space are consistent across all DSS Plans.

5.4.1 Title blocks

Standardised versions of the DSS Title block are available for sheet sizes and orientations as listed in Section 3.3.

Each Layout contains 5 objects that form the DSS title block (all available from DSS Template file):

- **DSS frame block:** block of linework and consistent text and features of the title block. A separate frame exists in the DSS Template file for each sheet size and orientation.
- **DSS Title information block:** a block of attributes that contains the textual information for the title block.
- **Adjoining sheet information block:** block of attributes used to reference adjoining plans in the same plan set. The adjoining sheet information block is not used to display references to plans in other plan sets.
- **Scale Bar:** block of attributes and linework to contain the scale of the drawing area main viewport and sheet size. Preferably the attributes of the scale bar block should contain a field linked to the viewport.
- **Amendment Panel block:** block of attributes to contain information regarding updates to the plan.

Refer to TMU MD 00006 ST section 11.4 Title block for information about the form, tags and requirements of all fields to be completed for the DSS title box. Refer to Section 7.3.1 about changes required to the DSS title block for WAsEx purposes.

5.4.2 Viewports

A single viewport shall be placed to the extents of the drawing area of the title block for Detail and Cover Plans.

Additional viewports for diagrams may be used. Refer to Section 5.5.4 for more information on diagrams.

5.4.3 Notes

Notes shall be of consistent form and typically placed on the paper space.

Notes shall be constructed as per the following:

- Use DSS Common format text
- contained in a text box and
- prefixed with underlined text of "NOTE:" and
- placed on layer R-GNRL-DRWG-AREA.

There are two types of notes shown on DSS Plans:

- General Notes; notes apply generally to the plan.
- Area Specific Notes; notes referring to a location shown on the plan.

All DSS Plans will contain general notes and they are typically to be placed in the bottom left hand corner of the drawing area of the plan and aligned vertically. Where displayed model information overlaps this area then notes shall be moved and placed in another corner of the drawing area.

5.4.3.1 General Note for Plans Read in Conjunction

Each Plan in a DSS plan set must include a note naming the cover and information plans that shall be read in conjunction with that plan. The Note is to include

- first and last sheet of Cover plans in that set and
- any information sheets to be read in conjunction with the entire plan set.

Where sheets (i.e. Bore Logs) outside the plan set are required to be read in conjunction with individual sheets within the plan set a Note shall be placed only on the affected sheets. Refer to Section 3.9.

The block DSS-CONJ-CV shall be used to list the plans.

5.4.3.2 General Note for Superseding of Plans

Where a new plan supersedes any previous plan then a note shall be added listing all CV numbers of the superseded plans. The block DSS-SUPERSEDE-NOTE shall be used for superseding of plans.

NOTE: THIS PLAN SUPERSEDES CV0123456

Figure 30: Supersede Note

5.4.3.3 Area Specific Notes

Area Specific Notes are used identify areas excluded from DSS Coverage. Areas may include but are not limited to:

- Substation Compounds
- Overline Bridges and Underline Crossing areas
- Tunnels
- Station Concourses.

The note is to include the name of the area preceded with “OUTSIDE DSS COVERAGE”.

NOTE: GRAEME STREET
OUTSIDE DSS COVERAGE

NOTE: BLACKTOWN SUBSTATION
COMPOUND OUTSIDE DSS COVERAGE

NOTE: ELLERTON WAY OVERLINE
BRIDGE OUTSIDE DSS COVERAGE

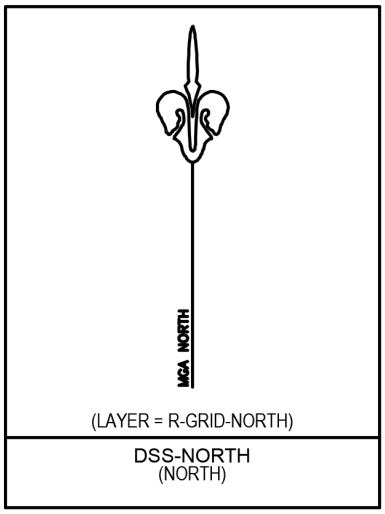
Figure 31: Area Specific Note Examples

At least one Area Specific note per area shall be placed in the model. Further copies of the same note may be placed in either model or paper space as required.

5.4.4 North Points

North Points (DSS-NORTH) are required to be placed in the model space for both Cover and Detail plans, but their positioning is to be determined by available space when viewed on the paper space.

North Points are preferred to be displayed in the top left corner of the drawing area. The DSS-NORTH block shall be sized using Annotative scales, placed on layer R-GRID-NORTH and be annotated with the co-ordinate system of the model (set using the custom properties of the block). Refer to Section 5.1.7.2.



5.5 Detail Plan Layouts

5.5.1 Viewport Display of Model Information

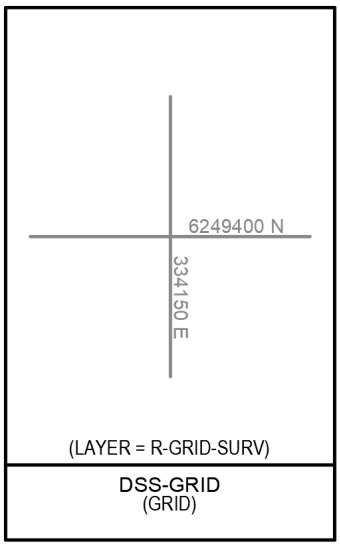
Viewports for Detail plans are to show all DSS Standard layers except for the following:

- F-BNDY
- F-BNDY-CDST
- F-SURV-RL-OFF
- R-GRID-FRAM
- R-GRID-FRAM-OFF
- R-GRID-FRAM-TEXT
- Defpoints.

5.5.2 Grid Ticks

Grid ticks (DSS-GRID) are required to be placed in the model space, but their positioning is to be determined by available space when viewed on the paper space.

Grid Ticks shall be placed in the model space with two markers placed per layout. The DSS-GRID block shall be placed on layer R-GRID-SURV with the insertion point placed at a point where the coordinate of the northing and easting is an even multiple of 10 and aligned with the world UCS. The DSS-GRID block contains two attributes which are to contain fields showing the easting and northing of the insertion point of the block along the lines of the block. Refer to Section 5.1.7.3.



5.5.3 Paper Space Text

There exists sheet specific text that shall be shown on the paper space. All text placed on the paper space shall be placed on layer R-GNRL-DRWG-AREA. The standard texts that are placed on Detail paper spaces are:

- Outside DSS Coverage Labels
- Next Station Labels
- Diagram Labels; refer to Section 5.5.4
- Adjoining Plan set Information Labels.

5.5.3.1 Outside DSS Coverage Labels

Outside DSS Coverage labels shall be placed where service routes run outside the control area boundary. These labels shall never be placed inside the control area boundary. Each text placed should be horizontal on the page and have the following properties.

Property	Value
Color	RGB: 130,130,130
Layer	R-GNRL-DRWG-AREA
Style	DSS-OUTSIDE-SCOPE
Height	5.0 (or 3.5 if insufficient space)
Rotation	90°

Table 19: DSS Outside Scope Text Properties

5.5.3.2 Next Station Labels

Next Station Labels shall be placed parallel with tracks on either end of the sheet, preferably in the six foot. The Sydney end of the tracks shall always be labelled with 'From SYDNEY' and the other end as 'To XXXX' (where XXXX is the next railway station). Once a Detail plan displays a station platform then the next Station Labels changes to the next country side station.

Property	Value
Layer	R-GNRL-DRWG-AREA
Style	DSS-FRAM-LABL
Height	4.0

Table 20: DSS Outside Scope Text Properties

5.5.3.3 Adjoining Plan Set Information Labels

Adjoining plan set information shall be placed at the start and end of the plan set and where other plan sets adjoin the DSS plan set. Labels on Detail Plans are to contain the CV number of the adjoining plan in the next plan set, as per Figure 32. If the extents of the next DSS CAB doesn't abut the current file then the word 'NEXT' shall be used in place of 'ADJOINS'. Labels shall be aligned with the page or Control Area Boundary.

