NCDOT

LOCATION & SURVEYS UNIT

ORD GUIDELINES

AUGUST 18, 2023

Revised August 31, 2023:	Added Terrain Model & Null File Naming Conventions. Revised verbiage for Photogrammetry file location.
Revised October 26, 2023:	Added new 2D file for Best-Fit Alignments (ELN). No longer part of the PRL file.
Revised November 7, 2023:	Revised naming conventions to include Unit (LS) and replace underscore before DATE with hyphen. Revised Control & RW Sheets – C Series to have a DGN for Primary Control and different DGN for Secondary Control

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Workflow Documentation

FINAL SURVEY

- Survey projects using the ORD workflow will begin with a 3D file created in the Location Surveys/Working Files/Conventional folder on ProjectWise (PW). The naming convention for this file will be TIP#_LS_CON_PEF-#-DATE.DGN (i.e., R2500_LS_CON_MCK-3-230818.DGN). The # symbol matches the assignment number for the project. If the work is performed by Location & Surveys simply use LSDIVISION (i.e., LS05-2) in place of PEF in the naming convention. This file will contain all the 3D data on a project including but not limited to Control, DTM's, Storm Drain, Sanitary Sewer and Topography.

- A 2D file will need to be created in the Location Surveys/Working Files folder that will contain the Property data. The naming convention for this file will be TIP#_LS_PRL_PEF-#-DATE.DGN. If the work is performed by Location & Surveys simply use LSDIVISION (i.e., LS05-2) in place of PEF in the naming convention.

- A 2D file will need to be created in the Location Surveys/Working Files folder that will contain the Best-Fit Alignment data. The naming convention for this file will be TIP#_LS_ELN_PEF-#-DATE.DGN. If the work is performed by Location & Surveys simply use LSDIVISION (i.e., LS05-2) in place of PEF in the naming convention.

- A 2D file will need to be created in the Location Surveys/Working Files folder that will contain the SUE data. The naming convention for this file will be TIP#_LS_SUE_PEF-#-DATE.DGN.

- Typically, there is a 3D file provided by Photogrammetry. A copy of the photogrammetric file should be placed in the Location Surveys/Working Files folder. The naming convention for this file will be TIP#_LS_PHOTO_PEF-#-DATE.DGN. There may also be a QL2 file that should be named TIP#_LS_QL2_PEF-#-DATE.DGN. Edits to these copied files can now be performed as needed.

- A 3D file will be created in the Location Surveys/Working Files folder that will contain the Mobile Scanning and/or Static Scanning files. The naming convention for these files will be TIP#_LS_TML_PEF-#-DATE.DGN or TIP#_LS_TSL_PEF-#-DATE.DGN.

- Once satisfied with the above files, make a copy of them and place the copies in the Final Survey/Delivered References folder. Rename these copies by dropping the DATE so that we don't have duplicate file names in multiple folders. These copied files can now be edited as needed for completeness and clarity.

- Now create the Final Survey file for the project which will be a blank/container file. This file will be located in the Final Survey folder with a naming convention of TIP#_LS_FS_PEF.DGN. Reference the reference files located in the Delivered References folder and perform edits as needed to the reference files. You can take advantage of the Activate/Deactivate tools in the reference file dialog box to access/edit the reference file. Additional reference files can be added to the Delivered References folder and referenced to the FS file without making any changes to the actual FS file.

EXISTING COMPLEX TERRAIN

- Terrain models need to be made for the individual 3D files mentioned above. There may be terrain models for SURVEY, PHOTO, MOBILE SCANNING, STATIC SCANNING, UAS and/or SONAR. Individual terrain models can be created by Field Book or by a Graphical Filter.

- Create a new 3D file for the Existing Complex Terrain in the Final Survey folder. The naming convention for this file is TIP#_LS_ECTM_PEF.DGN. This file will be a blank/container file.

