12d International Innovation Awards

David Mares

NorthConnex

WINNER: OVERALL

12d International Innovation Awards
12d® Model
WINNER
2016

Name:	David Mares (on behalf of LLBJV Survey Team)	Category:
Position:	Survey Manager	☐ Design & Visualisation
		☒ Survey & Construction
Company:	Lend Lease Bouygues Joint Venture	☐ Drainage, Sewer, Utilities & Rivers
		☐ Customisation
Name Project:	NorthConnex	☐ 12d Synergy
Client:	Transurban	

lendlease

BOUYGUES CONSTRUCTION
AUSTRALIA

NorthConnex

Description of Project:

The NorthConnex project is a joint venture between Bouygues Construction Australia and Lend Lease to construct a nine-kilometre tunnelled motorway. When complete, the motorway will link Sydney's north to the orbital network and form part of the National Highway route.

The link between the M1 and M2 is recognized as a high-priority project by Infrastructure Australia and in the NSW Government's *State Infrastructure Strategy* and *Long Term Transport Master Plan* as important for freight traffic, for the wider connectivity within NSW, to reduce congestion, and improve traffic flow along Pennant Hills Road.

The A$3 billion project, consisting of a construction budget of A$2.65 billion, will be funded through toll charges, with a contribution from the NSW and Federal Governments of up to $405 million each.

Scheduled for completion in late 2019, the project is the largest road tunnel project ever undertaken in Australia, presenting unique challenges in the design, survey and construction and opportunities for innovative solutions to deliver a successful, cost-effective, and high-quality project within tight timeframes.

Description of problem faced / task undertaken:

Volume of Work

The tunnelling portion of this project involves, at its peak, the use of 19 road headers for tunnel excavation (a record in Australia). For a great deal of the construction period, all these machines will be in use simultaneously and operating on a 24/7 schedule, requiring a correspondingly high amount of construction survey for setout, as-built, conformance and much more. In addition to the tunnelling, other construction activity includes the northern
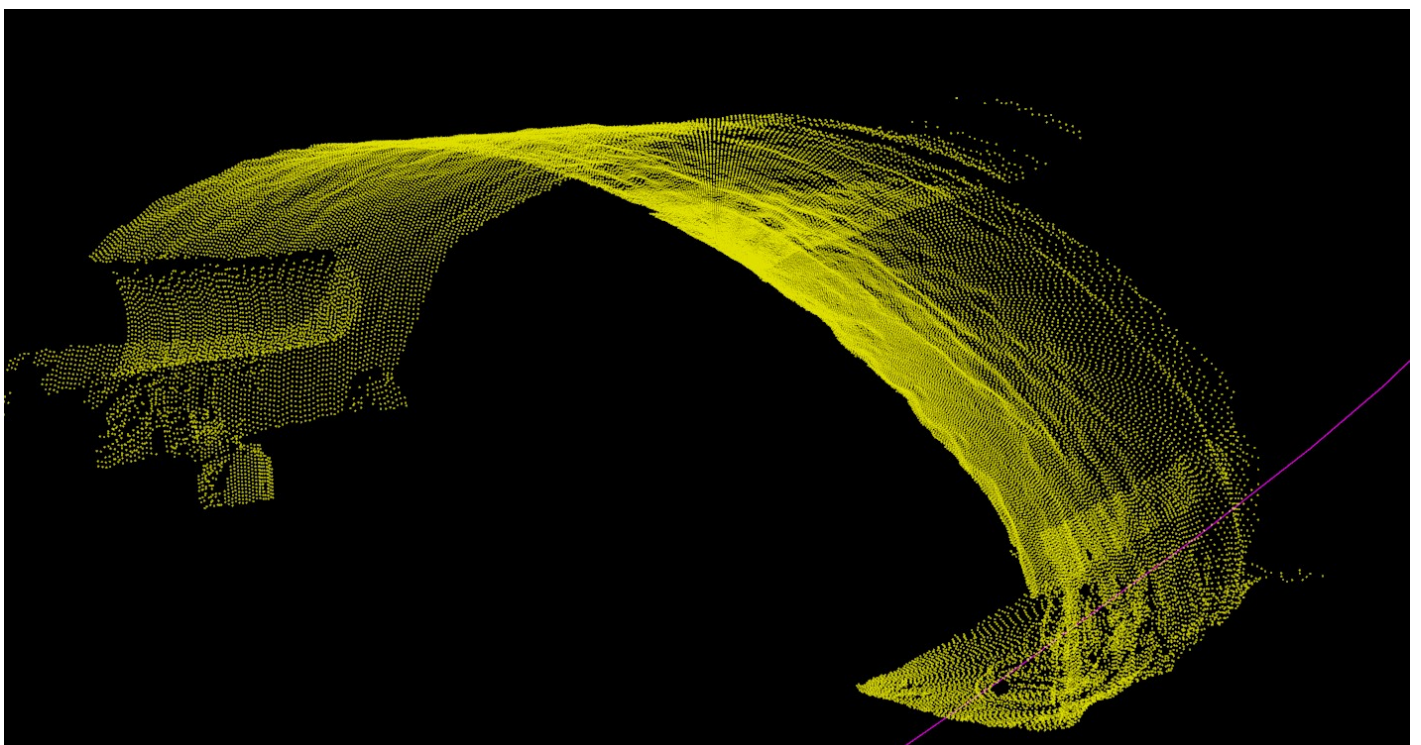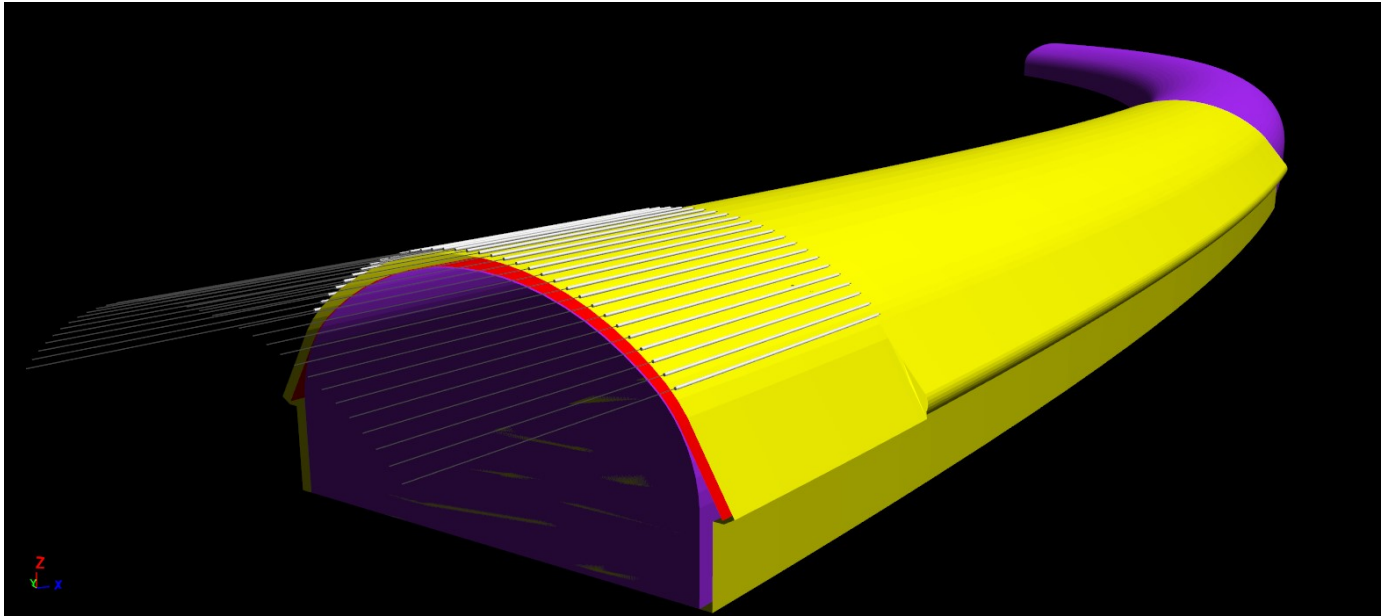
and southern interchanges- some 3km of road- and bridge-widening. As such, the project will require the creation, capture and verification of an extraordinary amount of design, survey and construction work, under constant time, cost and quality pressures.