Property	Value
Layer	R-GNRL-DRWG-AREA
Style	DSS-TITLEBLOCK-4
Height	2.5

Table 21: Adjoining Plan Set Text Properties

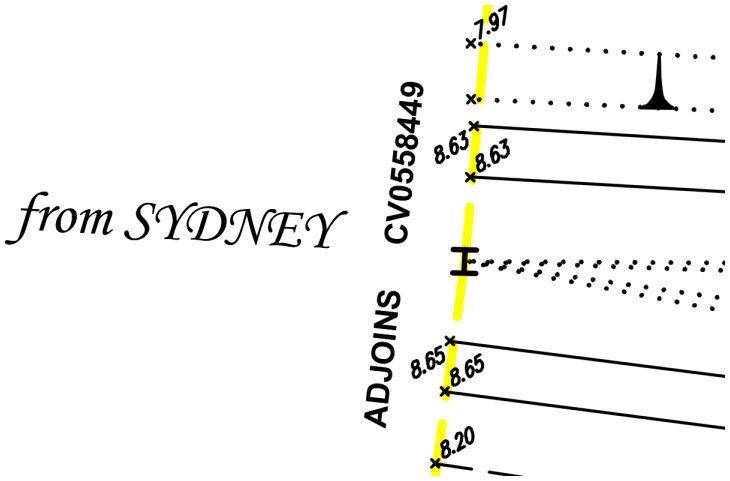


Figure 32: Detail Plan Adjoining Plan Set Information

5.5.4 Diagrams

In congested areas of the main viewport a diagram of increased size may be required for clarity. Diagrams shall be created using a scale of 1:100. The area enlarged in the diagram shall be outlined in the model using a rectangular 2D polyline placed in the model.

Diagrams shall be placed on the same plan as the area it enlarges. If there is insufficient space to show diagrams on the same plan then a separate Detail plan for Diagrams only shall be used. Detail plans for diagrams shall be placed at the end of the plan set and are to show enlarged diagram areas only.

5.5.4.1 Diagram Identifiers

The outline of the diagram shall be shown and annotated as per Table 22 and Table 23 . All diagrams shall be numbered uniquely throughout the DSS plan set. The annotation shall be placed on the paper space. Where a diagram is not placed on the same sheet as the outline identifier then the annotation is to also include reference to the diagram sheet on which it has been placed.

Component	Value
Entity type	Closed 2D Polyline
Layer	R-GNRL-DRWG-AREA
Colour	RGB:115,115,115
Lineweight	1.00mm
Elevation	0

Table 22: Diagram Outline Identifier Properties

Setting	Value
Text	"SEE DIAGRAM X" (potential additional text: " - SHEET X-CV0XXX123")
Style	DSS-NAME
Height	3

Table 23: Diagram Text Identifier Properties

All texts and Depth Tags referencing information within the diagram outline in the main viewport are not to be displayed (i.e. to be shown only in the separate diagram viewport). All other model entities (i.e. Block symbols, hatching, linework etc.) shall be shown in both the main and diagram viewports. Blocks shall be shown in both viewports through the use of multiple annotation scales attached to the block.

5.5.4.2 Diagram Presentation

The orientation of the diagram viewport shall follow the same orientation as the main viewport and a northpoint is not required to be shown in diagram viewports.

All information and text in the diagram viewport shall be placed in the model space and control of display to be achieved through application of Annotation Scales. Entities only shown in the diagram viewport shall only have 1:100 Annotation Scale applied whereas entities displayed in both main and diagram viewports shall have both 1:100 and 1:250 annotation scales applied.

The diagram viewport shall be annotated on the paper space with a 2D Polyline over the viewport outline, the diagram number and scale bar (multiple diagrams may reference a single diagrams scale bar). Diagram outline and number shall be as per Figure 34 and Figure 35 below.

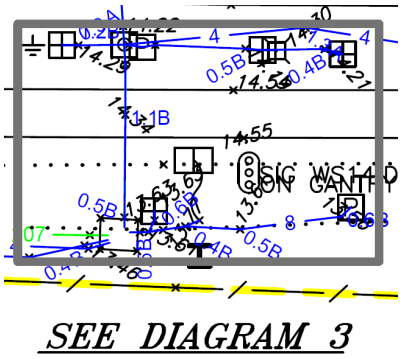


Figure 33: Incorrect Display of Area enlarged as Diagram in Main 1:250 Viewport

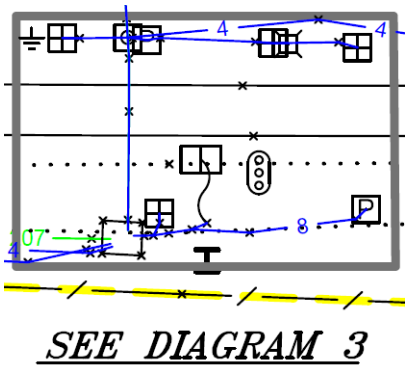


Figure 34: Correct Display of Area enlarged as diagram in Main 1:250 Viewport

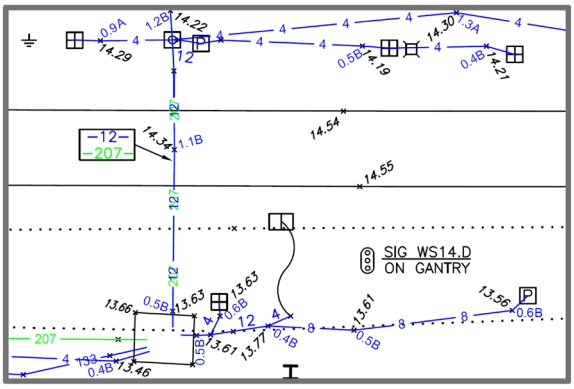


Figure 35: Correct Display of Diagram at 1:100 in separate Viewport

5.6 Cover Plan and Information Sheet Layouts

The Cover plans are created to display the following information:

- Detail Plan information
  - Detail Plans layout arrangement
  - Detail Plan CV Reference Numbers
  - Detail Plan sheets numbers
  - Adjoining DSS plan set information
- Surveyed Detail information
  - Rail Tracks
  - OHWS
  - Buildings
  - Bridges
  - Roads
  - Platform
- Text
  - OHWS Labels
  - Sydney and Next Station Labels
  - Station Labels

  - Road Names (e.g. Parramatta Road)
  - Major Building Labels (e.g. Blacktown Substation)
  - Major Topographical Features (e.g. Hawkesbury River)
- Notes
  - Read in Conjunction Notes
  - Superseding Notes
  - Area Specific Notes.

5.6.1 Viewport Display of Model Information

To display the required Surveyed Detail information for Cover Plans only the following layers shall be displayed in the viewport:

- "F-BLDG"
- "F-BLDG-AWNG"
- "F-BLDG-HTCH"
- "F-BRDG"
- "F-OHWS"
- "F-OHWS-TEXT"
- "F-PLFM"
- "F-PLFM-HTCH"
- "F-TRAK"
- "F-TUNL"
- "R-DSHT-TEXT-GNRL"
- "R-GRID-FRAM"
- "R-GRID-FRAM-TEXT"
- "R-GRID-NORTH".

5.6.2 Text

For Cover plans all text, except for sheet numbers and OHWS labels, shall be placed on the paper space.

All text on cover plans shall be placed on layer R-GNRL-DRWG-AREA.

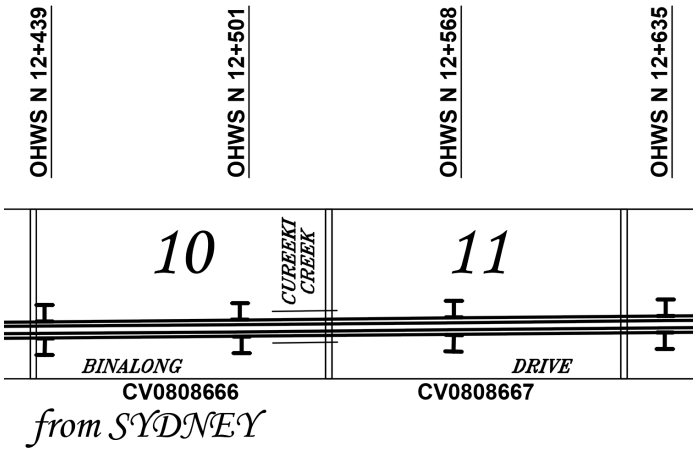


Figure 36: Text on Cover Plans

5.6.2.1 OHWS Labels

Overhead labels shall be shown on the down side outside the Detail sheet borders. Labels are to be shown in the model space through the use of the annotative scales. Where track geometry and page overlap causes issues with placement of labels in the model then those labels may be placed in the paper space.

5.6.2.2 Detail Plan CV Reference Numbers

Each page outline shall be annotated with the CV number.

The CV number shall be placed outside (and preferably centred below) the DSS border and orientated parallel to the horizontal axis of the associated DSS border.

Property	Value
Layer	R-GNRL-DRWG-AREA
Style	DSS-TITLEBLOCK-4
Height	2.5

Table 24: CV Number Text Properties

5.6.2.3 Detail Plan Border Sheet Numbers

Each Detail Plan border shall be labelled with the plan set sheet number.

Sheet Numbers shall be placed in the model space inside the detail plan borders, orientated parallel to the horizontal axis of the border and preferably centred within the page outline. Sheet Number Texts shall be created as per the following table.