- Reference applicable 3D files in the Delivered References folder. Perform manual edits to individual reference files as needed to ensure that models combine together properly. You can take advantage of the Activate/Deactivate tools in the reference file dialog box to access/edit the reference file. Below are standard naming conventions for the individual Terrain Models.

FILE NAME	TERRAIN MODEL NAME
TIP_LS_CON_PEF-#-DATE.DGN	TIP_LS_CON_PEF-#
TIP_LS_TML_PEF-#-DATE.DGN	TIP_LS_TML_PEF-#
TIP_LS_TSL_PEF-#-DATE.DGN	TIP_LS_TSL_PEF-#
TIP_LS_SON_PEF-#-DATE.DGN	TIP_LS_SON_PEF-#
TIP_LS_UAS_PEF-#-DATE.DGN	TIP_LS_UAS_PEF-#
TIP_LS_PHOTO_PEF-#-DATE.DGN	TIP_LS_PHOTO_PEF-#
TIP_LS_QL2_PEF-#-DATE.DGN	TIP_LS_QL2_PEF-#

- Once all edits are complete, perform the creation of the Existing Complex Terrain Model following instructions from the ECTM SOP document and training video.

- The blank/container ECTM.DGN file will now contain the ECTM model to be used throughout the life of a project. Additional/revised data can be merged or appended into this model without making any changes to the actual ECTM DGN file.