Survey Specifications and Quality Assurance

Adherence to survey specifications (e.g. G71 Construction Surveys) and best-practice procedures by large-scale civil contractors has traditionally been quite low. NSW *Roads and Maritime Services* (RMS), the State Road Authority, has recently indicated it is taking a hard-line approach to the way surveying is managed on projects and committed itself to conducting more extensive and frequent audits. NorthConnex, as a large, high-profile project, will be held to a high standard of quality assurance and adherence to the specifications, requiring innovative solutions in survey procedures. Traditional surveying practices and workflows will not meet those needs.

Field Procedures and Survey Deliverables

Due to the size and scope of the project, many surveyors will be required over the duration of the project. These surveyors will come from a wide range of backgrounds with high variation in:
- Survey coding standards (if present at all);
- File and model naming conventions;
- Data management procedures (formal or otherwise);
- Production of plots, reports and other outputs;
- Skill level and experience; and
- Minimum levels of acceptable quality.

The project, if it is to be not only successful, but innovative, must adopt new and novel ways of managing a diverse survey workforce to ensure a consistently high-quality and time-efficient output.

Availability of suitable Survey staff

In June 2015, a Department of Employment report found there to be a nation-wide shortage of surveyors. It is expected that, around the third quarter of 2016, demand for survey resources will be extreme and the likelihood of recruiting suitable, qualified and experienced staff will be low. With these constraints, the resources that can be secured for this project will be required to become more efficient.

Data Management

Management of design and survey data has traditionally been quite poor and of an informal nature on even the largest infrastructure projects. Design information is often poorly controlled once issued, with surveyors and others having various revisions, sometimes out-of-date. Furthermore, such design information is rarely controlled or handled in a way to prevent unauthorised alteration, allowing users to modify critical design information (deliberately or accidentally). Building 3d models for setout is often left to the surveyor, with inconsistent methods, results and occasional double-handling all typically present on projects, regardless of size. Similarly, field information is usually stored on the local drive of field tablets, offering poor data security and infrequent, unreliable or totally absent backup of a project-critical resource. There exists no consolidated, authoritative source of design or survey data from which to build, create important project documentation or act as a reference source-of-truth for the project.

How the problem was solved:

Planning

A strategic instrumentation and software plan was developed to base all survey work on a single platform of high-end ruggedized field tablets running 12d Model software with 12d Field exclusively used during the construction phase. A single, consistent platform allows for efficiencies to be gained from streamlining of training, support, customisation and procedures whilst still being able to cover all the needs of the surveying function. The adoption of 12d Model for all surveying functions also allows for the seamless and lossless transfer of rich data amongst the survey team. 12d Model's customisability, extensibility and ability to work in and support the entire project lifecycle lent further weight to its selection as the premier surveying software in use on this project.
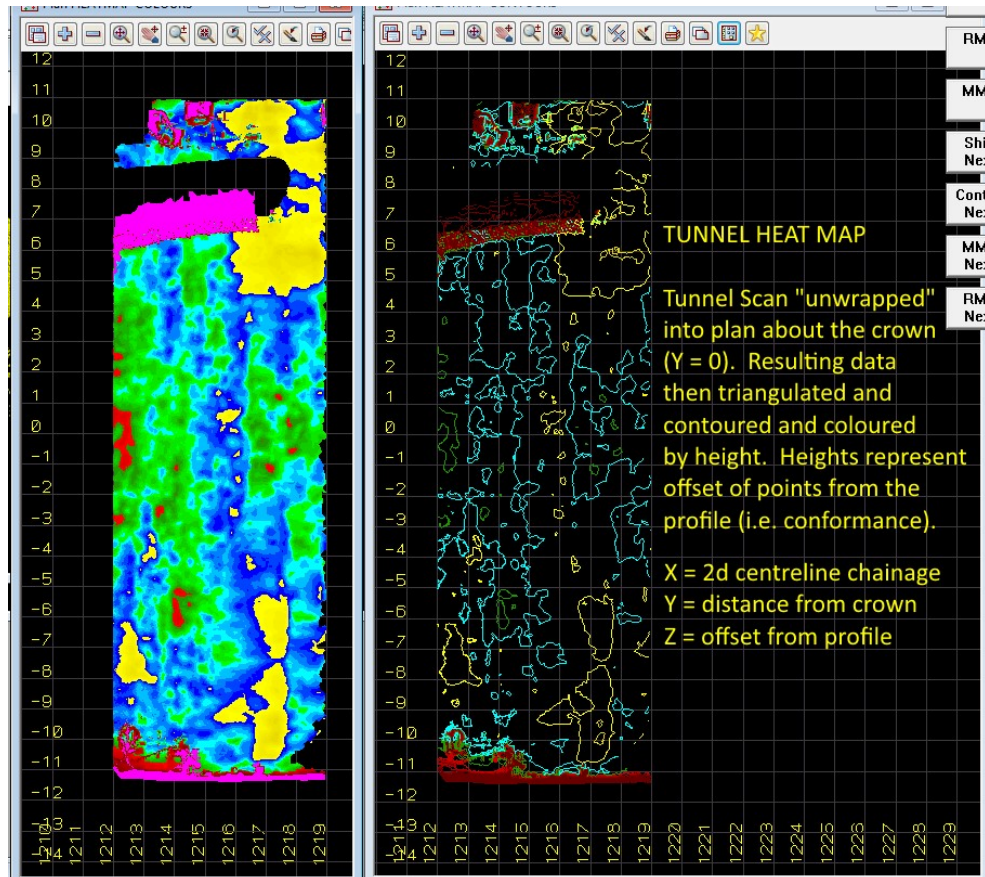
Centralisation of Data Storage and Processing
*** See entry in Customisation & Synergy Categories for further details ***

