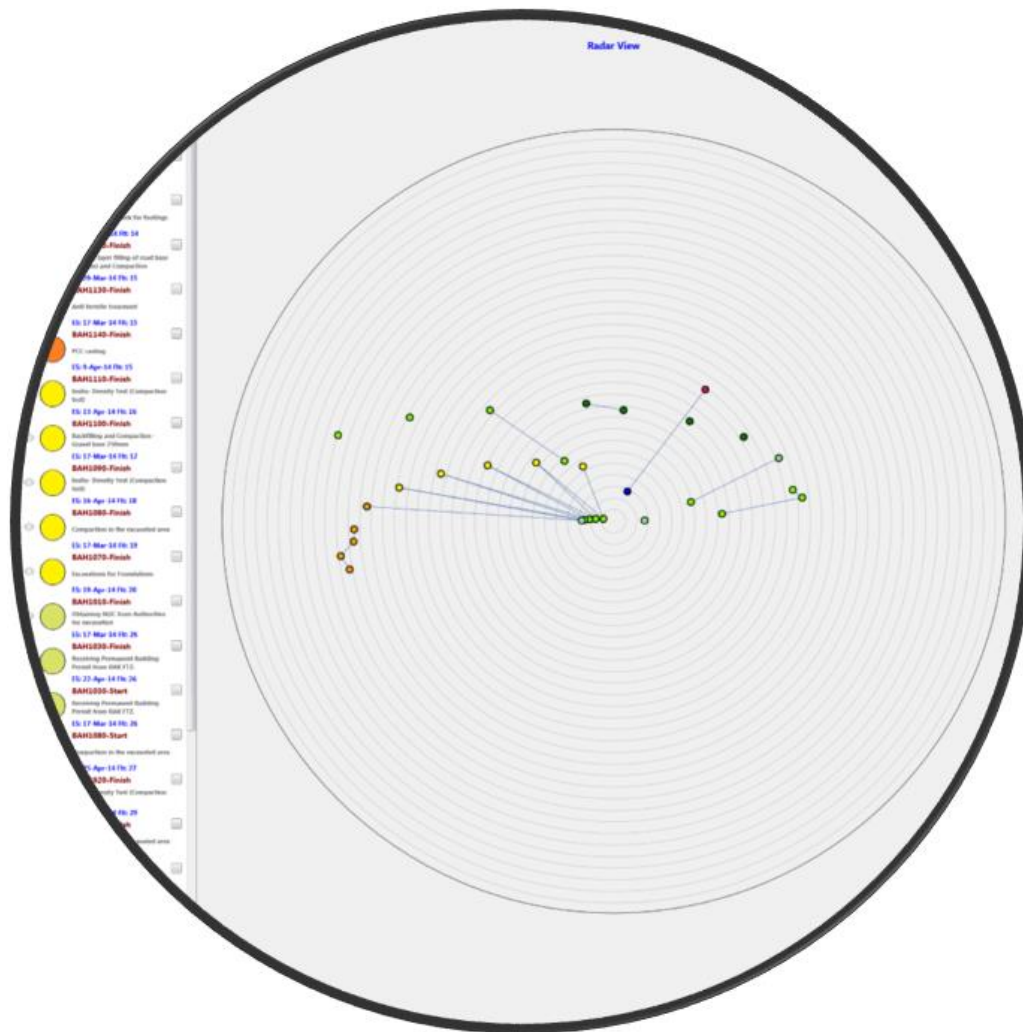


# Time-Logic User Manual

## P6 Addon, Delay Analysis Software



1.4. “Where Contractor Delay to Completion occurs concurrently with Employer Delay to Completion, the Contractor’s concurrent delay should not reduce any EOT due”

4.8 “...the amount of EOT may not precisely reflect the actual delay suffered by the Contractor. That does not mean that time impact analysis generates hypothetical results – it generates results showing entitlement.”

16. “Unless expressly provided for otherwise, compensation for prolongation should not be paid for anything other than work actually done, time actually taken up or loss and/or expense actually suffered”

**Society of Construction Law – Delay and Disruption Protocol**

## Preface

The approach for substantiating entitlement for Extension of time (EOT) and Compensation, is to separate the determination into two different types of impact analysis. Specifically, to perform a prospective Time Impact Analysis (TIA) to quantify the EOT, and a retrospective Windows Analyses to quantify periods of compensation. The reasoning for using this approach is as follows.

Protocol for determining an entitlement for an Extension of time is different from that for determining compensation. Compensation requires knowledge of actual progress of the work to ensure that the real impacts to the project are not running concurrently with Contractor responsible delays. In contrast, unless otherwise called for in the Contract, the procedure for determining an extension of time is a prospective analysis. A prospective analysis is an analysis that projects impacts into a reasonable plan of the work, as opposed to a retrospective analysis which considers how the work was actually carried out (i.e. when the activities in the network **actually** started and finished). Unless contractually addressed otherwise, Issues of concurrency have no part in determining entitlement to an extension of time, and usually are considered in determinations of compensation for prolongation only.