Property	Value
Style	DSS-FRAM-LABL
Height	7 (at scale on paper space)
Layer	R-GRID-FRAM-TEXT

Table 25: Border Sheet Number Properties

OFFICIAL

5.6.2.4 Adjoining Extents Labels

Where other plan sets adjoin DSS borders labels shall be placed noting the adjoining or next DSS File Number. Labels shall be placed parallel to the vertical side of the outer detail plan borders. Where the next plan set adjoins the extents of the current plan set the word "ADJOINS" shall prefix the DSS File Number. If the extents of the next DSS File Number doesn't' adjoin the current file then the word 'NEXT' shall be used. An area specific note may be placed to identify the section of rail corridor which is outside DSS coverage (e.g. "COCKLE CREEK RAIL BRIDGE IS OUTSIDE DSS COVERAGE").

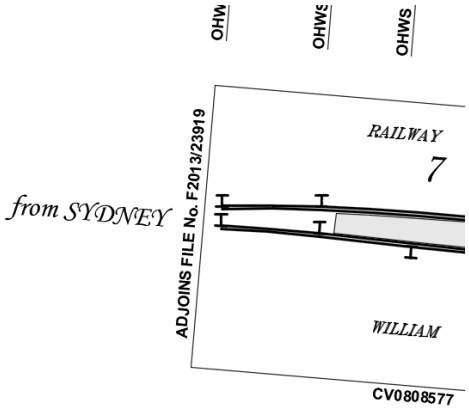


Figure 37: Cover Plan Adjoining Plan Set Information Text

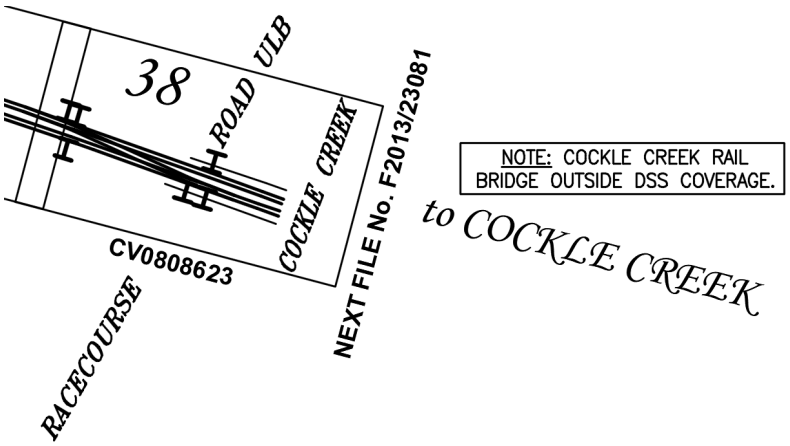


Figure 38: Cover Plan Next Plan Set Information Text & Area Specific Note

5.6.2.5 Next Station Labels

Each cover plan shall have two labels to identify the Sydney and Country side of the plan. The labels shall be "From SYDNEY" and "To XXX" (where XXX represents the next country station) and shall be placed beneath the CV Numbers. Refer to Section 5.5.3.2 for more information.

5.6.2.6 Road Names

Roads shall be labelled on the cover plans, only roads abutting or crossing the corridor shall be labelled. Road labels shall be created using DSS Proper text format and 2.0 high. Road labels may be spread over multiple detail plan borders.

5.6.2.7 Major Built and Topographical Feature Labels

Major features, including train stations, shall be labelled on the cover plans. Labels shall be created using DSS Proper text format and 2.5 high.

5.6.2.8 Northpoints

Northpoints shall be placed in the model space as per T MU MD 00006 ST in the top left portion of sheet if possible. Refer to Section 5.1.7.2 for more information.

5.6.2.9 Notes

All Cover plans must include a note specifying the other Cover plans and Information sheets required to be read in conjunction that Cover plan. Refer to Section 5.4.3.1.

5.6.2.10 Diagram Labels on Cover Sheets

Any diagram that is not shown on the same sheet as the detail plan it is generated from must be shown and labelled on the Cover plan. The diagram outline shall be shown as per in Section 5.5.4.2. The Label is to include the Diagram Number and the Sheet and CV Number of where the diagram is placed. Diagrams placed on the same detail plan it is generated from are not shown on cover sheets.

Property	Value
Layer	R-GNRL-DRWG-AREA
Style	DSS-TITLEBLOCK-4
Height	2.0

Table 26: Diagram Cover Sheet Label Properties

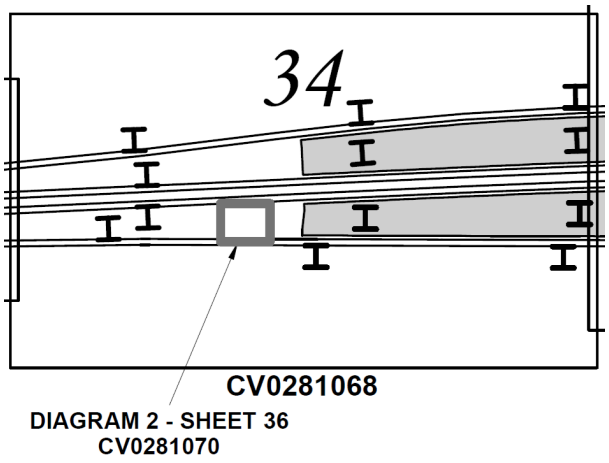


Figure 39: Diagram on Separate Plan Example

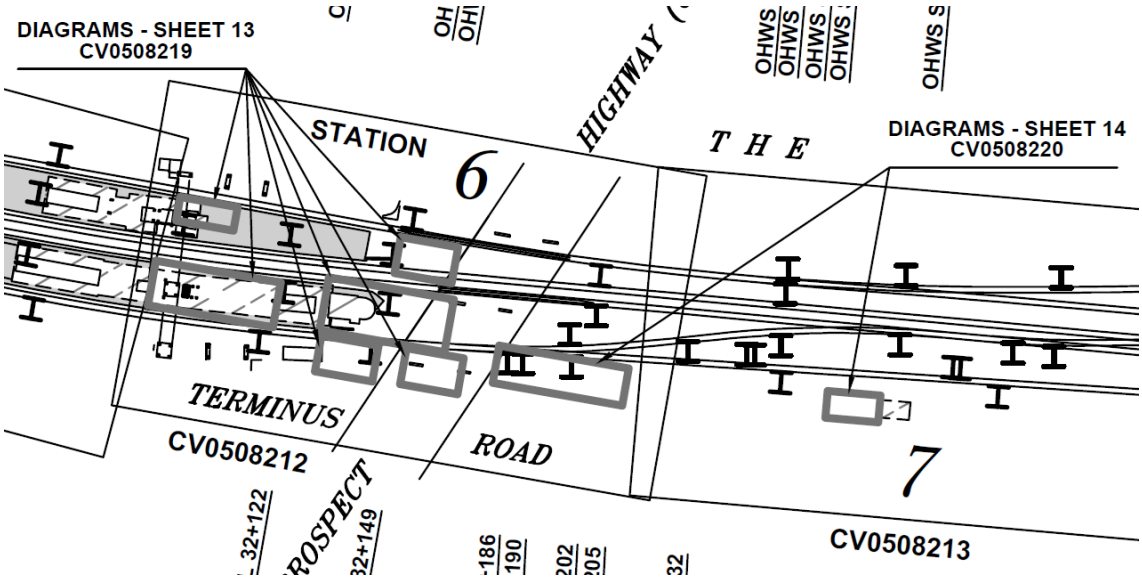


Figure 40: Multiple Diagrams on Multiple Separate Plans example

6 Work As Executed

Completion of Work-as-executed (WAsEx) plan updates are a mandatory requirement for obtaining DSS Plans. WAsEx plans shall be prepared and submitted on the completion of all newly installed services and infrastructure (including all changes to existing services and infrastructure).

WAsEx plans are to be submitted within 4 weeks after practical completion of the project and prior to CMWEB Gate 5. Work-as-executed (WAsEx) plans shall be prepared in compliance with this procedure and T MU MD 00006 ST for all works. All WAsEx plans prior to submission to USU are required to be signed as verified and approved by the Project.

Prior to submitting a Services Search Request Form the Project Manager must contact the USU DSS Survey Coordinator to determine whether WAsEx Updates are required. The USU DSS Survey Coordinator will determine the most effective way to deliver the WAsEx plan updates. If CAD files are required to undertake WAsEx plan updates, the DSS Survey Coordinator will authorise the issue of the CAD files to the Project.

6.1 Minor WAsEx

In some cases the WAsEx plan updates are considered to be minor in nature to the integrity of the plans. In these circumstances Plan Mark-ups on existing plans using field measurements may be accepted.