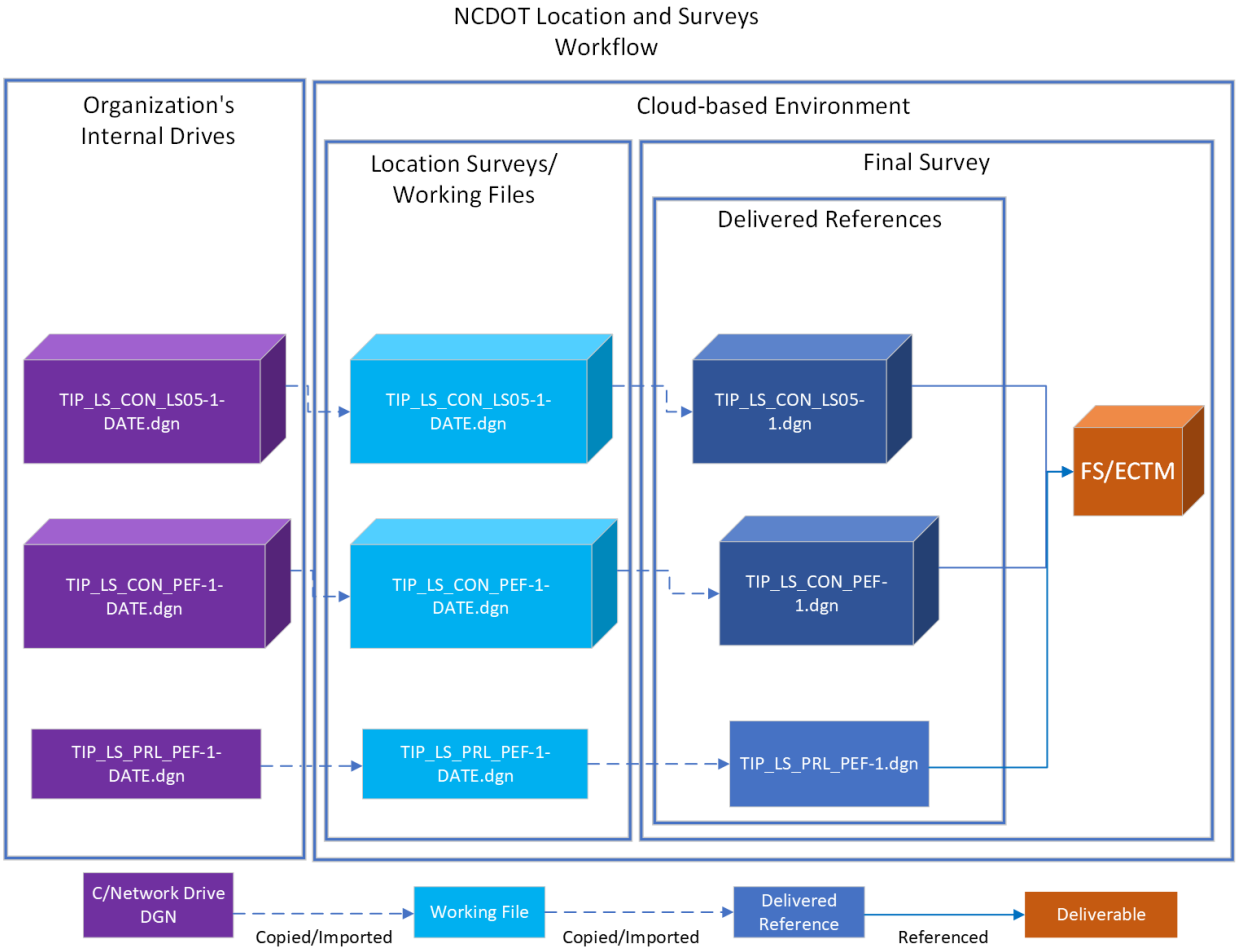

Figure 1 – NCDOT Location & Surveys Workflow

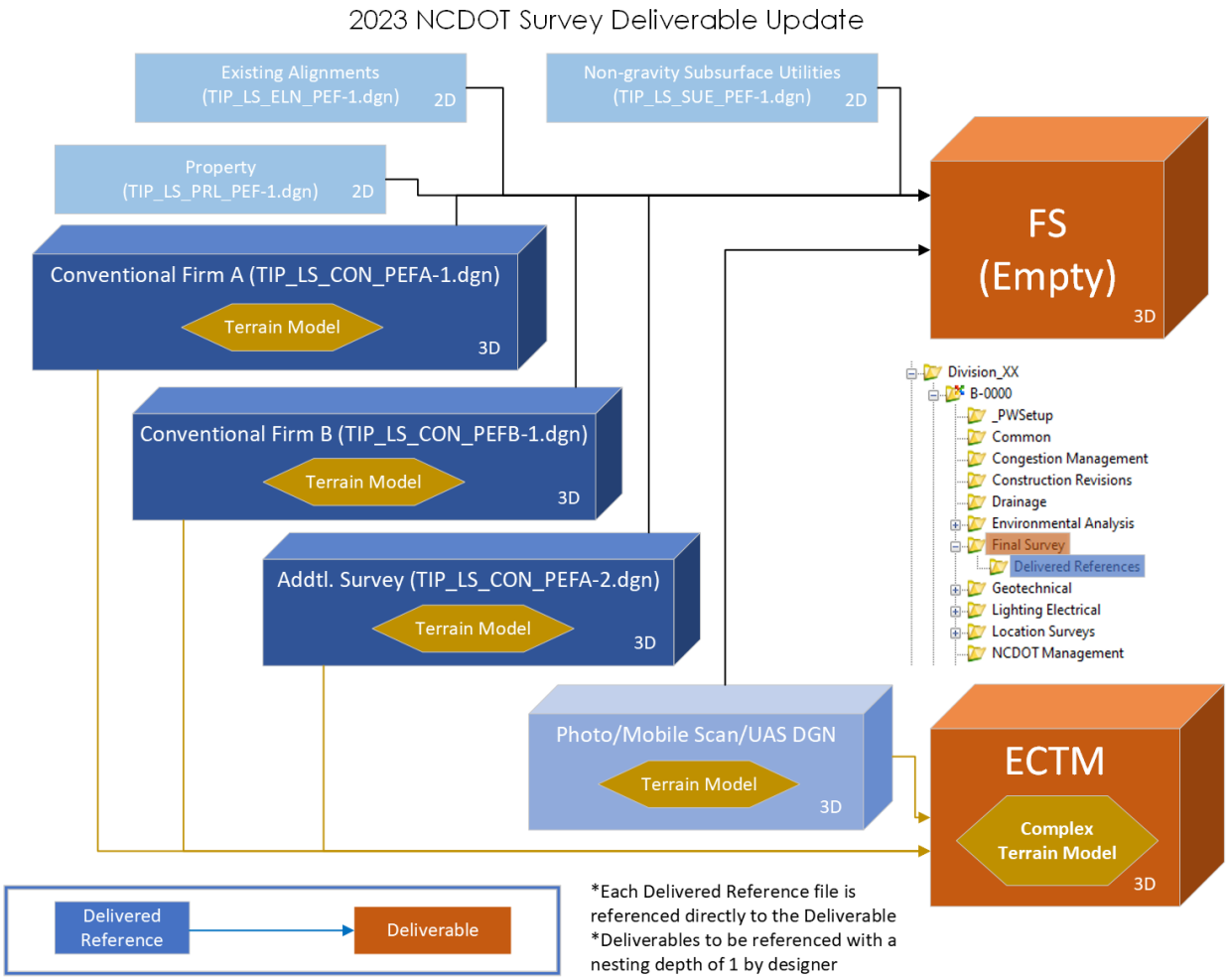

Figure 2 – NCDOT Location & Surveys Deliverable Update

Folder Structure

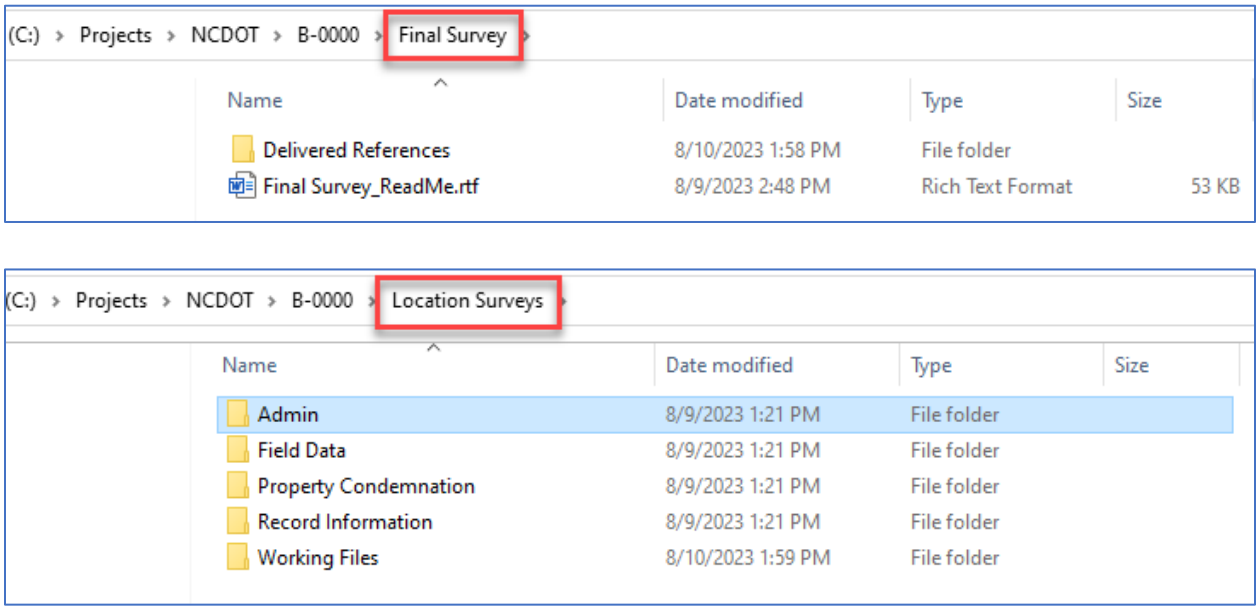

Figure 3 - View of Directory Structure on Local Drives

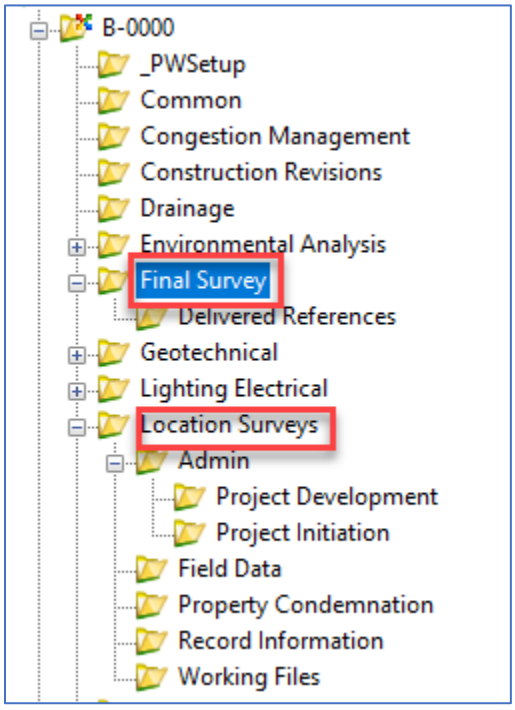

Figure 4 - View of Directory Structure on ProjectWise

ReadMe Files

Final Survey

This directory is intended to house the Final Survey file (FS) and the Existing Complex Terrain Model file (ECTM) for the project. The FS file will be a 3D file and will be blank/container files with no actual data in it. You will need to reference all the applicable files located in the Delivered References directory making edits to reference files as needed for clarity and compatibility. The blank FS file with multiple reference files is needed so that all the feature definitions are kept intact throughout the life of the project and the linkages for downstream users will stay intact. **Merging files or models together (merge to master) will lose the feature definitions and are not recommended for our workflow**.