There are several reasons a prospective Time Impact Analysis is the standard for determining an EOT. The most practical, is that by using a prospective analysis, you do not have to wait until the work is completed, to decide to extend the Time for Completion. Additionally, it is important to consider that the original Time for Completion was calculated without the knowledge of how the Work progressed. Given that the critical path in the baseline plan prospectively defines the original Time for Completion; it should be just as capable to determine an adjusted Time for Completion. Furthermore, since the prospective analysis is only being used to determine EOT and not compensation, the issue of concurrency (where both Owner and Contractor are simultaneously delaying the project) has no more relevance, than it did when the original Time for Completion was defined by the critical path of the baseline plan.

Because the procedures for determining an extension of time is different from that of determining compensation, this software makes use of both prospective and retrospective methods of delay analysis: a prospective time impact analysis to determine an extension of time, and a retrospective daily windows analysis to quantify periods of compensable delays. The software as a basis uses the Primavera xer files, modified to differentiate delay events from the rest of the project activities.

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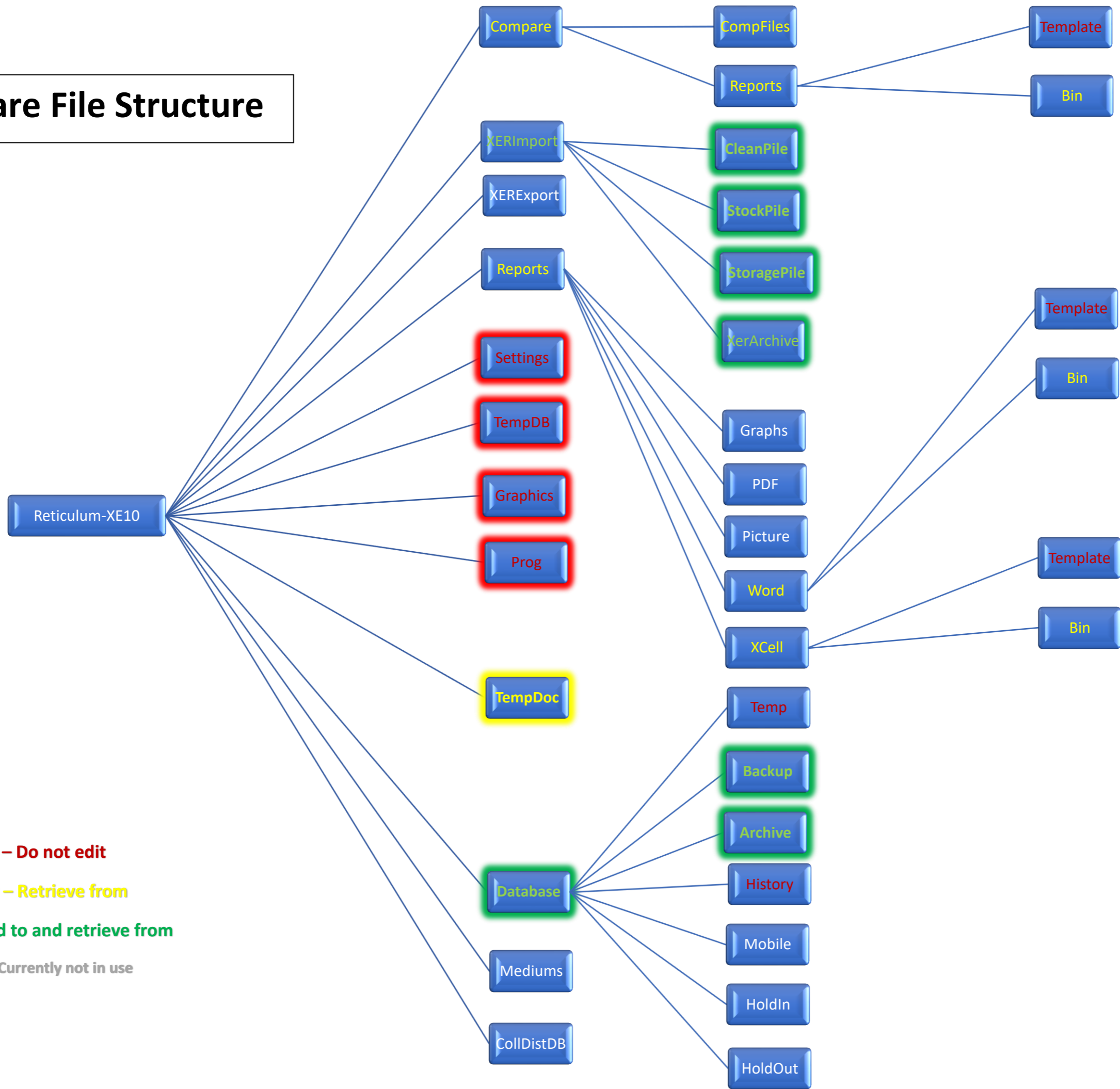
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The screenshot displays the TIME-LOGIC software interface. At the top, there are progress bars and a navigation menu. The main area features a 'Project: Plan - Windows Analysis, Cumulative Delays Graphic' with a line graph showing completion dates over time. To the left, there are performance gauges for Delay Days, EOT Days, and Delay Event Mit. %. On the right, a detailed activity list is shown with columns for Start/Finish dates, Activity ID, Event, and Description. The interface is annotated with red circles and letters (A through Z) pointing to various UI elements.