The determination of whether WAsEx updates are minor is at the discretion of the DSS Survey Coordinator. The following examples are WAsEx updates that may be considered minor:

- Powerpole replacements (like for like replacement)
- Change of route code without new containments installed
- Installation of single route typically less than 10 metres
- Removal of routes only
- Removal of minor features only
- Install of a single block symbol feature (without routes attached)
- Some minor feature installations without routes (e.g. Bike Locker).

Plan Mark-ups will only be accepted after the DSS Survey Coordinator has verified that the field measurements can plot the features accurately. The DSS Survey Coordinator may also require that field measurements are drafted on existing plans and signed as verified and approved by the project prior to acceptance by USU.

6.1.1 Plan Mark-ups

DSS Plan Mark-ups are to contain all changes to DSS Plans and shall be completed on the current version of DSS plan. All installed, modified and removed works are required to be shown according to Table 26.

Installation and changes to service routes may result in different outcomes. Any changes to routes require sufficient information to be supplied so that the correct changes can be applied. Refer to Section 7.2.2 for changes to routes.

Entity	Method
Installed Symbol Feature	Position and label drawn in red/pink. 3 Horizontal Distance lines triangulated as per Section 6.1.1.1
Installed Linework and Services	Drawn linework in red/pink with distances along linework and from features. End points triangulated as per Section 6.1.1.1 if not ending at existing structure shown on DSS plan.
Modified Services	Changed services to be highlighted in Pink and annotated with changes as per Section 7.2.2
Deleted Linework and Services	All linework segments highlighted in Orange. Services are only deleted (and highlighted in orange) if all services and the containments have been removed in that route.

Table 27: Plan Mark-up Requirements

6.1.1.1 Field Measurement

Field measurements are required to determine the position of features when undertaking minor WAsEx updates. Measurement of features shall be done via triangulation.

The measurements collected must be sufficient for defining the horizontal position of features through measurements from 3 shown features on the DSS Plan. Distances shall be measured horizontally to the nearest centimetre from the closest structures and/or square offsets from aboveground linework.

Accurate measurements from features shown on DSS plans is dependent upon how the existing feature is displayed on the DSS Plan. Distances must be taken from the existing features as per the table below.

Existing Feature on DSS Plan	Location point for distance measurement	Example
Block Symbol	Distance to be measured from centre of the feature	From centre of OHWS metal mast.
Linework	Distance to be measured from corner of feature Or Perpendicular from linework	From corner of building Perpendicular offset from fence or distance to bend in fence.
Track	Perpendicular from Running Face of nearest Rail.	

Table 28: Field Measurement Requirements

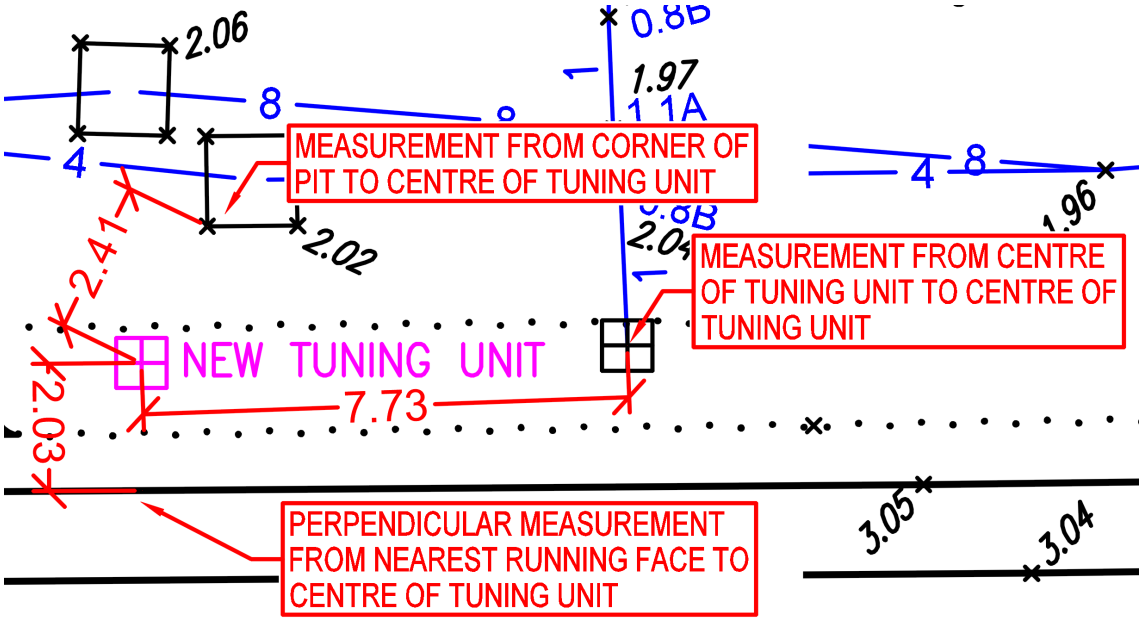


Figure 41: Field Measurements

6.1.1.2 Field Mark-up Signatures

Field mark-ups on existing plans shall be signed as verified and approved by the project and submitted to USU. A single signature will be accepted (as both verified and approved) from Sydney Trains/TfNSW employees. Signatures must be in accordance with Section 6.3.

6.2 Typical WAsEx

In all other cases, not considered by the DSS Survey Coordinator to be Minor, the works will be considered Typical WAsEx. All Typical WAsEx will need to be surveyed and drafted by the project and updates to CAD and PDF files created.

A suitable survey resource from the DSS Survey Panel can be engaged by the Project Manager or the project can liaise with the USU DSS Survey Coordinator to assist in the capture of WAsEx data in accordance with this procedure and T MU MD 00006 ST.

Major Projects may be required to enter into a DSS Management Plan prior to obtaining control of DSS Plans. This will be determined by the DSS Survey Coordinator and the DSS Management Plan stipulates further requirements to ensure WAsEx updates are managed adequately.

6.3 DSS WAsEx Plan Project Approvals

In accordance with T MU MD 00006 ST the relevant Configuration Change Request number, District Reference number and project description shall be applied to the title block Amendment box on each plan.

DSS WAsEx submissions must be verified and approved by the project through signatures applied to the amendment box.

Signatures must be applied prior to submission to USU for compliance review. Unsigned submissions cannot be accepted or reviewed for compliance by USU.

6.3.1 Signatures

DSS WAsEx plans have two signature fields that are required to be completed (refer to Section 11.4.3 of T MU MD 0006 ST), being verified and approved. To be able to sign either field the person must have completed the DSS ELearning module (which is also a prerequisite of being issued control of the plans).

6.3.1.1 Verified Signature

The person signing the verified panel (i.e. delegated representative from the TAO or Sydney Trains or TfNSW) is certifying that:

- They are a person competent to verify all works by the project have been captured (i.e. knowledgeable of the extent of works undertaken by the project)
- All changes shown on the plan are a true and accurate representation of all works under taken by the project
- All works undertaken by the project (in relation to that DSS plan) have finished and the associated control of that plan can be closed

6.3.1.2 Approved Signature

The person signing the Approved panel (typically Sydney Trains project engineer or project manager or TfNSW project manager) is certifying that:

- They are a Sydney Trains/TfNSW employee related to the project
- The person who has verified the plans is an appropriate person to undertake the responsibilities of the verifier
- All works for the project (in relation to that DSS plan) have finished and the associated control of that plan can be closed.

6.3.1.3 Acceptable Signature Formats

Signatures are required to be of forms accepted by T MU MD 00006 ST.

As per T MU MD 0006 ST the following three signatures formats are acceptable on DSS WAsEx Plans:

- **wet signature:** original handwritten signature in ink on original drawing
- **electronic signature:** electronic equivalent of a handwritten signature, where a person adopts the contents of an electronic message through any electronic means. An electronic signature creates an audit history that cannot be repudiated, which includes verification of who signed the document and the date and time stamp of when it was signed.
- **digital signature:** an electronic signature that includes all of the elements mentioned in electronic signature. Additionally, it also includes a certificate of authority issued by a third party

Where the signatories are not the listed controllers of the plans for that Control the names of the signatures shall be provided in the WAsEx submission.

Once accepted as compliant the DSS Survey Coordinator can endorse the Final Certification of Project Works and associated documentation in accordance with Configuration Change Management processes.

6.4 WAsEx Submissions

6.4.1 Minimum Submission Requirements

USU will only accept submissions for review once all the following information has been supplied depending upon WAsEx Classification.

WAsEx Classification	Document	Refer
Minor	Signed Field Mark-ups	Section 6.1.1.2
Typical	DSS CAD Files	Section 7
	DSS Plans (in PDF Format)	
	Signed DSS Plans	Section 6.3

Table 29: Minimum Submission Requirements

6.4.2 Compliance Checks

The USU checks all WAsEx submissions for compliance prior to acceptance. PDF and CAD Files are checked for compliance against this document and T MU MD 00006 ST, with a focus on ensuring that complete information has been supplied for underground routes. The checking of routes includes but is not limited to:

- checks on connections between existing and new route interfaces
- sufficient survey points and Depth Tags have been collected along routes.