To simplify the management, control and issue of the large amount of survey data, the concept of a Central Data Model (CDM) was created. The Central Data Model comprises 12d Model projects for design, survey, utilities, tunnel, imagery, cadastral and survey control marks. Customisations for 12d Model, 12d Synergy, 3rd party software, help documents and training tutorial videos are also stored in the Central Data Model. Each aspect of the CDM can then be further split to allow for finer control, easier management and the future size of the projects. The CDM provides:

- A single, centralised source of truth for all data;
- A secure, managed, version-controlled and backed-up source of fieldwork and design data;
- A system for controlling and ensuring the validity of data for construction;
- A formal, consistent workflow for data management on the project;
- Allowance for growing as the amount of data increases over the project lifetime;
- A live, as-built model of the entire project, assembled as surveys are completed, rather than the traditional method of building an as-built model at the end of the project;
- Scope for automation of survey workflows;
- Consistency in 12d Model across the project; and
- Data for other survey functions, such as monitoring and guidance, and other project functions, such as geotechnical, traffic, utility relocations and program management.

Such use of a CDM is a novel and innovative solution, not previously used on a civil infrastructure project of this size in Australia.

12d International Innovation Awards

TUNNEL HEAT MAP

Tunnel Scan "unwrapped" into plan about the crown (Y = 0). Resulting data then triangulated and contoured and coloured by height. Heights represent offset of points from the profile (i.e. conformance).

X = 2d centreline chainage
Y = distance from crown
Z = offset from profile

Customisation of 12d Model & Field Processes
** See entry in Customisation Category for further details **

The entire 12d Model was customised to best suit the project requirements and streamline workflows. Providing a consistent interface across the project helps a diverse survey workforce provide identical outputs, regardless of skill level. All fieldwork processes were reviewed to allow for:

- Easier use (i.e. touch-friendly, small-screen-friendly) on field tablets- for example, using tickboxes, minimising typing, automatic population of fields;
- Compliance with survey-specific quality standards (RMS G71) and providing an audit trail for all data
- Standardised naming conventions, inputs and outputs; and
- Off-line use (i.e. with no network connectivity).

An on-going process, the project goal is to have the surveyor in the field as much as possible, being able to produce and deliver reports, plots, and calculations and make assessments without leaving site. Processes are continually reviewed based on surveyor feedback and assessed against key performance indicators. Any future enhancements can be automatically delivered to all surveyors, allowing for productivity gains to be realised immediately.

Synchronisation of Field Tablets with Central Data Model
**See Entry in Synergy Category for further details **

Although the NorthConnex project will be unique in being one of the first projects in Australia to have a wifi network available in the tunnels, all field procedures and processes have been developed on the worst-case assumption that no network connection will be present. This presents unique problems and requires innovative solutions in providing the surveyor with the most up-to-date design and survey information to build and also receiving data collected in the field. Solved through the adoption and customisation of 12d Model and 12d Synergy software, our selected solution performs the following core functions:

- Central Data Models are synchronised from the server to the local client, providing the surveyor with the latest, official and up-to-date data for construction. Such data can be pushed automatically to all tablets

without user interaction using the 12d Synergy Synchronization Tool.

- Fieldwork data- including raw fieldwork, post-processed fieldwork, reports, plots, videos, photos, notes, and other miscellaneous 12d Model data and files- are exported to a common location with standardised filenames. This location is automatically uploaded to 12d Synergy on a schedule or on-demand when the user is connected to the network.

The development and use of such a streamlined synchronization process for field surveyors has already provided numerous benefits, allowing surveyors to receive the latest and correct information almost immediately, giving managers and the project progress updates and assurance the project is on-schedule and to specification.

Use of Sharing Master Files
***See entry in Customisation Category for further details ***

With the local, offline copy of Central Data Model projects on field tablets, surveyors are able to make extensive use of the native share functionality of 12d Model. Master Share Files (MSFs) are created on the server and pushed out to surveyors as part of the CDM. Surveyors can then subscribe to their local copy of the Master Share Files to view and use the CDM data. Use of relative paths in MSFs allow the offline CDM projects to be used by surveyors as if they were still connected to the network and had access to the server CDM. The read-only nature of 12d Model shared data prevents inadvertent modification of critical project data, whilst retaining the speed benefits of a local copy able to be used in the field.
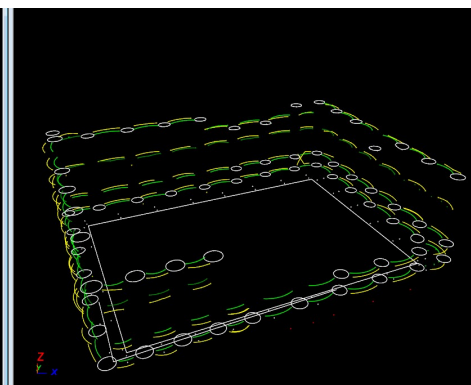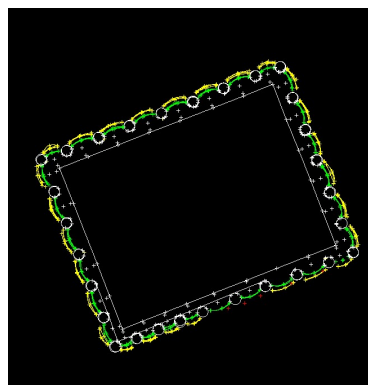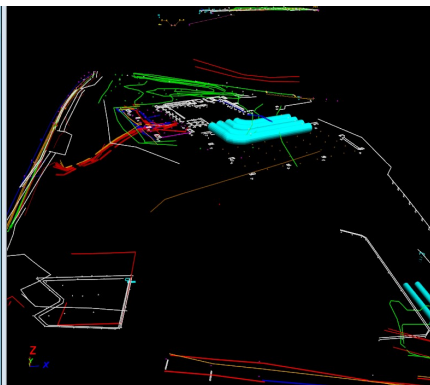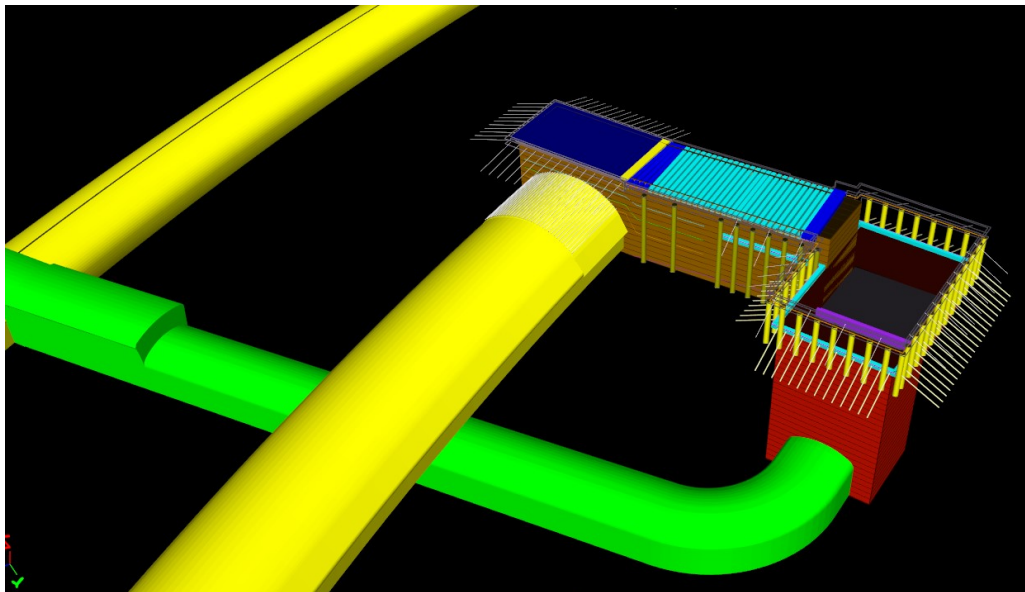
Survey Specification and Quality Assurance
** See entry in Customisation Category for further details **