A	Rotating sphere showing processing rate	B	Annotation tool bar and mode selection	C	Progress bars	D	Progress text
E	Log-In, Updater Panel, Run Companion Programs	F	Primary function buttons	G	Project Selection List	H	Performance gauges for selected date
I	Delay analysis display checkbox	J	Date selection slide bar	K	Graphic editing tools	L	Date selected information text
M	Primary information display tabs	N	Display critical path graphic for date selected	O	Status summary review between dates selected	P	Major aspects of analysis tabs
Q	Before and after impact graphic	R	Daily windows analysis graphic	S	Time impact analysis graphic	T	Label selection and text angle controls
U	Zoom on and off switch	V	Switch between delay analysis and Control Activities	W	From date selection slide bar	X	From date display
Y	Graphic switch: compensation vs. controlling activities	Z	Tabular display of graphic results	1	Project Selection indicator	2	Load to memory process indicator
3	Calculation process indicator	4	Importing process indicator	5	Aggregating plans process indicator	6	Database connection status text
7	File Maintenance Button for Projects, Xer Files, Temp Docs						

# Software File Structure



**Red – Do not edit**

**Yellow – Retrieve from**

**Green – Send to and retrieve from**

**White – Currently not in use**



## Database Tables

#	Table Name	Fields
	<u>Project Tables</u>	
1	ProjInfo	ProjName VARCHAR(25) PRIMARY KEY NOT NULL, ShortDesc VARCHAR(128), NumMile INTEGER, AbstractDetail TEXT, Start INTEGER, Owner VARCHAR(128), Engineer VARCHAR(128), Contractor VARCHAR(128), Finish INTEGER, LastUpdate INTEGER, Performance REAL, Liquid CURRENCY, LiquidCap CURRENCY, ContractAmount CURRENCY, CurrencyType VARCHAR(3)
2	SchedInfo	ProjName VARCHAR(25) NOT NULL, SchedName VARCHAR(10) NOT NULL, BriefDesc VARCHAR(128), StartDate INTEGER, DataDate INTEGER, FinishDate INTEGER, InceptionDate INTEGER, CalcIn INTEGER, CalcOut INTEGER, ReportIn INTEGER, ReportOut INTEGER, NumAct INTEGER, NumRel INTEGER, Accuracy REAL, Precesion REAL, Performance REAL, PRIMARY KEY(ProjName,SchedName)
3	ConInfo	ProjName VARCHAR(25) NOT NULL, MileNum SMALLINT, MileDesc VARCHAR(128), MileDate INTEGER, Liquid REAL, LiquidType INTEGER, LiquidCap REAL, PRIMARY KEY(ProjName, MileNum)
4	MessageInfo	UserID VARCHAR(25) NOT NULL, DateTimeStamp VARCHAR(128), MessageDate INTEGER, Message TEXT, PRIMARY KEY(UserID, DateTimeStamp)
5	Documents	UniqueID INTEGER, FileType VARCHAR(10), FileName VARCHAR(200), DocDesc TEXT, DateStamp INTEGER, PRIMARY KEY(UniqueID)
6	Prolongation	ProgDate INTEGER, Prolongation CURRENCY, ProlongDocID INTEGER, PRIMARY KEY(ProgDate)
7	ReportInfo	ProjName VARCHAR(25), PlanName VARCHAR(25), DateTimeStamp VARCHAR(128), ReportTitle VARCHAR(250), CreatedBy VARCHAR(128), CreatedFor VARCHAR(128), AbstractDesc VARCHAR(400), ReportPerIn INTEGER, ReportPerOut INTEGER, Icon1 BLOB, ComaChoices VARCHAR(600), PRIMARY KEY(ProjName, PlanName, DateTimeStamp)
8	DocuPDF	UniqueID INTEGER, FileName VARCHAR(80), RawData BLOB, PRIMARY KEY(UniqueID)
9	DocuPIC	UniqueID INTEGER, FileName VARCHAR(80), RawData BLOB, PRIMARY KEY(UniqueID)
10	DocuVID	UniqueID INTEGER, FileName VARCHAR(80), RawData BLOB, PRIMARY KEY(UniqueID)
11	DocuWAV	UniqueID INTEGER, FileName VARCHAR(80), RawData BLOB, PRIMARY KEY(UniqueID)
12	DocuEXL	UniqueID INTEGER, FileName VARCHAR(80), RawData BLOB, PRIMARY KEY(UniqueID)
13	DocuDOC	UniqueID INTEGER, FileName VARCHAR(80), RawData BLOB, PRIMARY KEY(UniqueID)
14	DocuMOD	UniqueID INTEGER, FileName VARCHAR(80), RawData BLOB, PRIMARY KEY(UniqueID)
15	DocuLog	NumID INTEGER, UniqueID INTEGER, FileType VARCHAR(10), FileName VARCHAR(200), DocDesc TEXT, DateStamp INTEGER, PlanID, ActivityID VARCHAR(50), EventCode VARCHAR(50), PRIMARY KEY(NumID)
#	<u>Plan Tables</u>	
	* = PlanName	
1	*_PlanProg	ProgDate INTEGER, TypeCalc INTEGER, DelayEvent INTEGER, FinDate INTEGER, Transpired INTEGER, DelayTot INTEGER, DelayThisDate INTEGER, MitigatedDelayThisDate INTEGER, ChangeInLongestPath INTEGER, ControlString VARCHAR(180), ControlEvID INTEGER, ControlActID VARCHAR(30), ControlEvent VARCHAR(30), ControlDesc VARCHAR(180), MHistory VARCHAR(180), ConActIDComa VARCHAR(300), ConEventIDComa VARCHAR(100), ChangeInControllingEvent INTEGER, CritPathNum INTEGER, MitigationType INTEGER, EOTDate INTEGER, Compensatory INTEGER, PlanID VARCHAR(10), PRIMARY KEY(ProgDate, TypeCalc, DelayEvent)
2	*_Plan	PlanID VARCHAR(10) NOT NULL, Description VARCHAR(128), StartDateDay INTEGER, StartDateMin INTEGER, DataDateDay INTEGER, DataDateMin INTEGER, MSEV01 INTEGER, MSEV02 INTEGER, MSEV03 INTEGER, MSEV04 INTEGER, MSEV05 INTEGER, MSEV06 INTEGER, MSEV07 INTEGER, MSEV08 INTEGER, MSEV09 INTEGER, MSEV10 INTEGER, MSEV11 INTEGER, MSEV12 INTEGER, MSEV13 INTEGER, MSEV14 INTEGER, MSEV15 INTEGER, MSEV16 INTEGER, MSEV17 INTEGER, MSEV18 INTEGER, MSEV19 INTEGER, MSEV20 INTEGER, PRIMARY KEY(PlanID)
3	*_Activity	ActivityID VARCHAR(30) NOT NULL, UIDNum INTEGER, ActUniqueID INTEGER, PlanID VARCHAR(10) NOT NULL, StartEventID INTEGER, FinishEventID INTEGER, Description VARCHAR(128), Milestone INTEGER, DelayEvent INTEGER, LocatorID INTEGER, DocuComa TEXT, PlanComa TEXT, GPSComa VARCHAR(100), PRIMARY KEY(UIDNum, ActivityID)