6.5 GIS and VPR submission

WAsEx information will be used to update the existing DSS plans. Compliant CAD and image rendition files containing WAsEx details shall be forwarded to Sydney Trains GIS unit by the USU for updating of the corporate GIS. The USU shall submit the finalised DSS plans to the VPR, and arrange for superseded plans to be archived.

6.6 WAsEx Process

The WAsEx process flow diagram below shows the major steps and interactions with the Underground Services Unit (USU) necessary in the creation of WAsEx Plans.

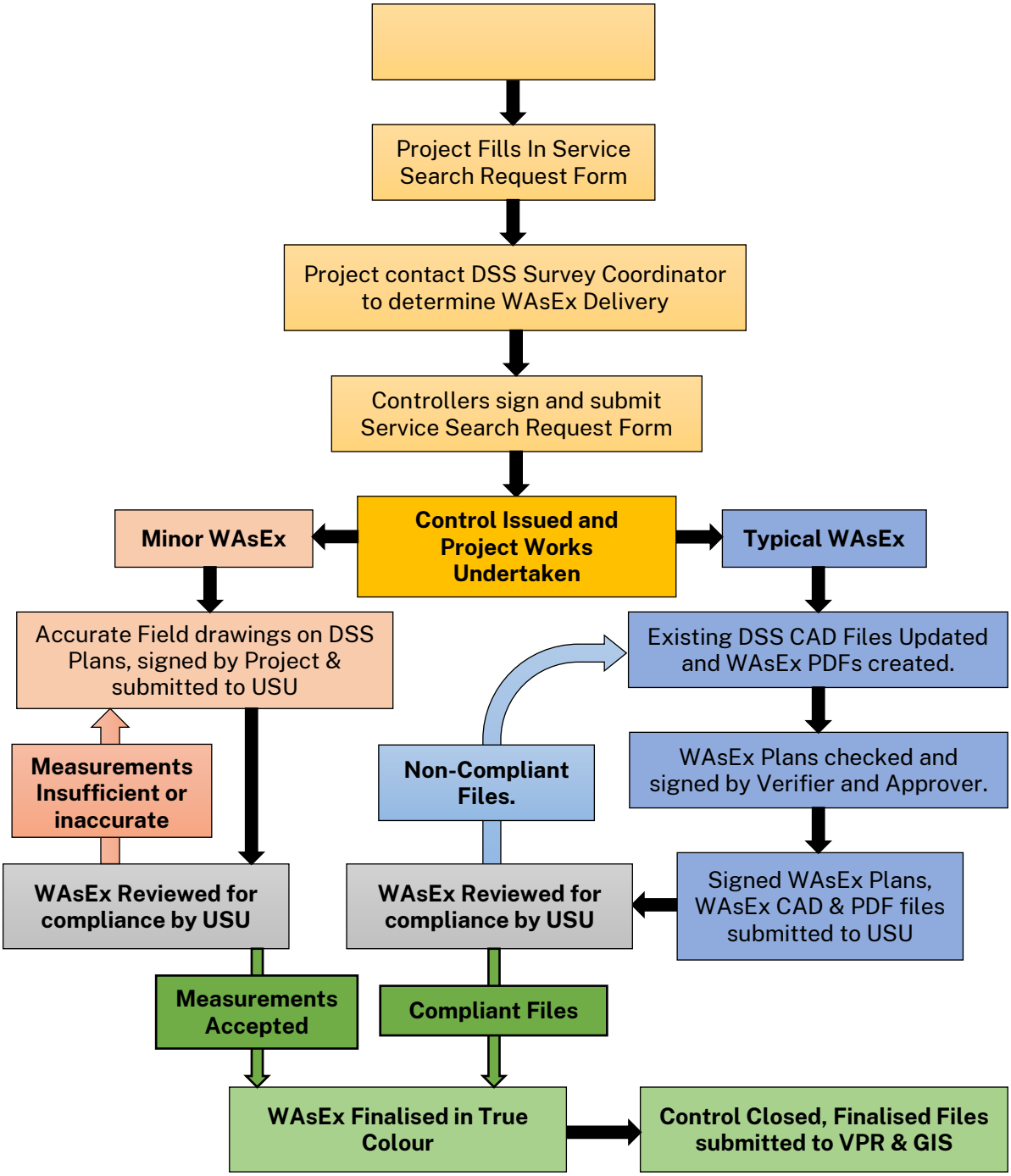


Figure 42: WAsEx Process

7 WAsEx CAD Drafting

Drafting of all elements in WAsEx plans shall be done in accordance with their respective section regarding their creation and the additional requirements listed in this section which are required to display WAsEx elements correctly.

Any services found, but not shown on the existing DSS plans, shall be surveyed in the vicinity of the project's work area, included in WAsEx plans and may be annotated with 'by others'. Every effort shall be made to determine the origin of these services. If the service is unable to be identified only then shall route 199 be used.

'U' routes will not be used/accepted for new installations and should only be used when absolutely necessary for previously unrecorded services.

All external party works installed within railway boundaries must comply with AS 4799, THR CI 12190 ST, T MU MD 0006 ST and this procedure to provide WAsEx.

WAsEx Plans are created utilising 3 separate CAD Files:

- DRAFT CAD file: the base file which will be the supplied CAD file for the current version of the plans; containing the existing model and sheet layouts
- WAX CAD file: model of all new and modified objects by the project
- DEL CAD file: model of all features deleted by the project.

The DRAFT CAD File shall externally reference (XREF) the information contained in the WAX & DEL CAD files. No information should be duplicated across the files.

7.1.1 WAsEx CAD Drawing Naming Convention

Each separate CAD File shall be named as per the tables below.

DRAFT CAD File Naming:

First OHWS Number starting with line letter code	DSS Number	Job status	Last modified date	File extension
AB123+456	_F2012-12345	_DRAFT1 _DRAFT2	_12.12.2021	.dwg

WAX CAD File Naming (new/modified features):

First OHWS Number starting with line letter code	DSS Number	WAsEx Detail	Last modified date	File extension
AB123+456	_F2012-12345	_WAX(**REF**)	_12.12.2021	.dwg

DEL CAD File Naming (removed/deleted features):

First OHWS Number starting with line letter code	DSS Number	WAsEx Detail	Last modified date	File extension
AB123+456	_F2012-12345	_DEL(*REF*)	_12.12.2021	.dwg

REF: To be Service Search Number of the project (e.g. CD-SS-21001).

7.1.2 WAsEx PDF File Naming Convention

WAsEx PDF files are to follow the naming convention set out in Section 3.12. The first submission of WAsEx plans to USU shall all be amendment level 1.

Internal submissions between contractors and survey companies are to utilise the fields TAO Drawing Reference Number and TAO Drawing File Name for their internal revisions prior to being sent to the USU. Refer to T MU MD 00006 ST Section 11.4.1 for more details.

The example below outlines the process to be followed for WAsEx PDF file naming:

- WAsEx Plan Draft 1 submission: 0123457_A1c.pdf
- WAsEx Plan Draft 2 submission: 0123457_A2c.pdf
- Finalised DSS Plan: 0123457_B0c.pdf

7.2 WAsEx Model Objects

7.2.1 WAsEx Object Colours

WAsEx plans are modified DSS Plans where all features not modified by the WAsEx are coloured consistent with DSS Plans and changes shall be coloured based on Table 29.

Colour		AutoCAD Entity Colour	WAsEx Object Category
	Pink	6	WAX Objects; including but not limited to: • New Features (infrastructure, routes, banks etc.) created by Project. • End result of modifications to existing features. • New Text and Annotations related to new or modified features. • Existing features identified by Project not shown on DSS.
	Orange	30	Deleted Objects; including but not limited to: • Existing infrastructure and routes removed by the Project. • Initial display of existing infrastructure, features and services that are no longer correct as a result of modification by Project. • Text and annotations no longer required as a result of deletion or modification of features by Project. • Infrastructure, features and services identified as no longer existing by the project (even if not removed by Project).

Table 30: WAsEx Colours and Objects

To show that features are WAsEx information on DSS Plans is achieved by changing an object's colour property as per table above, all other properties of the feature shall be as per Section 5.

Objects that are shown as WAX or Deleted shall be placed in their respective WAX (all pink entities) and DEL (all orange entities) CAD Files. WAX and DEL CAD Files are to contain only model space entities.

7.2.2 WAsEx Changes to Existing Routes and Depth Tags

There are a number of possible outcomes when WAsEx changes an existing route, including but not limited to:

- Complete removal of service and containment
- Removal of all services but retaining the containment
- Removal or redundancy of some services in a containment
- Retaining service and containment but making services redundant
- Addition of services to an existing containment.