All submitted fieldwork data has an assigned quality class, reflecting its adherence to the requirements of RMS' G71 specification. When exported, a report file summarises the submitted data, including how and why it met or failed the specifications and the quality class assigned. This provides the user with immediate feedback as to the quality of their survey, allowing them to correct or redo their survey to meet project requirements, before it is reviewed by managers. This quality class record travels with the submitted data as it travels through the survey workflow. At each step, various macros and processes add extra data to record the progress and actions taken at each step- export, post-processing, review, approval or rejection and, finally, import into the CDM. This provides an extensive and thorough audit trail that successfully meets the RMS and project quality requirements with no extra effort required from surveyors or managers.

By automatically assessing data for quality standards, the review process by managers is streamlined and greatly improved. The corresponding reduction in time spent managing and reviewing data means that more time can be spent on other, more important aspects of surveying for the project. Assessment of the quality of surveys also allows managers to identify deficiencies in training or skills and provide remedial training, action or revise processes.

New Features & Enhanced Functionality

This project has contributed to the development and testing of new features and functionality in 12d Model and 12d Synergy software, advancing the state-of-the-art and helping to continue 12d Model's position as a high-tech leader in the construction survey industry. This project is leading the industry on many such features, including:

- Tunnel scans (using Leica's MS50 instrument)
- Tunnel setout, including from trimeshes
- Tunnel Conformance Plots & Reports
- Tunnel definitions on alignments
- Conformance analysis and assessment on scans using "heat maps"
- Management of point cloud data
- Additional 12dField attributes to help with QA checks

The use of 12d Model for the survey and construction process has allowed for unprecedented customisation and automation of survey workflows, delivering actual efficiencies on the project in construction survey. The project has built on the solid base of 12d Model and 12dField as a leading civil engineering and surveying package and extended functionality in a novel and innovative way, providing an example of best-practices surveying on civil infrastructure construction projects in Australia and the world.

Fieldwork Review Process inside 12d Model

Legend:
- 12d Panel Action (grey)
- 12d Synergy Interaction (yellow)

Open REVIEW project
→ Click on the "Import Fieldwork" button

IMPORT FIELDWORK

Browse and select the 12daz file of the submitted fieldwork
→ Review the associated info report for the fieldwork
→ Existing "FIELD WORK" model is cleaned, if needed
↓
Plan view "REVIEW" is created, if necessary
← Data is imported and added to view "REVIEW"
← String attributes added to the imported data with file details

CORRECT & UPDATE VALUES

Click on the "Set Location and State" button, if needed
→ Current Location, State and Surveyor values are shown.
↓
Select new values and click "Update Values", as needed
← Relevant 12d Field attributes are updated

MAP DATA

Click on the "Map to CDM models" button
→ Fieldwork data is mapped to many models with prefix
→ Click on "Approve or Reject" button