4	*_Event	EventID VARCHAR(50), EvnUniqueID INTEGER, Description VARCHAR(128), PRIMARY KEY(EventID)
5	*_UnEvent	UniqueID INTEGER, ActUniqueID INTEGER, ActivityID VARCHAR(30), EvnUniqueID INTEGER, PlanID VARCHAR(10) NOT NULL, ASDay INTEGER, ASMinute INTEGER, PRIMARY KEY(PlanID, UniqueID)
6	*_Progress	UniqueID INTEGER, PlanID VARCHAR(10) NOT NULL, InitDay Integer, InitESDay INTEGER, InitMargin INTEGER, EStr TEXT, MStr TEXT, ActivityID VARCHAR(30), EvnUniqueID INTEGER, LocatorID INTEGER, Description VARCHAR(128), DocuComa TEXT, PRIMARY KEY(PlanID, UniqueID)
7	*_DriverMap	Date INTEGER, UniqueID INTEGER, NumOfDrivers INTEGER, DriverID INTEGER, PlanID VARCHAR(10) NOT NULL, PRIMARY KEY(Date, UniqueID, NumOfDrivers, DriverID, PlanID)
8	*_DriverMapTIA	DelNum INTEGER, UniqueID INTEGER, NumOfDrivers INTEGER, DriverID INTEGER, PlanID VARCHAR(10) NOT NULL, PRIMARY KEY(DelNum, UniqueID, NumOfDrivers, DriverID, PlanID)
9	*_Logic	RelUniqueID INTEGER, PredUniqueID INTEGER, SuccUniqueID INTEGER, SortOrder INTEGER, RSortOrder INTEGER, PDMSortOrder INTEGER, PDMRSortOrder INTEGER, PlanID VARCHAR(10) NOT NULL, Type INTEGER, DelayEvent INTEGER, Duration INTEGER, CalIDP INTEGER, CalIDS INTEGER, ActivityOrLag INTEGER, LogiCon VARCHAR(8), EventLink VARCHAR(2), FirstOne INTEGER, LastOne INTEGER, PRIMARY KEY(PlanID, RelUniqueID)
10	*_CalendarGen	CalID INTEGER, DOW INTEGER, StartMinute INTEGER, StopMinute INTEGER, CalDesc VARCHAR(128), P6CalID INTEGER, PlanID VARCHAR(10) NOT NULL, PRIMARY KEY(CalID, DOW, StartMinute)
11	*_Inceptions	CalID INTEGER, DayNum INTEGER, StartMinute INTEGER, StopMinute INTEGER, PlanID VARCHAR(10) NOT NULL, PRIMARY KEY(CalID, DayNum, StartMinute)
12	*_Exceptions	CalID INTEGER, DayNum INTEGER, StartMinute INTEGER, StopMinute INTEGER, PlanID VARCHAR(10) NOT NULL, PRIMARY KEY(CalID, DayNum, StartMinute)
13	*_LongestPath	ViewDate INTEGER, ChainNumber INTEGER, PathOrder INTEGER, UniqueID INTEGER, PlanID VARCHAR(10) NOT NULL, SDay INTEGER, FDay INTEGER, SADay INTEGER, ActID VARCHAR(30), EventID VARCHAR(30), ActDesc VARCHAR(180), NumOfSucc INTEGER, CritPathNum INTEGER, PRIMARY KEY(ViewDate, ChainNumber, PathOrder)
14	*_DelayEvents	StartDate INTEGER, Typeo VARCHAR(8), UniqueID INTEGER, PlanID VARCHAR(10) NOT NULL, Usit BOOL, P6SubID INTEGER, LongestPathFinish INTEGER, EOTFinish INTEGER, BeforeImpact INTEGER, AfterImpact INTEGER, IndepImpact INTEGER, ChronImpact INTEGER, CumullImpact INTEGER, FinishDate INTEGER, EventDesc VARCHAR(240), ReasonStart VARCHAR(380), ReasonFinish VARCHAR(380), Merit TEXT, NumOfEvents INTEGER, IDCode VARCHAR(30), DocuComa TEXT, PRIMARY KEY(StartDate, Typeo, UniqueID, PlanID)
15	*_Impacts	IWStart INTEGER, IWFinish INTEGER, IWIDNum INTEGER, IWActI VARCHAR(30), IWEventI VARCHAR(30), PlanID VARCHAR(10), IWDesc VARCHAR(180), IWImpact INTEGER, IWMitImpact INTEGER, CritPathNum INTEGER, IWHistory VARCHAR(360), IWReasonShift VARCHAR(100), IWDelEv INTEGER, IWCompStart INTEGER, IWCompFinish INTEGER, PRIMARY KEY(IWStart)
16	*_RelProg	InterC INTEGER, RelDate INTEGER, TypeCalc INTEGER, DelayEvent INTEGER, RelUniqueID INTEGER, PlanID VARCHAR(10) NOT NULL, RelState INTEGER, Driver INTEGER, RemDur INTEGER, ReasonRem VARCHAR(30), PRIMARY KEY(InterC)
17	*_TIAPath	PlanID VARCHAR(10) NOT NULL, DelayEvent INTEGER, PathOrder INTEGER, UniqueID INTEGER, SDay INTEGER, FDay INTEGER, SADay INTEGER, ActID VARCHAR(30), EventID VARCHAR(30), ActDesc VARCHAR(180), NumOfSucc INTEGER, PRIMARY KEY(PlanID, DelayEvent, PathOrder)
18	*_PrimaryCriticalPaths	CritPathNum INTEGER, PathOrder INTEGER, UniqueID INTEGER, FirstAppearDate INTEGER, PlanID VARCHAR(10) NOT NULL, ActID VARCHAR(30), EventID VARCHAR(30), ActDesc VARCHAR(180), PRIMARY KEY(PlanID, CritPathNum, PathOrder)
19	*_Locator	PlanID VARCHAR(10), LocatorID INTEGER, P6ID INTEGER, LocDesc VARCHAR(128), ParentID INTEGER, PRIMARY KEY(PlanID, LocatorID)