Each change above to an existing route may result in a different drafted result.

See Table 30 to Table 32 below for guidance on changes existing service routes. Please note that where changes to an existing route hinder the readability of services then route annotations shall be placed (refer to Section 7.2.3).

Action (removed services)	Drafted Results
Complete Removal of all services and containments in a route	1. Show existing route as deleted 2. Show any associated Depth Tags as Deleted
All Services in the route are removed but no changes to the containment(s)	1. Show original route line as deleted 2. Show duplicate line as Vacant containment route code as WAX 3. Add Route Text Box of two routes (in steps 1 & 2) in DEL CAD file 4. Show Existing associated Depth Tags as deleted 5. Show duplicate copy of any associated Depth Tags as WAX on matching vacant route layer
All services of a certain type in multiple service route have been removed	1. Show original route line as deleted 2. Show duplicated line as route of remaining services as WAX 3. Add Route Text Box of two routes (in steps 1 & 2) in DEL CAD file 4. Show Existing associated Depth Tags as deleted 5. Show duplicate copy of any associated Depth Tags as WAX on remaining layer
Not all services of same type in a route have been removed	No Change

Table 31: Removing Services from Existing Route

Action (redundant services)	Drafted Results
All Services in the route made redundant	1. Show original route line as deleted 2. Duplicate line as original route with appended 'R' route code and show as WAX 3. Add Route Box of two routes (in steps 1 & 2) to DEL DWG File
All services of same type in a multiple service route have been made redundant	1. Show original route line as Deleted 2. Duplicate deleted line and apply route code of individual service using appended 'R' route code and show as WAX 3. Duplicate deleted line and apply route code of remaining active services and show as WAX 4. Add Route Box of all routes (to be placed in WAX DWG File) 5. Show Existing associated Depth Tags as deleted 6. Show duplicate copy of any associated Depth Tags as WAX on matching non-redundant route layer
Some (but not all) services of same type in route have been made redundant	No Change

Table 32: Redundant Services in Existing Route

Action (added services)	Drafted Results
Add new Service to existing route not containing that service (where route code exists for combined of new and existing services)	1. Show original route line as deleted 2. Show duplicated line as new combined route code as WAX 3. Add Route Box of two routes (in steps 1 & 2) in DEL CAD file 4. Show Existing associated Depth Tags as deleted 5. Show duplicate copy of any associated Depth Tags as WAX on new combined route code layer
Add new Service to existing route not containing that service (where no route code exists for combined of new and existing services)	1. Show duplicate line as new route code as WAX 2. Add Route Text Box of routes in WAX CAD file
Add extra services to route already containing that service	No Changes

Table 33: Adding Services in Existing Route

7.2.2.1 Amendment of Depth Tags for Topographical Changes

Where a project undertakes significant ground level changes over an area that has existing depth tags then the RL and depth tag shall be adjusted. The process for correcting depth tags is as follows:

- Show existing route, existing depth tag, point cross and RL text as deleted (orange)
- Show adjusted route, depth tag, point cross and RL text as WAsEx (pink) where:
  - All WAsEx elements have their elevation component adjusted to the new ground level
  - Depth Tag depth attribute recalculated to account for the change in ground level.

Consult with DSS Survey Coordinator to determine if this applies to project WAsEx.

7.2.3 Annotation of Routes

Where a route is installed or modified and it affects the ability to identify that route and/or existing routes then the affected routes shall be annotated with a route box (refer to section 5.2.5.2). There are two possible scenarios for the correct file to place the Route Box depending upon the number of new objects required to be listed in the route box, they are:

- if the route box only contains a single pink (and any number of deleted routes) then the route box shall be placed in the DEL CAD file
- all other scenarios that require either a new route box or changes to an existing route box shall be placed in the WAX CAD File. Existing route boxes shall only be moved to the DEL file if all routes shown in the box have been deleted.

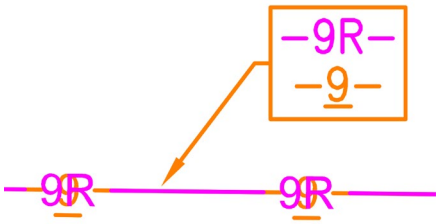


Figure 43: Example of Route Box to be added to DEL CAD File

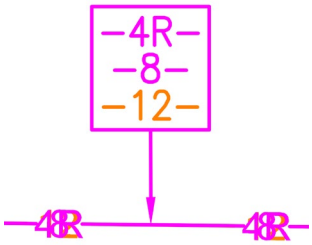


Figure 44: Example of Route Box to be added to WAX CAD File

7.2.4 Adjusting Existing Text and Annotations

Where new WAX objects overlap with existing text or annotations then those annotations shall be modified and retained in the DRAFT CAD File. Moved text and annotations are not considered WAX or Deleted objects and therefore do not change colour or be moved to the WAX or DEL CAD file. Any changes to text on the Paper space shall be made in the DRAFT CAD File and do not need to change colour.

7.2.5 Control Area Boundary Changes

Where changes to the CAB are anticipated to be made by the project the DSS Survey Coordinator shall be consulted.

If WAsEx changes any structure used to define the CAB then consideration has to be given to whether the CAB needs to change with the structure. Any changes to the definition of the CAB shall comply with the requirements of Section 5.1.7.1.

If the changed CAB now includes areas that were not previously inside the CAB then the project is to ensure that the area is validated for all existing internal and external agency services and infrastructure. Any identified services and infrastructure within the area is required to be located and surveyed and submitted as part of the Project's WAsEx. Any changes to the definition of the CAB shall comply with the requirements of Section 5.1.7.1.

Where a new installation may affect the CAB, such as a Substation, then the DSS Survey Coordinator shall be consulted as to whether the area will be excluded or included in the CAB.

7.2.6 Platform Hatching

Where WAsEx changes or extends features that define the extents of the Platform hatching then the existing platform hatch shall be retained and adjusted to align with the new WAX objects. The adjusted Platform hatch shall be retained in the DRAFT file and not changed to WAsEX colouring and not placed in WAX CAD File.

7.2.7 Removal of OHWS

The drafted result of removing OHWS is dependent upon how much of the structure was removed and shall be determined as per Table 33.

Action	Drafted Result
Total Removal of OHWS and concrete base	1. OHWS Symbol and annotation shown as Deleted
OHWS Mast removed whole Base retained in-situ	1. OHWS symbol and annotation shown as deleted 2. Box placed in F-SITE layer with annotation "OHWS BASE" (both shown as WAX).
OHWS Mast removed and base partially removed to certain depth below surface	1. OHWS symbol and annotation shown as deleted 2. Box placed in F-SITE layer with annotation "BURIED OHWS BASE" (both shown as WAX).

Table 34: WAsEx Changes for OHWS Removals

7.3 WAsEx Title blocks and Notes

All WAsEx plans shall be supplied on the latest version of the available DSS title block from the current template file. Where the current base title block is less that Version 1.5 the project is to consult with the DSS Survey Coordinator regarding this requirement.

7.3.1 WAsEx Title block changes

The latest version of the available DSS Title block has a defined visibility state, called WAsEx, to be used for all WAsEx plans. Applying this visibility state sets some of the field requirements shown for WAsEx plans in Section 3.6.1.

The Revision Field is to use the current version letter of the plan and be appended with a numerical counter which corresponds to the submission number to USU and align with Section 7.1.2.

Submissions between contractors and survey companies are to utilise the fields TAO Drawing Reference Number and TAO Drawing File Name for their internal revisions prior to being sent to the USU. Refer to T MU MD 00006 ST Section 11.4.1 for more details.

7.3.2 Notes on paper space

There are 3 separate notes that can be applied to WAsEx plans. Each note is available as a block in the current template file. The notes are:

- Base Data note (DSS-BASED-INFO-NOTE); containing CV number and Revision of plan used as the base
- WAX colour note (DSS-WAX-NOTE); to be coloured pink
- Deleted colour note (DSS-DEL-NOTE); to be coloured orange.

These notes shall be placed in the drawing area of the plan on the paper space of the DRAFT CAD File. WAX and Deleted colour notes are not required if the WAsEx plans do not display any respective WAX or Deleted objects.

7.4 Completion of Amendment Box

All WAsEx plans at a minimum are required to have a completed Amendment box stating the DRN (and CCR if available) for which the WAsEx relates and a brief description of the works and be completed as per requirements of T MU MD 0006 ST Section 11.4.3 Amendment Box for DSS Drawings.

7.5 Changes to Drawing Area of Base Plan

The extents of the drawing area on a WAsEx Plans shall not be changed from the existing Base Plan. The sheet size and orientation shall not be changed for a WAsEx plan. Where WAsEx information extends beyond the display of the base plan drawing area then the DSS Survey Coordinator shall be consulted.