APPROVE OR REJECT

Select the (mapped) source data to approve or reject
← Current Location, State and Submitted File are shown.
← Click "Approve" or "Reject" button on panel.
↓
Type in a reason for rejection or comment for approval.
→ Click the "Process" button
→ String attributes added to the data with approval details
↓
Data exported to 12daz in relevant CDM MSM project
← PPFW files (.12daz and .txt) are updated in Synergy
← Review_Status = Approved
↓
Review_Status = Rejected
Imported review data is deleted.
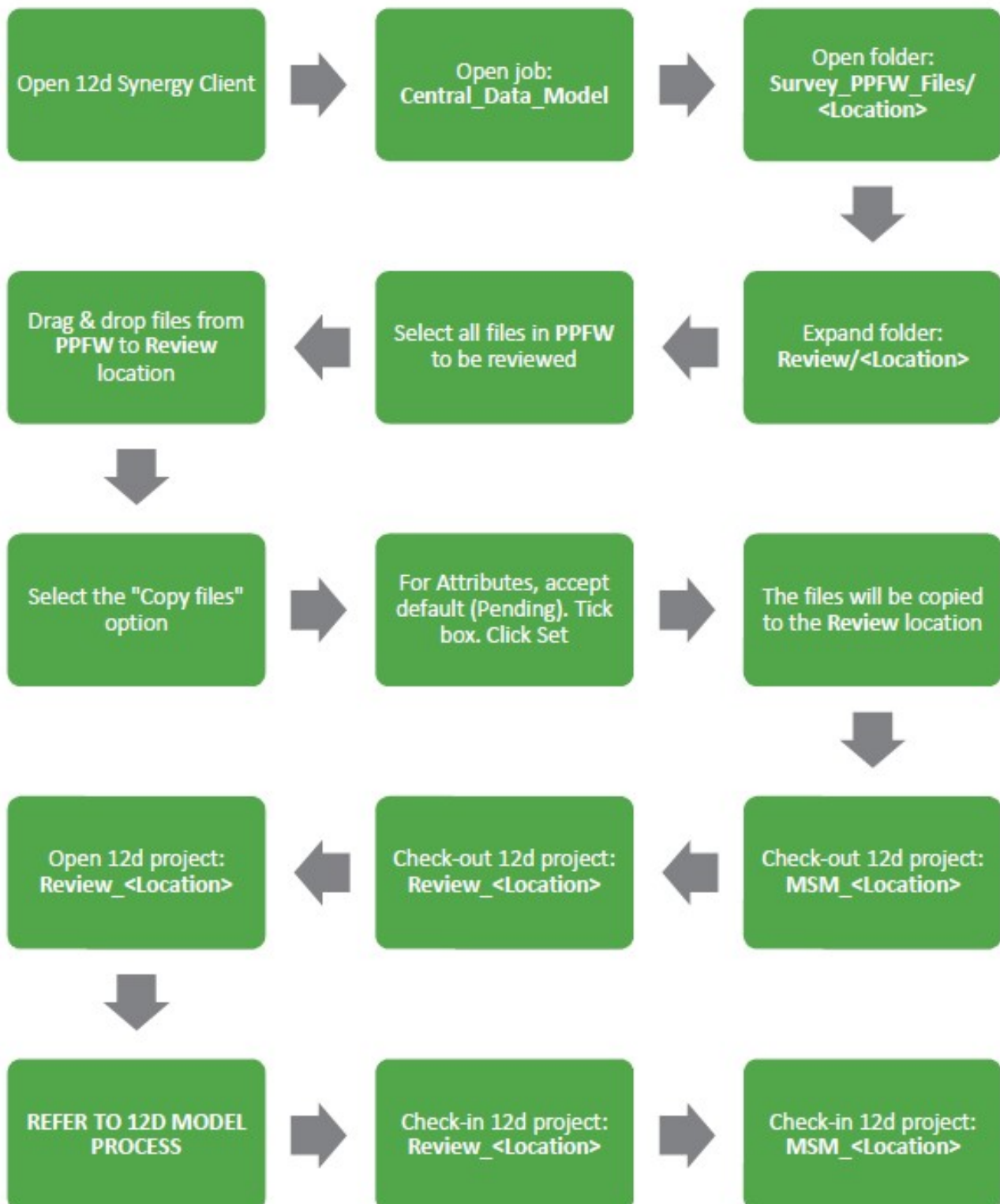→ Ready to import and review next submitted fieldwork file.
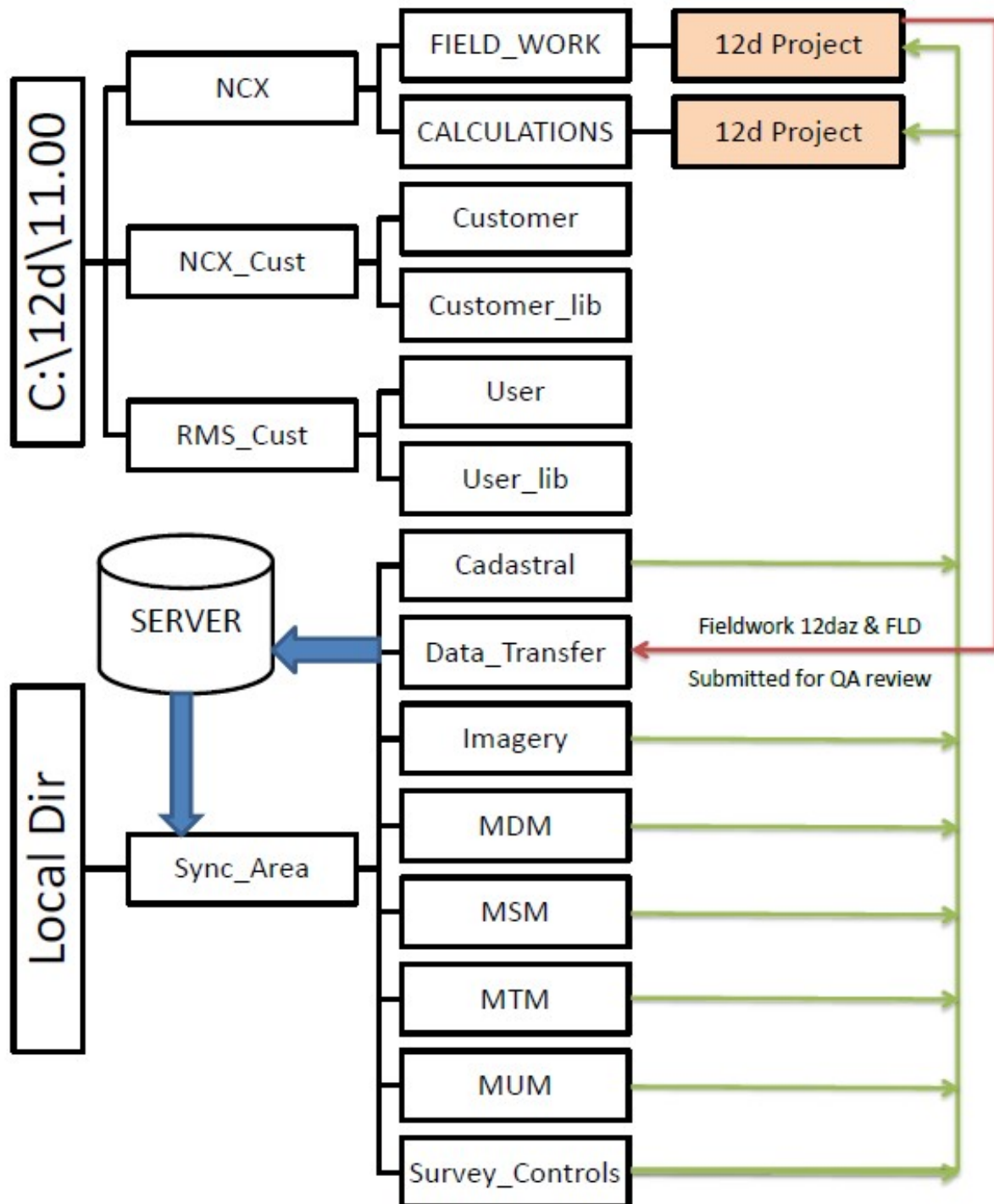
12d International Innovation Awards