## Introduction

Time-Logic software is a P6 add-on application which provides extended project information on delays and their causes. It operates as a 64-bit program using SQLite databases, which imports its primary information from P6 xer files.

In essence, it removes the barriers from the snapshot segregated approach used in P6, to allow for a single daily updated CPM master plan which incorporates revisions as they are implemented, so that delays can be traced and quantified continuously through time. This continuity enhances the:

- **depth of insight**
- **speed of calculation**
- **level of detail**

providing delay analysis, exceeding standard methods.

## Main Application File Structure

As a basis of understanding how the software operates, it is important to understand its file structure. This will allow a significant increase in ability to manipulate both input and output for your analysis.

The software is installed on a directory or subdirectory under the folder name “Reticulum-XE10”. This folder has nine sub-folders. They are as follows: CollDistDB, Compare, Database, Graphics, Mediums, Prog, Reports, XERImport and XERExport. The following section will go through each of these folders and their subfolders to explain software’s file structure.

Compare – This file folder holds the reports generated from the XerComp application, which compares two xer files to detect changes and to create reports of the findings.

CollDistDB – This file is currently not in use but is a place marker to help identify different calculations performed by the IsoCalculator application, which performs the various calculations of the delay analysis and related functions.

Database – The first file folder, named “Database”, as the name implies, holds the database files. These are 64-bit encrypted SQLite database files, which are stored under the project name with the file extension “.db”. Each project has a separate database, typically with many different plans within it. For example, if you had a project named “PROJ”, it would hold various plans for that project, such as the baseline, and various revisions or updates. These different plans are stored as various tables within each project database. The tables are named after the plan and the function of that table. For instance, the activity table for a plan with the name “BASE”, would be called “BASE\_Activity”.

Having separate databases for each project has several advantages over holding all the projects in one database, like the database format used by P6. Firstly, if a database gets corrupted, it only effects the one project and not the entire software data storage. Secondly, it allows for the easy transfer of projects from one computer to another. You can email or transfer the entire database file, and store it under this database directory, and the software will instantly recognize the new

project with all its information. It also allows for easy security and access on the project level, as projects are separately encrypted. Additionally, it keeps the size of the database manageable, which increases speed of access to the information.