7.6 Addition of Diagrams

Diagrams for WAsEx may be added on the same page on which the diagram outline is shown, as per Section 5.5.4. Where there is insufficient space on the same plan then the DSS Survey Coordinator shall be consulted.

7.7 Finalisation of Plans

The project may be required to produce Finalised (true colour) versions of WAsEx plans. Depending upon other works in the area this requirement may be waived by the DSS Survey Coordinator.

WAsEx plans will be converted to a Final DSS plan through

- Removing deleted information
- Converting WAX information to true colour
- Updating Title block to final state with next revision letter
- Removing Notes generated by Section 7.3.2
- Updating Amendment panel with text for signatures.

WAsEx plans and Finalised versions of WAsEx plans will then be processed as per Section 6.5.

8 Appendixes

8.1 Layers

Layer	Colour	Linetype	Lineweight (mm)	Description
0	2	CAB	1	Control Area Boundary (CAB)
1	5	1	Default	S - DB
2	5	2	Default	S - GST
3	5	3	Default	S - GLT
4	5	4	Default	S - P
5	5	5	Default	C - DB
6	5	6	Default	C - GST
7	5	7	Default	C - GLT
8	5	8	Default	C - P
9	5	9	Default	S & C - DB
10	5	10	Default	S & C - GST
11	5	11	Default	S & C - GLT
12	5	12	Default	S & C - P
13	5	13	Default	OF - DB
14	5	14	Default	OF - GST
15	5	15	Default	OF - GLT
16	5	16	Default	OF - P
17	5	17	Default	LV - DB
18	5	18	Default	LV - GST
19	5	19	Default	LV - GLT
20	5	20	Default	LV - P
21	5	21	Default	HV - DB
22	5	22	Default	HV - GST
23	5	23	Default	HV - GLT
24	5	24	Default	HV - P
25	5	25	Default	S & C, OF - DB
26	5	26	Default	S & C, OF - GST
27	5	27	Default	S & C, OF - GLT
28	5	28	Default	S & C, OF - P
29	5	29	Default	C, OF - DB

Layer	Colour	Linetype	Lineweight (mm)	Description
30	5	30	Default	C, OF - GST
31	5	31	Default	C, OF - GLT
32	5	32	Default	C, OF - P
33	5	33	Default	OF, LV - DB
34	5	34	Default	OF, LV - GST
35	5	35	Default	OF, LV - GLT
36	5	36	Default	OF, LV - P
37	5	37	Default	OF, HV - DB
38	5	38	Default	OF, HV - GST
39	5	39	Default	OF, HV - GLT
40	5	40	Default	OF, HV - P
41	5	41	Default	S, LV - DB
42	5	42	Default	S, LV - GST
43	5	43	Default	S, LV - GLT
44	5	44	Default	S, LV - P
45	5	45	Default	S, HV - DB
46	5	46	Default	S, HV - GST
47	5	47	Default	S, HV - GLT
48	5	48	Default	S, HV - P
49	5	49	Default	S & C, LV - DB
50	5	50	Default	S & C, LV - GST
51	5	51	Default	S & C, LV - GLT
52	5	52	Default	S & C, LV - P
53	5	53	Default	S & C, HV - DB
54	5	54	Default	S & C, HV - GST
55	5	55	Default	S & C, HV - GLT
56	5	56	Default	S & C, HV - P
57	5	57	Default	S, OF - DB
58	5	58	Default	S, OF - GST
59	5	59	Default	S, OF - GLT
60	5	60	Default	S, OF - P
61	5	61	Default	LV, HV - DB
62	5	62	Default	LV, HV - GST

Layer	Colour	Linetype	Lineweight (mm)	Description
63	5	63	Default	LV, HV - GLT
64	5	64	Default	LV, HV - P
65	5	65	Default	S & C,OF , LV - DB
66	5	66	Default	S & C,OF , LV - GST
67	5	67	Default	S & C,OF , LV - GLT
68	5	68	Default	S & C,OF , LV - P
69	5	69	Default	S & C,OF , HV - DB
70	5	70	Default	S & C,OF , HV - GST
71	5	71	Default	S & C,OF , HV - GST
72	5	72	Default	S & C,OF , HV - P
73	5	73	Default	S & C,OF , LV, HV - DB
74	5	74	Default	S & C,OF , LV, HV - GST
75	5	75	Default	S & C,OF , LV, HV - GLT
76	5	76	Default	S & C,OF , LV, HV - P
79	5	79	Default	CUL - unknown
80	5	80	Default	TD - unknown
83	5	83	Default	CA - DB
84	5	84	Default	CA - AG
85	5	85	Default	AR - unknown
86	5	86	Default	S - UB
87	5	87	Default	C - UB
88	5	88	Default	S & C - UB
89	5	89	Default	OF - UB
90	5	90	Default	LV - UB
91	5	91	Default	HV - UB
92	5	92	Default	S & C,OF - UB
93	5	93	Default	C,OF - UB
94	5	94	Default	OF, LV - UB
95	5	95	Default	OF, HV - UB
96	5	96	Default	S, LV - UB
97	5	97	Default	S, HV - UB
98	5	98	Default	S & C, LV - UB
99	5	99	Default	S & C, HV - UB

Layer	Colour	Linetype	Lineweight (mm)	Description
100	5	100	Default	S , OF - UB
101	5	101	Default	LV, HV - UB
102	5	102	Default	S & C, OF, LV - UB
103	5	103	Default	S & C, OF, HV - UB
104	5	104	Default	S & C, OF, HV, LV - UB
105	5	105	Default	LV - ARL
106	5	106	Default	HV - ARL
107	5	107	Default	DC - DB
108	5	108	Default	DC - GST
109	5	109	Default	DC - GLT
110	5	110	Default	DC - P
111	5	111	Default	E - unknown
112	5	112	Default	EB - unknown
113	5	113	Default	CCTV - P
114	5	114	Default	CCTV - GST
115	5	115	Default	CCTV - GLT
116	5	116	Default	CCTV, C - P
117	5	117	Default	CCTV, C - GST
118	5	118	Default	CCTV, C - GLT
119	5	119	Default	CCTV, LV - P
120	5	120	Default	CCTV, LV - GST
121	5	121	Default	CCTV, LV - GLT
122	5	122	Default	CCTV, C, LV - P
123	5	123	Default	CCTV, C, LV - GST
124	5	124	Default	CCTV, C, LV - GLT
125	5	125	Default	SD - P
126	5	126	Default	SD – GST
127	5	127	Default	SD - GLT
128	5	128	Default	S - ARL
129	5	129	Default	C - ARL
130	5	130	Default	OF - ARL
131	5	131	Default	F - unknown
132	5	132	Default	Vacant - P

Layer	Colour	Linetype	Lineweight (mm)	Description
133	5	133	Default	Vacant - GST
134	5	134	Default	Vacant - GLT
197	136	Continuous	Default	Pit: Large Circular & Rectangular Pit
198	136	Continuous	Default	Pit: Small Pit Centroid
199	5	199	Default	USM - unknown
200	3	200	Default	PL33 - EXT
201	3	201	Default	PG33 - EXT
202	3	202	Default	GLP - EXT
203	3	203	Default	GHP - EXT
204	3	204	Default	TLS - DB
205	3	205	Default	TLS - GST
206	3	206	Default	TLS- GLT
207	3	207	Default	TLS - P
208	3	208	Default	OPT - DB
209	3	209	Default	OPT - GST
210	3	210	Default	OPT - GLT
211	3	211	Default	OPT - P
212	3	212	Default	PWL - DB
213	3	213	Default	PWL - GST
214	3	214	Default	PWL - GLT
215	3	215	Default	PWL - P
216	3	216	Default	VS - DB
217	3	217	Default	VS - GST
218	3	218	Default	VS - GLT
219	3	219	Default	VS - P
220	3	220	Default	WTR - unknown
221	3	221	Default	SWR - unknown
222	3	222	Default	OS - DB
223	3	223	Default	UE - DB
224	3	224	Default	OS - GST
225	3	225	Default	OS - GLT
226	3	226	Default	OS - P
227	3	227	Default	OS - UB