The ECTM file will also be a blank file referencing multiple terrain models from various sources (ie Airborne LiDAR, Mobile Scanning, Static Scanning Conventional Surveys, etc). There is a Standard Operating Procedure (SOP) and training video located in the NCDOT-Location and Surveys Teams site on how to generate and update the ECTM file.

The following files should be placed here:

- Final Survey File (3D): TIP#_LS_FS_PEF.DGN
- Existing Complex Terrain Model File (3D): TIP#_LS_ECTM_PEF.DGN

Delivered References

This directory is intended to house the Final Reference files for the project. Final Reference files will have been copied from the Working Files directories and renamed by dropping the date. Edits needed for clarity and compatibility can be made to these copied files. Files in the Working File directory will remain intact as delivered from the consultant.

Location Surveys/Admin/Project Development

This directory is intended to house any critical data that is generated throughout the life of a project. The following items should be stored here:

- Review/Comment documents
- Final Survey Report
- Project Check Lists
- Critical correspondence
- Evaluations
- Misc Project Information

Location Surveys/Admin/Project Initiation

This directory is intended to house any critical documents used throughout the project initiation phase. This will be very valuable data for anyone coming behind to check scopes of work, etc.

The following items should be stored here:

- Survey Limits files
- Approved Scope of Work document
- Misc Project Information

Location Surveys/Field Data

This directory is intended to house all critical field data that is generated throughout the life of a project. The following items should be stored here:

- Closure Reports
- Control Files
- Field Notes
- Raw Files
- Site Photos
- TBC Data
- RW Staking

Location Surveys/Property Condemnation

This directory is intended to house all critical data related to property condemnation surveys. The following items should be stored here:

- PSD files
- Closure Reports
- Check Lists

Location Surveys/Record Information

This directory is intended to house all critical record information throughout the life of a project. The following items should be stored here:

- Deeds/Plats
- NCDOT Records
- Property Owner Data
- Utility Records
- Misc Record Information

Location Surveys/Working Files

This directory is intended to house all CAD files that are still in an unfinished state. The following files should be placed here. Once these files are in a finished state they will need to be copied and renamed to the Final Survey/Delivered References folder for downstream users.