Graphics - This file folder holds the graphics used by the computer primarily for its icon. This is a separate file because it makes changes to the appearance of the software easier, but these files are not relevant to the end user.

Mediums - This folder contains several sub-folders which are used for enhanced documentation of the delay analysis. It is subdivided into four different medium files: Pictures, Sound, Text, Videos and 3D Models. These folders hold the files as described, and is used in the documentation of delays and tied to the activities data table. The 3DModel folder holds several sub-folders. Specifically, these are the "Database table, which holds the database of the 3D models which are stored in either the "Warehouse" or the "Project Hold" folders. The "Project Hold" folder temporarily holds the model files for an active project, and the "Warehouse" is a storage folder for all the 3D models.

Prog – This folder holds all the executable files of the program along with essential libraries which the software uses.

Reports – This folder holds the various report files. It is broken into four sub-folders: Graphics, Word, XCell and PDF. The Graphics files hold all the report graphics which are used in the word or excel reports. Those reports are in their native file formats in either the "Word" folder which holds the Word report documents or the "XCell" folder which holds the Excel report documents. Both subfolders are further broken down into two identical subfolders: "Bin", which holds the reports themselves, and the "Template" subfolder, which holds the templates used to create the reports. There is a pdf folder as well, this is an empty folder where pdf folders can be stored.

XERImport – This folder holds the xer files. These are files with the file extension ".xer", which are created by P6 as a way of exporting and importing data files. There are two subfolders under this folder: "Stockpile" and "Cleanpile". The "Stockpile" folder holds the xer files in the original form that they are exported in. The "Cleanpile" is meant to hold xer files whose structure has been changed so that there are no impediments to the causality of the CPM. To clarify, there are some structures in the CPM precedence diagramming method currently used by P6, which goes against causality which can be re-structured to show clear how delays and mitigations affect completion. This is created automatically as one of the functions of the software. **Please use caution as this alters the structure of the original schedule.**

XERExport – This folder contains the XER files which have been created by the Time-Logic software. These files are meant to support the conclusions of the software, and so that P6 can be used to further analyze points on the Time-Logic project analysis.

Settings – This folder contains the settings information for login features and ip addresses etc.

# Main Application Overall Functions

## A quick guide to Accessing and Using the Time-Logic Software

*Once you have an account with Time-Logic, you should receive a welcome email to your account's designated email address. Please check your spam folder if you do not see it in your inbox. If you cannot find it at all please email Support at [support@assembler.ltd](mailto:support@assembler.ltd) for further assistance.*

### Step 1: Go to <http://www.time-logic.com>

<http://www.time-logic.com>. The welcome email will provide you with your randomly generated initial password. You will be the only one who knows this password, and you can also change the password from within the time-logic website by clicking the "Account" link in the upper right corner.

### Step 2: Find the "Download" section

In the top menu of the website you will find a link that says "Download". Click this and you will be taken to the download section. Find the software "Time-Logic Delay Analysis". Click "Download Installer". When this finishes, run the installer.

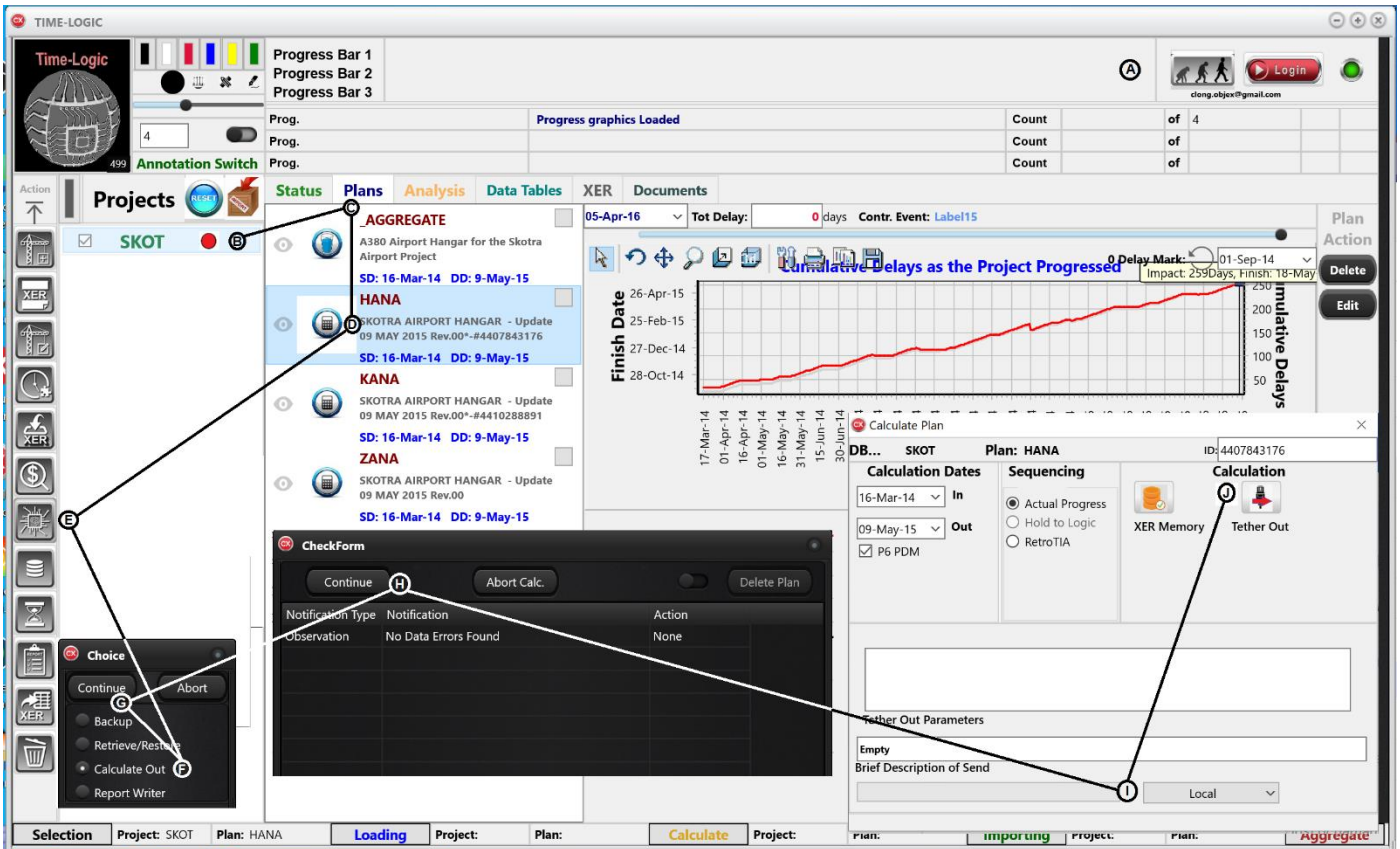
### Step 3: Installation and License verification