Fieldwork Review Process inside 12d Synergy

12d International
Innovation Awards

Proposed Client Structure

12d Sharing   File Import/Export   Data Sync

12d International Innovation Awards

Proposed Server Structure
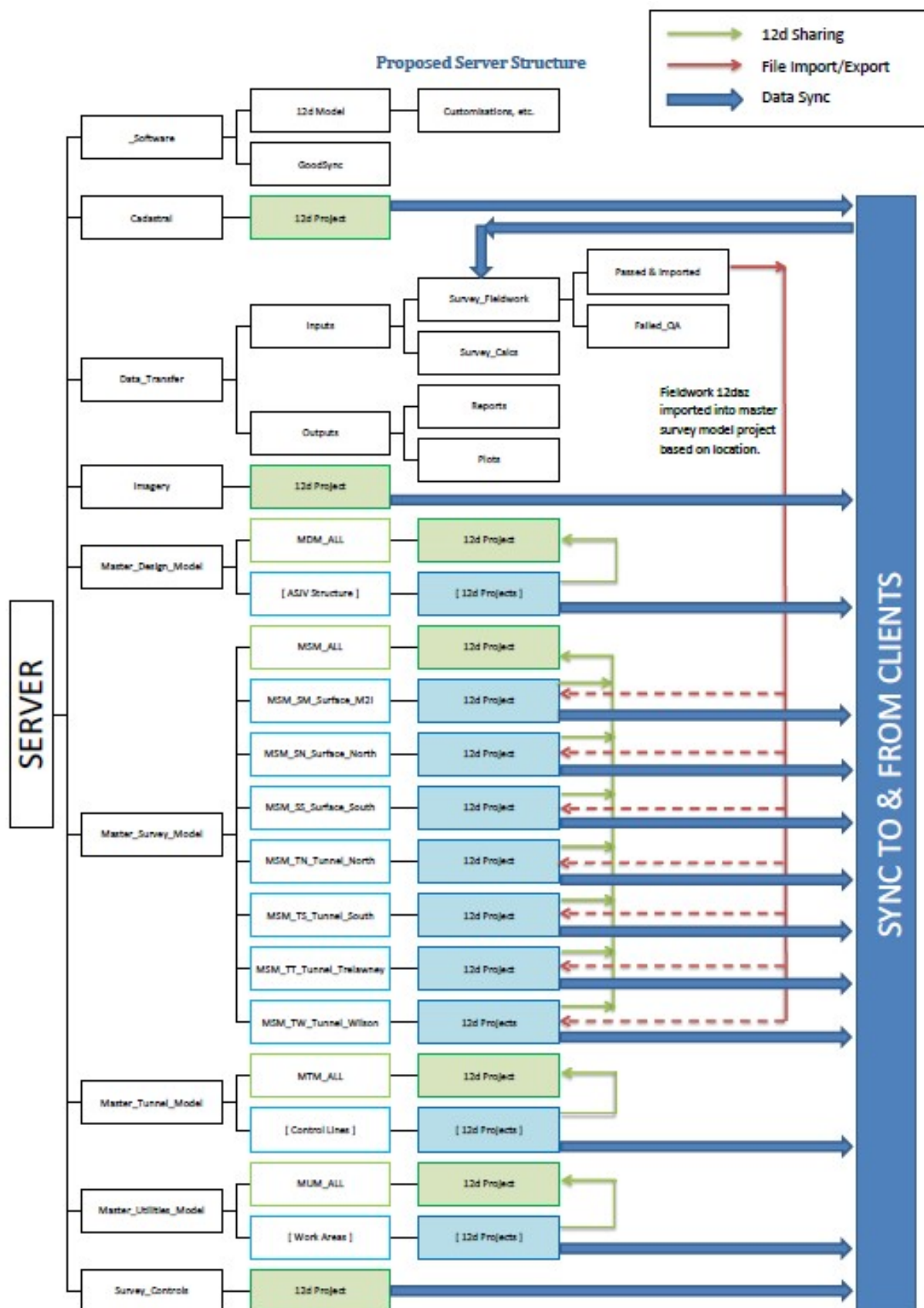
Survey Fieldwork Process

* Requires network connection

Locations:
Surface M2I (SM)
Surface North (SN)
Surface South (SS)
Tunnel North (TN)
Tunnel South (TS)
Tunnel Trelawney (TT)
Tunnel Wilson (TW)

States:
As Built (AB)
Check (CH)
Conformance (CO)
Control (CT)
Monitoring (MO)
Pickup (PU)
Potholing (PH)
Pre-pour (PP)
Setout (SO)

PRE-FIELD
- Start of Shift
- Sync Data*
- Open 12d "FIELD WORK" project
- Start 12dField

Data in "FIELD WORK" model? — YES → Submit Field Work

NO ↓

SURVEY TASK
- Setup Surveyor, Location (Lot Number) and State (Category)
- Station Setup (Helmert Resection)
- Check Shot at Start (Measure + Store)
- Do Survey Check Shots @ 1 hr interval
- Check Shot at End (Measure + Store)

Submit Field Work → Another survey task?
- YES → Setup Surveyor, Location (Lot Number) and State (Category)
- NO ↓

POST-FIELD
- Sync Data*
- End of Shift

12d International Innovation Awards

Submitted Fieldwork

Files:

When fieldwork is submitted, at least three (3) files are created and sent to the server. These have the following extensions:

1. **12daz – zipped 12d Archive format file of the raw fieldwork data.** This is the data as produced by 12dField in the field with no post-processing. This is the data imported into the CDM projects.
2. **fld.zip – zipped 12d Field File (FLD) of the raw fieldwork data.** This is a backup of the data in the 12daz file created and kept by 12dField. This is kept as a backup of the 12daz, but not imported into the CDM project.
3. **txt – A text file containing a summary of key information about this submission.** This is a basic report listing some key points about the submission, details of the QA checks and a basic summary of the data submitted. This is not imported into the CDM, but is a human-readable summary of the submission that can be viewed without importing the 12daz.

All files are named the same except for the extension.

Directory:

The fieldwork files are submitted to the following location:

`<CDM_DATA>\Data_Transfer\Inputs\Survey_Fieldwork_Files`

Where **<CDM_DATA>** is:

For local, offline copy: `C:\_CDM_DATA`
For server master copy: `S:\500E Survey\591 Central Data Models`

Naming:

For v1.4 of NCX_export_fieldwork_panel macro

`[<FAIL>]<LL>_<SS>_<TIMESTAMP>_<USER>`

<FAIL> - Optional prefix when submission fails one of several checks.

The actual value of the **<FAIL>** prefix will vary depending on which checks failed.

<FAIL> prefix <u>always</u> starts with X and at least one of the following:

L	Failed location – not present or varies across survey
S	Failed state – not present or varies across survey
U	Failed surveyor – not present or varies across survey
Q	Failed quality – not present or doesn't meet minimum required

<LL> Location as a two-letter abbreviation

SM	Surface M2l	TS	Tunnel South
SN	Surface North	TT	Tunnel Trelawney
SS	Surface South	TW	Tunnel Wilson
TN	Tunnel North	XX	Failed location – not present or varies

<SS> State as a two-letter abbreviation

AB	As Built	PU	Pickup
CH	Check	PH	Potholing
CO	Conformance	PP	Pre-pour
CT	Control	SO	Set-out
MO	Monitoring	XX	Failed state – not present or varies

<TIMESTAMP> Timestamp of submission (when exported from the panel)

Is in the format YYYYMMDDTHHmm

YYYY	Year, including century
MM	Month, padded with zeroes to two digits (01 – 12)
DD	Day, padded with zeroes to two digits (01 – 31)
T	Letter 'T' – Constant separator between date and time parts
HH	Hour, 24-hour padded with zeroes to two digits (00-23)
mm	Minutes, padded with zeroes to two digits (00-59)

<USER> Surveyor's name

Should be UPPER-CASE, based on Windows username and without punctuation. In the case of fieldwork, this should be the same value as the Surveyor setting from 12dField.

For v1.3 of NCX_export_fieldwork_panel macro

> [<FAIL>]<LL>_<SS>_<TIMESTAMP>_<SURVEYOR>

As for v1.4, except:

- <FAIL> constant two-character **XX-** prefix to denote one of the location, state or surveyor checks failed.

For v1.2 of NCX_export_fieldwork_panel macro

> <LL>_<SS>_<TIMESTAMP>_<SURVEYOR>

As for v1.4, except:

- No <FAIL> prefix
- The <LL> and <SS> fields are almost entirely always set to XX due to a bug in the macro and different behaviour in some of the checks. These earliest fieldwork submissions do not necessarily mean that they failed the QA checks.