WORKING DIRECTORIES	DELIVERED REFERENCES (DROP DATE)	DESCRIPTION	3D/2D
BASE MAPPING			
TIP_LS_CON_PEF-#-DATE.DGN	TIP_LS_CON_PEF-#.DGN	CONVENTIONAL	3D
TIP_LS_PRL_PEF-#-DATE.DGN	TIP_LS_PRL_PEF-#.DGN	PROPERTY	2D
TIP_LS_ELN_PEF-#-DATE.DGN	TIP_LS_ELN_PEF-#.DGN	BEST-FIT ALIGNMENTS	2D
TIP_LS_SUE_PEF-#-DATE.DGN	TIP_LS_SUE_PEF-#.DGN	SUE UTILITY - LEVEL B,C	2D
TIP_LS_SUETH_PEF-#-DATE.DGN	TIP_LS_SUETH_PEF-#.DGN	SUE UTILITY - LEVEL A - TEST HOLES	2D
TIP_LS_TML_PEF-#-DATE.DGN	TIP_LS_TML_PEF-#.DGN	TERRESTRIAL MOBILE LIDAR	3D
TIP_LS_TSL_PEF-#-DATE.DGN	TIP_LS_TSL_PEF-#.DGN	TERRESTRIAL STATIC LIDAR	3D
TIP_LS_SON_PEF-#-DATE.DGN	TIP_LS_SON_PEF-#.DGN	SONAR , BATHYMETRIC	3D
TIP_LS_UAS_PEF-#-DATE.DGN	TIP_LS_UAS_PEF-#.DGN	DRONE, UAS, UAV	2D/3D
TIP_LS_PHOTO_PEF-#-DATE.DGN	TIP_LS_PHOTO_PEF-#.DGN	COPY OF PHOTOGRAMMETRY FILE	3D
TIP_LS_QL2_PEF-#-DATE.DGN	TIP_LS_QL2_PEF-#.DGN	COPY OF QL2 FILE	3D
TIP_LS_REM_PEF-#-DATE.DGN	TIP_LS_REM_PEF-#.DGN	REALITY MODEL FILE FROM UAS DATA	3D
TIP_LS_NULL_PEF-#-DATE.DGN	TIP_LS_NULL_PEF-#.DGN	NULL FILE FOR SINGLE SURVEY DATABASE (ECTM)	3D
RIGHT OF WAY			
TIP_LS_RW01_PEF-#-DATE.DGN	SEE NOTE BELOW	TITLE SHEET	2D
TIP_LS_RW02C-P_PEF-#-DATE.DGN	SEE NOTE BELOW	C SERIES CONTROL SHEETS - PRIMARY CONTROL	2D
TIP_LS_RW02C-S_PEF-#-DATE.DGN	SEE NOTE BELOW	C SERIES CONTROL SHEETS - SECONDARY CONTROL	2D
TIP_LS_RW02D_PEF-#-DATE.DGN	SEE NOTE BELOW	D SERIES RW SHEETS	2D
TIP_LS_RW03E_PEF-#-DATE.DGN	SEE NOTE BELOW	E SERIES RW SHEETS	2D
TIP_LS_RWL_PEF-#-DATE.DGN	SEE NOTE BELOW	RW SHEETS (COPIED PPL FILE)	2D
OTHER			
TIP_LS_PSD_PEF-#-DATE.DGN	TIP_LS_PSD_PEF-#.DGN	PSD, CONDEMNATION	2D
TIP_LS_WEX-M_PEF#-DATE.DGN	TIP_LS_WEX_M_PEF-#.DGN	UNVERIFIED MAPPING GRADE WETLAND	2D
TIP_LS_WET-M_PEF-#-DATE.DGN	TIP_LS_WET_M_PEF-#.DGN	VERIFIED MAPPING GRADE WETLAND	2D
TIP_LS_WEX-S_PEF-#-DATE.DGN	TIP_LS_WEX_S_PEF-#.DGN	UNVERIFIED SURVEY GRADE WETLAND	2D
TIP_LS_WET-S_PEF-#-DATE.DGN	TIP_LS_WET_S_PEF-#.DGN	VERIFIED SURVEY GRADE WETLAND	2D
TIP_LS_FERC_PEF-#-DATE.DGN	TIP_LS_FERC_PEF-#_DATE.DGN	FERC (FEDERAL ENERGY REGULATORY COMMISSION)	2D
TIP_LS_DOI_PEF-#-DATE.DGN	TIP_LS_DOI_PEF-#.DGN	DEPT OF INTERIOR	2D
TIP_LS_ALTA_PEF-#-DATE.DGN	TIP_LS_ALTA_PEF-#.DGN	ALTA	3D
TIP_LS_RR_PEF-#-DATE.DGN	TIP_LS_RR_PEF-#.DGN	RAILROAD	2D
TIP_LS_DOD_PEF-#-DATE.DGN	TIP_LS_DOD_PEF-#.DGN	DEPT OF DEFENSE	2D
TIP_LS_MLP_PEF-#-DATE.DGN	TIP_LS_MLP_PEF-#.DGN	MAPPING LIMITS POLYGON, PHOTO LIMITS	2D
TIP_LS_SLP_PEF-#-DATE.DGN	TIP_LS_SLP_PEF-#.DGN	SURVEY LIMITS POLYGON, TIN HULL	2D
TIP_LS_PARCEL_PEF-#-DATE.DGN	TIP_LS_PARCEL_PEF-#.DGN	PARCEL POLYGON FOR DEED DRAFT	2D
TIP_LS_ASB_PEF-#-DATE.DGN	TIP_LS_ASB_PEF-#.DGN	AS-BUILT	3D
PEF# MATCHES ASSIGNMENT#			
PEF = FIRM OR LS DIVISION			
DATE = SUBMITTAL DATE IN YEAR/MONTH/DAY FORMAT (i.e., 230818)			
EXAMPLES	DESCRIPTION		
U3633_LS_CON_JMT-3-230621.DGN	3RD ASSIGNMENT TO JMT		
U3633_LS_PRL_LS05-2-230621.DGN	2ND ASSIGNMENT TO LS DIVISION 5		
NOTE:			
FINAL PDF'S OF CONTROL & RW SHEETS WILL CONTINUE TO RESIDE ON SHARE POINT.			