Follow the installation steps until you reach a section that requires a License Number. You can locate available license numbers on the time-logic website under the download section.

### Step 4: Open Time-Logic and optionally, attempt to run a calculation to ensure the tether is working properly.

You will find the IsoCalculator in the prog directory. You should be able to connect to the IsoCalculator either locally or to the remote server, which runs at a rate of typically about 50 times faster than the local calculator. Here are the steps to get that going:

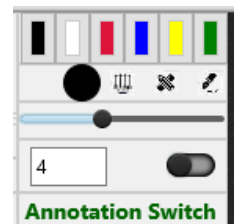
- Open the Time Logic app (c:\Reticulum-XE10\Prog\Reticulum.exe).
- Open the IsoCalculator app (c:\Reticulum-XE10\Prog\IsoCalculator.exe).
- When both applications are up and running, find the **Login** button (A) in the upper right corner of the main app. Click it and use your Time-Logic website credentials to login.
- Select a Project (B), then click on the Plans tab (C) and select a Plan (D)
- Click the Calculator button on the Left Menu (E)
- On the "Choice" dialog box, select button "Calculate Out" (F), then press "Continue" (G)
- On the "CheckForm" dialog box select button "Continue" (H)
- Set the "Target" to **local**.
- Find the top red arrow button labeled "Tether Out" and click (J)
- If the transfer is successful the calculator window will eventually close, otherwise you will receive an error message and the status text will read "CALCULATION STOPPED".\





## Annotations

In the upper left corner of the main application is a tool box, which was introduced to allow software users to annotate over any part of the program, which is displayed right.


There are 4 rows of functions to this annotation tool box. The top row is a display of six color buttons. Pressing any of these buttons will change the color of the annotation to the color selected. When a color is selected it will turn the circle in the second row, the color that was selected. To the left of this color circle are three small speed buttons with icons on them. These buttons select the kind of annotation to be used in the Main App.





 The first speed button is the arrow speed button. If selected, when the annotator is turned on the figure drawn will be an arrow, pointing in the direction that the arrow was drawn. To draw an arrow, first you will need to turn on the annotator, which is the switch in the fourth row of the tool box. Once in annotation mode, the arrow is drawn by holding down the left mouse key and dragging the arrow from its start, which will be where the mouse is pressed, to its finish, where the mouse button is released.

 The second speed button is the line tool button. Like the arrow tool, the line tool will draw a line from the point where the left mouse button is pressed until the point where it is released.

And also like the previous functions, in order to draw the line the program has to be in annotation mode, which is accomplished by flipping the switch on the forth row.

 The third and last speed button is the free draw button. Like the other tools, this will start drawing when the left mouse button is pressed while the program is in annotation mode, and stop drawing when the mouse button is released. The free draw selection will draw a line following the movement of the mouse from the starting point until the release point.

 The third row contains a slider bar, which adjusts the line width of the drawing functions just discussed. The default is set to 4. Moving the bar to the right increases the line with, and to the left, decreases the line width. The numeric values of the line width is shown in the number box just underneath the slide bar in the fourth row.