Layer	Colour	Linetype	Lineweight (mm)	Description
228	3	228	Default	OS - unknown
229	3	229	Default	TLS - UB
230	3	230	Default	OPT - UB
231	3	231	Default	PWL - UB
232	3	232	Default	VS - UB
233	3	233	Default	PL33 - ARL
234	3	234	Default	PG33 - ARL
235	3	235	Default	DRE - P
236	3	236	Default	TLS - ARL
237	3	237	Default	OPT - ARL
238	3	238	Default	PWL - ARL
239	3	239	Default	VS - ARL
240	3	240	Default	OS - ARL
241	3	241	Default	OF - ARL
242	3	242	Default	E - unknown
243	3	243	Default	F - unknown
244	3	244	Default	RMS - P
245	3	245	Default	RMS - GST
246	3	246	Default	RMS - GLT
247	3	247	Default	RMS - ARL
248	3	248	Default	NBN - DB
249	3	249	Default	NBN - GST
250	3	250	Default	NBN - GLT
251	3	251	Default	NBN - P
252	3	252	Default	NBN - ARL
Defpoints	7	Continuous	Default	0
F-BLDG	151	Continuous	Default	Field Survey - Buildings: Includes all building types, roofs,etc.
F-BLDG-AWNG	151	Awnings	Default	Field Survey - Buildings: Awnings
F-BLDG-HTCH	8	Continuous	0.35	Field Survey - Buildings: Patterning and hatching
F-BLDG-STAR	151	Continuous	Default	Filed Survey - Buildings: Stairs
F-BLDG-TEXT	151	Continuous	Default	Field Survey - Buildings: Text

Layer	Colour	Linetype	Lineweight (mm)	Description
F-BNDY	201	Continuous	Default	Field Survey - Boundaries: All boundary types excluding CAB and Cadastral boundaries
F-BNDY-CDST	201	Continuous	Default	Field Survey - Boundaries: Cadastral boundaries
F-BNDY-TEXT	201	Continuous	Default	Field Survey - Boundaries: Text
F-BRDG	31	Continuous	Default	Field Survey - Bridges
F-BRDG-ABUT	31	Continuous	Default	Field Survey - Bridges: Abutments
F-BRDG-FTGS	31	Continuous	Default	Field Survey - Bridges: Footings
F-BRDG-HTCH	251	Continuous	Default	Field Survey - Bridges: Patterning and hatching
F-BRDG-PIER	31	Continuous	Default	Field Survey - Piers
F-BRDG-TEXT	31	Continuous	Default	Field Survey - Bridges: Texts
F-COMS	252	Continuous	Default	Field Survey - Communication
F-COMS-TEXT	252	Continuous	Default	Field Survey - Communication: Text
F-DRAN	45	Continuous	Default	Field Survey - Drainage: Structure and symbols
F-DRAN-TEXT	45	Continuous	Default	Field Survey - Drainage: Text
F-ELEC	13	Continuous	Default	Field Survey - Electrical
F-ELEC-TEXT	13	Continuous	Default	Field Survey - Electrical: Text
F-FURN-OUTD-STRESIGN	61	Continuous	Default	Field Survey - Site: Billboard
F-FURN-OUTD-STRESIGN-TEXT	61	Continuous	Default	Field Survey - Site: Billboard Text
F-GEO	101	Continuous	Default	Field Survey - Geotechnical
F-GEO-TEXT	101	Continuous	Default	Field Survey - Geotechnical: Text
F-MISC	43	Continuous	Default	Field Survey - Miscellaneous: Text boxes, arrowheads, etc.
F-MISC-TEXT	43	Continuous	Default	Field Survey - Miscellaneous: Text
F-NATL	13	Bank	Default	Field Survey - Natural Terrain: Surfaces, bank symbology and contours etc.
F-NATL-TEXT	13	Continuous	Default	Field Survey - Natural Terrain: Text
F-OHWS	41	Continuous	Default	Field Survey - Overhead Wiring Structure
F-OHWS-TEXT	41	Continuous	Default	Field Survey - Overhead Wiring Structure: Text
F-PIT-SML	136	Continuous	Default	Field Survey - Small Pit Symbol
F-PIT-TEXT	136	Continuous	Default	Field Survey - Pit: Text

Layer	Colour	Linetype	Lineweight (mm)	Description
F-PLFM	112	Continuous	Default	Field Survey - Platform
F-PLFM-HTCH	254	Continuous	Default	Field Survey - Platform: Patterning and Hatching
F-PLFM-TEXT	112	Continuous	Default	Field Survey - Platform: Text
F-PRKG	132	Continuous	Default	Field Survey - Parking Lots
F-PRKG-TEXT	132	Continuous	Default	Field Survey - Parking Lots: Text
F-RETG-WALL	7	Retaining Wall	Default	Field Survey - Retaining Walls
F-RETG-WALL-TEXT	7	Continuous	Default	Field Survey - Retaining Walls: Text
F-ROAD	132	Continuous	Default	Field Survey - Roads
F-ROAD-TEXT	132	Continuous	Default	Field Survey - Roads: Text
F-SIGL	171	Continuous	Default	Field Survey - Signal: Signal equipment
F-SIGL-TEXT	171	Continuous	Default	Field Survey - Signal: Text
F-SITE	53	Continuous	Default	Field Survey - Site Features: Footpaths etc.
F-SITE-FENC	53	Fence	Default	Field Survey - Site: Fences
F-SITE-FENC-GATE	53	Continuous	Default	Field Survey - Site: Fences Gates
F-SITE-TEXT	53	Continuous	Default	Field Survey - Site: Text
F-SURV-RL	145	Continuous	Default	Field Survey - Reduced Level text
F-SURV-RL-OFF	252	Continuous	Default	Field Survey - Reduced Level text for area of congestion where the RL is not to be shown
F-SURV-SYMB	7	Continuous	Default	Field Survey - Survey: Survey Symbols
F-SURV-TEXT	7	Continuous	Default	Field Survey - Survey: Text
F-TRAK	51	Continuous	Default	Field Survey -Track
F-TRAK-BLST-BOTM	13	Ballast	Default	Field Survey -Track: Bottom of Ballast
F-TRAK-BLST-TOP	51	Ballast	Default	Field Survey -Track: Top of Ballast
F-TRAK-TEXT	51	Continuous	Default	Field Survey -Track: Text
F-TUNL	190	Continuous	Default	Field Survey -Tunnels
F-TUNL-TEXT	190	Continuous	Default	Field Survey -Tunnels: Text
F-UTIL	130	Continuous	Default	Field Survey - Utilities: All utilities including fuel, gas and compressed air
F-UTIL-TEXT	130	Continuous	Default	Field Survey - Utilities: Text

Layer	Colour	Linetype	Lineweight (mm)	Description
F-VEGE	60	Continuous	Default	Field Survey - Vegetation: Vegetation includes all vegetation types, garden edges, etc.
F-VEGE-TEXT	60	Continuous	Default	Field Survey - Vegetation: Text
R-DSHT-TEXT-GNRL	7	Continuous	0.18	Drawing Sheet: Text General
R-GNRL-DRWG-AREA	7	Continuous	Default	Rail CAD General - Drawing Sheet Drawing Frame
R-GNRL-TITL-TEXT	252	Continuous	Default	Rail CAD General - Title Text
R-GRID-FRAM	155	Continuous	Default	Rail CAD General - Grid Sheet: Framework
R-GRID-FRAM-OFF	157	Continuous	Default	Rail CAD General - Grid Sheet: Cover Sheet Framework
R-GRID-FRAM-TEXT	155	Continuous	Default	Rail CAD General - Grid Sheet: Framework: Text
R-GRID-NORTH	7	Continuous	Default	Rail CAD General - Grid Sheet: North Point
R-GRID-SURV	253	Continuous	Default	Rail CAD General - Grid Sheet: Survey Grid
R-GRID-SURV-TEXT	253	Continuous	Default	Rail CAD General - Grid Sheet: Survey Grid Text

8.2 Text Styles

Style Name	Font Type	Font Style	Oblique	Width	Height
DSS-BLOCK	romans.shx	SHX File	0°	1	0
DSS-FRAM-LABL	Monotype Corsiva	Regular	0°	1	0
DSS-GNRL	romans.shx	SHX File*	0°	1	0
DSS-NAME	romant.shx	SHX File*	20°	1	0
DSS-OHWS	Arial	Bold	0°	1	0
DSS-OUTSIDE-SCOPE	arial.shx	SHX File*	20°	1	0
DSS-TITLEBLOCK-1 (V1.7)	Arial Narrow	Regular	0°	1	0
DSS-TITLEBLOCK-2 (V1.7)	Arial Narrow	Italic	0°	1	0
DSS-TITLEBLOCK-3	romans.shx	SHX File*	0°	1	0
DSS-TITLEBLOCK-4	Arial	Bold	0°	1	0
DSS-TRACK	Arial	Italic	0°	1	0
Standard	Arial	Regular	0°	1	0

*SHX Files available from USU.

8.3 Permitted DSS Plan Abbreviations

A/C	Air-conditioning Unit
ABUT	Abutment
COL	Column
CONC	Concrete
FTG	Footing
HWY	Highway
LND	Landing
LOC	Location
OHWS	Overhead wire structure
OLB	Overline Bridge
PTS	Points
RET. WALL	Retaining Wall
SIG	Signal
ULB	Underline Bridge

8.4 Example Drawing Area Arrangement