Figure 5 – Typical Naming Conventions

TASK	PW/LOCAL DIRECTORY	FILE NAME
Property Owner Research (GIS, DB/PB compilation)	Location Surveys/Record Information	TIP_LS_DBPB_PEF-#-DATE.PDF
Property Owner Contact (Procom Database, POC.mdb)	Location Surveys/Record Information	TIP_LS_POC_PEF-#-DATE.XLS
Photogrammetric Control (Set/Tie Photo Points)	Location Surveys/Field Data	TIP_LS_PHOTO CONTROL_PEF-#-DATE.CSV
Project Control - Horz. & Vert. (GNSS/Static/VRS, etc.)	Location Surveys/Field Data	TIP_LS_PRIMARY CONTROL_PEF-#-DATE.CSV
Baseline (Set/Traverse/Elevate)	Location Surveys/Working Files	TIP_LS_CON_PEF-#-DATE.DGN
Benchmarks (Set/Tie/Elevate)	Location Surveys/Working Files	TIP_LS_CON_PEF-#-DATE.DGN
Compute Best-Fit Alignments (EL/EY alignments)	Location Surveys/Working Files	TIP_LS_ELN_PEF-#-DATE.DGN
Loc. of Pavement DTMs - Conventional	Location Surveys/Working Files	TIP_LS_CON_PEF-#-DATE.DGN
Loc. of Pavement DTMs - Mobile Scanning	Location Surveys/Working Files	TIP_LS_TML_PEF-#-DATE.DGN
Loc. of Pavement DTMs - Static Scanning	Location Surveys/Working Files	TIP_LS_STL_PEF-#-DATE.DGN
Loc. of Rail DTMs	Location Surveys/Working Files	TIP_LS_CON_PEF-#-DATE.DGN
Loc. of Earth DTMs (Including obscured areas)	Location Surveys/Working Files	TIP_LS_CON_PEF-#-DATE.DGN
Hydrographic - Conventional (Water Features)	Location Surveys/Working Files	TIP_LS_CON_PEF-#-DATE.DGN
Hydrographic - Sonar Surveys (Sonar)	Location Surveys/Working Files	TIP_LS_SON_PEF-#-DATE.DGN
Property Mapping	Location Surveys/Working Files	TIP_LS_PRL_PEF-#-DATE.DGN
Loc. of Planimetric Features	Location Surveys/Working Files	TIP_LS_CON_PEF-#-DATE.DGN