Examples:

For v1.4 (29th Jan 2016 – present)

XQ-TW_CH_20160128T0823_MMONK

SN_PU_20160122T1055_MMONK

For v1.3 (10th Dec 2015 – 29th Jan 2016)

SS_AB_20160122T0837_BHUSSEY

XX-TS_XX_20160121T1142_SDOOLIN

XX-XX_SO_20151211T0828_BHUSSEY

For v1.2 (before 10th Dec 2015)

XX_XX_20151109T0914_JRAWARD

XX_XX_20151118T1456_TW

Submitted Monitoring Data

Files:

If the fieldwork being submitted has a State = Monitoring (MO), then an additional file is created and submitted. This file has an extension:

- **csv – A comma separated values file of critical information for monitoring.** This is exported from the 12d Model fieldwork data produced from 12dField. The file contains basic, stripped-back information for inclusion in the monitoring process. This file is not imported into the CDM 12d Model projects.

All files are named the same except for the extension.

Directory:

The fieldwork files are submitted to the following location:

> <CDM_DATA>\Data_Transfer\Inputs\Survey_Monitoring

Where **<CDM_DATA>** is:

For local, offline copy: `C:\_CDM_DATA`

For server master copy: `S:\500E Survey\591 Central Data Models`

Naming:

The naming of the files is as per the Submitted Fieldwork files for v1.4+ of the macro.

Submitting Data

Files:

When submitting model data, there are two (2) files created. These files have the extensions:

1. **12daz – zipped 12d Archive format file of the submitted model data.** This is the data as produced within 12d Model. This data might be imported into the CDM projects.
2. **txt – A text file containing a summary of key information about this submission.** This is a basic report listing some key points about the submission. This is not imported into the CDM, but is a human-readable summary of the submission that can be viewed without importing the 12daz.

All files are named the same except for the extension.

Directory:

The fieldwork files are submitted to the following location:

```
<CDM_DATA>\Data_Transfer\Inputs\Survey_Calc_Files
```

Where **<CDM_DATA>** is:
For local, offline copy: `C:\_CDM_DATA`
For server master copy: `S:\500E Survey\591 Central Data Models`

Naming:

```
<TYPE>-<LL>_<SS>_<TIMESTAMP>_<USER>-<PURPOSE>-<REASON>
```

Where:

<TYPE>	**Type of file being submitted**
CALC	Calculation data. Model data created for survey setout, modelling, reporting or general use.
PPFW	Post-processed fieldwork. Fieldwork data that has been processed after the raw data has been submitted.
OTHR	Any other type of model data not covered by the above types.

<LL>   **Location as a two-letter abbreviation**

As per the naming for the Submitted Fieldwork.

<SS>   **State as a two-letter abbreviation**

As per the naming for the Submitted Fieldwork.

<TIMESTAMP>   **Timestamp of submission (when exported from the panel)**

As per the naming for the Submitted Fieldwork.

In this case, it is the name of the person submitting the data, which may not be the same person who did the fieldwork.

<PURPOSE>	**Purpose of the model data**
SETO	For setout
INFO	For information only

This effectively acts as a priority or importance, with data required for setout being more important than data submitted for information only.

<REASON>   **Reason for submitting the data as entered by the user**

This is free text as entered by the user, but with invalid characters removed/replaced.

Examples:

CALC-SS_SO_20160126T1149_MMONK-SETO-Sth shaft capping beam

PPFW-SN_PU_20160115T0950_MMONK-INFO-Fixed pt codes

OTHR-SM_AB_20160120T1301_MMONK-INFO-Grid of ex surface for GIS

12d International Innovation Awards

Submitted Files

Files:

When submitting generic files, there are at least two (2) files created. These files have the extensions:

1. **??? – The file extension of the original file being submitted.** Depends on the file selected, but the file extension is passed through the submission to help identify the type and associated program.
2. **txt – A text file containing a summary of key information about this submission.** This is a basic report listing some key points about the submission. This is not imported into the CDM, but is a human-readable summary of the submission that can be viewed without importing the file.

All files are named the same except for the extension.

Directory:

The fieldwork files are submitted to the following location:

`<CDM_DATA>\Data_Transfer\Inputs\Survey_Files`

Where **<CDM_DATA>** is:

For local, offline copy:	`C:\_CDM_DATA`
For server master copy:	`S:\500E Survey\591 Central Data Models`

Naming:

`<TYPE>-<LL>_<SS>_<TIMESTAMP>_<USER>-<REASON>`

Where:

<TYPE>	**Type of file being submitted**
TEXT	Text
PDF	PDF
DWG	CAD Drawing, not necessarily in AutoCAD DWG format. Could also be a CAD drawing format from another software (e.g. Microstation DGN, DXF, DWF)
FOTO	Photograph or image file
VID	Video file
AUD	Audio file
OTHR	Any other file that doesn't fit into the above types

<LL>   **Location as a two-letter abbreviation**

As per the naming for the Submitted Fieldwork.

<SS>   **State as a two-letter abbreviation**

As per the naming for the Submitted Fieldwork.

<TIMESTAMP>   **Timestamp of submission (when exported from the panel)**

As per the naming for the Submitted Fieldwork.

<USER>   **User's name**

In this case, it is the name of the person submitting the data, which may not be the same person who did the fieldwork.

<REASON>   **Reason for submitting the data as entered by the user**

This is free text as entered by the user, but with invalid characters removed/replaced.

Examples:

DWG-TW_AB_20160125T1347_MMONK-DWG file for use by traffic group

OTHR-TW_AB_20160125T1347_MMONK-Custom template for string report

TEXT-SM_PP_20160122T1741_MMONK-Volume calc for carpark

Submitted Plots

Files:

When plot files are submitted there are two (2) files that are created. These files have the extensions:

1. **zip – Zip archive containing the plot file and any 12d Plot Parameter File (PPF) also submitted.** The plot file can be in any format (e.g. PDF, DWG, DGN) and the PPF is optional, though recommended.

All files are named the same except for the extension.

Directory:

The fieldwork files are submitted to the following location:

`<CDM_DATA>\Data_Transfer\Inputs\Survey_Plots`

Where **<CDM_DATA>** is:

For local, offline copy:	`C:\_CDM_DATA`
For server master copy:	`S:\500E Survey\591 Central Data Models`

Naming:

`<TYPE>-<LL>_<SS>_<TIMESTAMP>_<USER>-<REASON>`

Where:

<TYPE>	**Type of the plot being submitted.**
PLAN	Plan plot
LONG	Longitudinal section plot
XSEC	Cross section plot
COMB	Combination plot – i.e. a mix of the above or other data. Not one single type.

<LL>   Location as a two-letter abbreviation

As per the naming for the Submitted Fieldwork.

<SS>   State as a two-letter abbreviation

As per the naming for the Submitted Fieldwork.