Figure 6 – PEF Tasks with Naming Conventions & Folder Structure (Page 1 of 2)

Loc. of Non-Gravity U/G Utilities (LOS-C 811)	Location Surveys/Working Files	TIP_LS_CON_PEF-#-DATE.DGN
Loc. of Non-Gravity U/G Utilities - SUE	Location Surveys/Working Files	TIP_LS_SUE_PEF-#-DATE.DGN
Loc. Of U/G Storm Utilities	Location Surveys/Working Files	TIP_LS_CON_PEF-#-DATE.DGN
Loc. Of Gravity Sanitary Sewer Utilities	Location Surveys/Working Files	TIP_LS_CON_PEF-#-DATE.DGN
R/W & Easements Staking	Location Surveys/Field Data	TIP_LS_RW STAKING_PEF-#-DATE.CSV
Control & RW Sheets - Title Sheet	Location Surveys/Working Files	TIP_LS_RW01_PEF-#-DATE.DGN
Control & RW Sheets - C-Series - Primary Control	Location Surveys/Working Files	TIP_LS_RW02C-P_PEF-#-DATE.DGN
Control & RW Sheets - C-Series - Secondary Control	Location Surveys/Working Files	TIP_LS_RW02C-S_PEF-#-DATE.DGN
Control & RW Sheets - D Series	Location Surveys/Working Files	TIP_LS_RW02D_PEF-#-DATE.DGN
Control & RW Sheets - E Sheets	Location Surveys/Working Files	TIP_LS_RW03E_PEF-#-DATE.DGN
Control & RW Sheets - Plan Sheets	Location Surveys/Working Files	TIP_LS_RWL_PEF-#-DATE.DGN
Final Survey	Final Survey	TIP_LS_FS_PEF.DGN
Existing Complex Terrain Model	Final Survey	TIP_LS_ECTM_PEF.DGN
Ground Truthing (Scan & Control Data)	Location Surveys/Field Data	TIP_LS_SCAN CONTROL_PEF-#-DATE.CSV
Photogrammetry Check Points	Location Surveys/Field Data	TIP_LS_PHOTO CHK_PEF-#-DATE.CSV
Project Review Checklist	Location Surveys/Admin/Project Development	TIP_LS_CHK LIST_PEF-#-DATE.CSV
Preliminary Condemnation Map	Location Surveys/Property Condemnation	TIP_LS_PSD#_PEF-#-DATE.DGN
PEF# MATCHES ASSIGNMENT#		
PEF = FIRM OR LS DIVISION		
DATE = SUBMITTAL DATE IN YEAR/MONTH/DAY FORMAT (i.e., 230818)		
EXAMPLES	DESCRIPTION	
U3633_LS_CON_JMT-3-230621.DGN	3RD ASSIGNMENT TO JMT	
U3633_LS_PRL_LS05-2-230621.DGN	2ND ASSIGNMENT TO LS DIVISION 5	
NOTE:		
FINAL PDF'S OF CONTROL & RW SHEETS WILL CONTINUE TO RESIDE ON SHARE POINT.		

Figure 6 – PEF Tasks with Naming Conventions & Folder Structure (Page 2 of 2)