<TIMESTAMP>   Timestamp of submission (when exported from the panel)

As per the naming for the Submitted Fieldwork.

<USER>   User's name

In this case, it is the name of the person submitting the data, which may not be the same person who did the fieldwork.

<REASON>   Reason for submitting the data as entered by the user

This is free text as entered by the user, but with invalid characters removed/replaced.

Examples:

PLAN-TS_CO_20160125T0958_MMONK-Pavement conformance plot

LONG-SS_PU_20160128T0913_MMONK-MC10 Long section

XSEC-SW_AB_20160128T1235_MMONK-Site sections for discussion

12d International Innovation Awards

Submitted Notes

Files:

When notes are submitted, only one (1) file is created for submission. This file has the extension:

1. **txt – A text file containing the notes and summary of key information about this submission.** This is a basic report listing some key points about the submission and the note itself. This is not imported into the CDM.

Directory:

The fieldwork files are submitted to the following location:

```
<CDM_DATA>\Data_Transfer\Inputs\Survey_Notes
```

Where **<CDM_DATA>** is:

For local, offline copy:	`C:\_CDM_DATA`
For server master copy:	`S:\500E Survey\591 Central Data Models`

Naming:

```
<LL>_<SS>_<TIMESTAMP>_<USER>-<IMP>-<REASON>
```

Where:

<LL>   Location as a two-letter abbreviation

As per the naming for the Submitted Fieldwork.

<SS>   State as a two-letter abbreviation

As per the naming for the Submitted Fieldwork.

<TIMESTAMP>   Timestamp of submission (when exported from the panel)

As per the naming for the Submitted Fieldwork.

<USER>   User's name

In this case, it is the name of the person submitting the data, which may not be the same person who did the fieldwork.

<IMP>   Importance

LOW	Low importance
MED	Medium importance
HIGH	High importance

<REASON>   Reason for submitting the data as entered by the user

This is free text as entered by the user, but with invalid characters removed/replaced.

Examples:

SN_MO_20160126T1238_MMONK-HIGH-Site instruction by engineer

TT_PU_20160105T1537_MMONK-MED-Note about existing manhole condition

Example Fieldwork Info Report

Below is an example of the information report (.txt) file produced when fieldwork data is submitted. The right-side of the report has been truncated to fit on a page without wrapping.

```
XQ-TW_CH_20160128T0823_CHOGAN.12daz      10c60c7536f6e8ec4cb6cd790db74b1888645a3078ef8e8ddc3bd29c3468ce87
XQ-TW_CH_20160128T0823_CHOGAN.fld.zip    21ceb32726b8371e0068245212d82a61d35357decc8e015582aa80e613d096fe

################### JOB DETAILS ###################
Location:          Tunnel Wilson (TW)
State:             Check (CH)
Export Time:       Thu 28/01/2016 08:24:19 AUS Eastern Daylight Time
Surveyor:          CHOGAN
Description:
Comment:           This is my survey
Submitted by:      M.MONK
Submitted from:    NCX-7RQ5V72

################### INSTRUMENT ###################
Type:              TPS (Leica_TS16)
Serial:            3200281
Calibrated?        YES

################ SURVEY QA CHECK ################

Standards File:    C:/_CDM_DATA/Survey_Controls/NCX_Survey_Fieldwork_QA_Standards.csv
Number of standards:   7
```

Type	QA Class	Pass/Fail	Instrument Type	Location	Max Resect Horz Residual	Max Resect Vert
Current Survey			TPS	Tunnel Wilson	0.0050	0.0014
Standard	A	N/A Location	TPS	S*	0.0030	0.0030
Standard	B	N/A Location	TPS	S*	0.0030	0.0030
Standard	C	N/A Location	TPS	S*	0.0050	0.0050
Standard	D	N/A Location	TPS	S*	0.0100	0.0100

```
Standard        E          N/A Location   TPS        S*              0.0500              0.0500
Standard        F          xxx FAIL xxx   TPS        T*              0.0050              0.0050
Standard        G          N/A Instr Type GPS        *               0.0500              0.0500
Location:              Tunnel Wilson
Instrument Type:       TPS (Leica_TS16)
Min. Required Class:   F
Actual Survey Class:   NONE = FAIL


################### SOURCE DATA ###################
Number Of Elements:    13
Extents of data:       (min x: -4.855, min y: -2.685, min z: -4.855),(max x: 320465.495, max y: 6265044.122, max z: 320465.495)


------------------ Element List ------------------
Str Name,Model Name,Num Pts,Length,Time Created,Time Updated
T RKWL 100,FIELD WORK,4,10.543,01/19/16 09:26:02,01/19/16 10:02:42
T RKTP,FIELD WORK,2,3.394,01/19/16 10:06:50,01/19/16 10:06:50
T RKWL 100,FIELD WORK,4,10.543,01/19/16 10:17:49,01/19/16 10:17:49
T RKTP,FIELD WORK,2,3.394,01/19/16 10:17:49,01/19/16 10:17:49
T RKFL 100,FIELD WORK,2,4.029,01/19/16 10:17:49,01/19/16 10:17:49
SV CP,FIELD WORK,3,53.417,01/13/16 13:43:31,01/13/16 13:43:31
SV CP,FIELD WORK,3,53.417,01/13/16 13:43:31,01/13/16 13:43:31
Helmert Setup,FIELD WORK,1,0.000,01/15/16 13:04:34,01/15/16 13:04:34
SV CP,FIELD WORK,4,45.235,01/15/16 13:09:12,01/15/16 13:09:12
Helmert Setup,FIELD WORK,1,0.000,01/15/16 13:47:57,01/15/16 13:47:57
SV CP,FIELD WORK,3,53.418,01/15/16 13:49:16,01/15/16 13:49:16
Helmert Setup,FIELD WORK,1,0.000,01/15/16 14:17:28,01/15/16 14:17:28
SV CP,FIELD WORK,3,48.096,01/15/16 14:24:40,01/15/16 14:24:40
```

Example Non-Fieldwork Info Report

Below is an example of the information report (.txt) file produced when non-fieldwork data is submitted. The actual content will vary depending on the type of data submitted.

```
//######## NCX SUBMIT DATA - NOTES #######
//
//================= INFO =================

Location:          Tunnel South
State:             Setout
Reason:            M110 F barrier
Element:
Project:           CALCULATIONS
Project Dir:       C:\12d\11.00\NCX\CALCULATIONS
Username:          MMONK
Computer:          NCX-7RQ5V72
Timestamp:         20160125T172617

Model type:        CALC

Purpose:           For setout

Works package:     99-9999
Source file:       12345-6789-XXX-WWW-ZZZ-001
Revision:          99

Submitted File:    C:/_CDM_DATA/Data_Transfer/Inputs/Survey_Calc_Files/CALC-TS_SO_20160125T1725_MMONK-SETO-M110 F barrier.12daz
File Checksum:     f6d2d60c74c560b28c2fd5aed2d58a4fc8661e7be7289d7581a84321246b9cf1
```