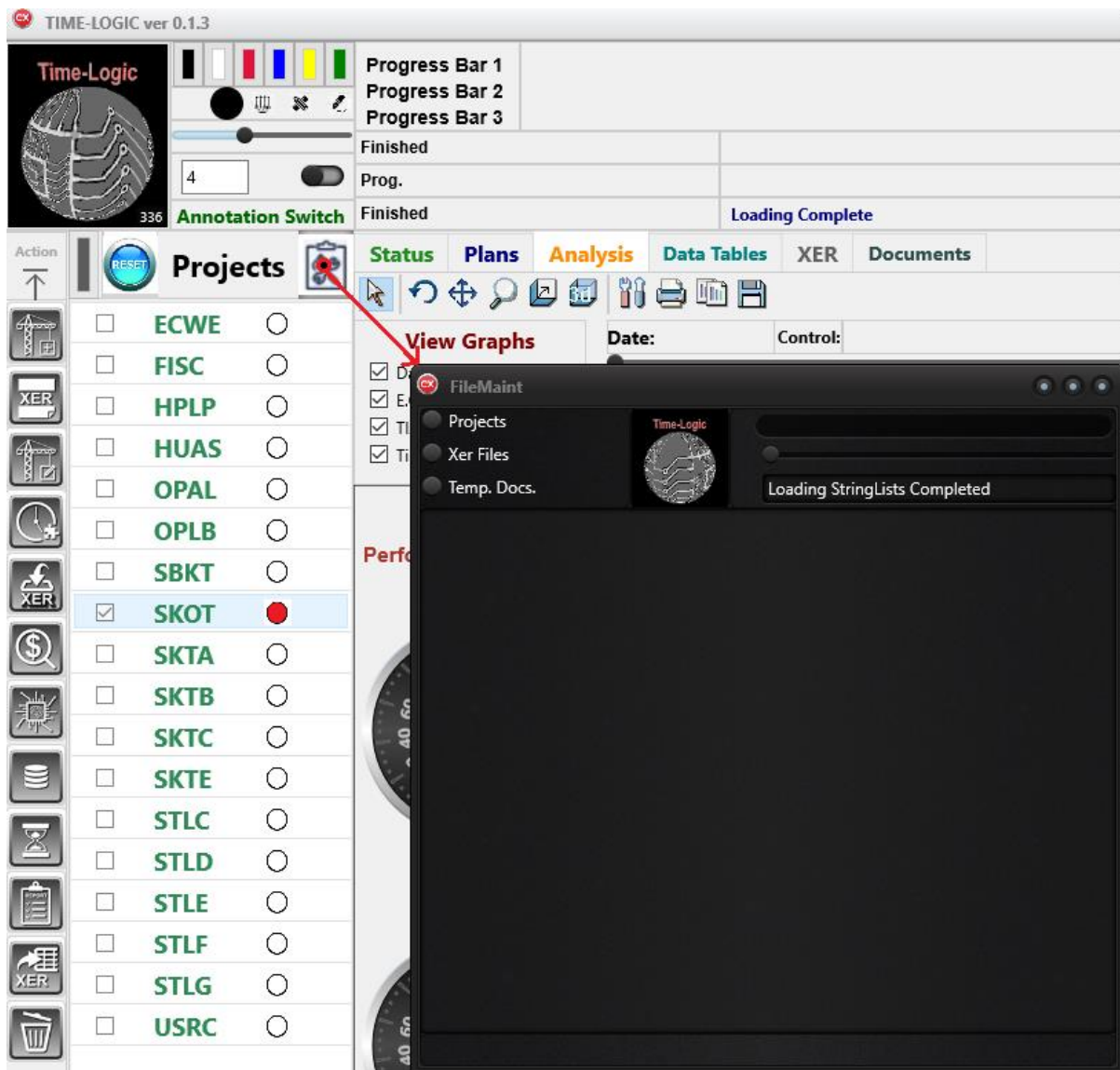
 Once a line drawing tool, color and line width are selected, flipping the switch on the fourth row, sets the entire surface of the program into annotation mode. Meaning the entire interface of the program now if set, so that free drawing, as well as, arrow and line drawing can be done on any section which the user wishes. Using the left mouse down and up, as a drawing tool event, also corresponds to drawing pens on interactive surfaces. This is because touching the pens to the surface activates the left mouse down event, and raising the pen from the surface activated the left mouse up event. So, drawing with a pen on an interactive surface should translate fine using the annotation functions.

Because the annotation mode is for the entire interface of the software, activating it disables all of the user interface functions of the software. This means that you cannot just switch the annotation button back to shut off the annotation mode. In order to signal to the software to return to regular user mode, there are two different methods to switching off the annotation mode: the first is to use the mouse scroll function. If your mouse does not have a scroll function simply hold down the shift key and press the left mouse button. Either input will return the software to its regular functionality and erase any lines drawn during the annotation.

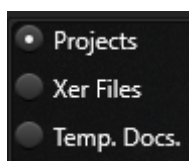
## File Maintenance

There are three folders where files will accumulate, and that will need to be maintained regularly to make sure your projects, plans and documents are well organized and not cluttered. These three folders are the Projects (each project is a separate database), the Plans which are each a separate Primavera Xer file, and the Temp Doc file directory, which as the name implies, holds the temporary documents which are stored within each project. In order to be able to maintain these files, there is a file maintenance section in the software. The button to call the file maintenance dialog box is on the right of the “Projects” column, which is denoted as area 7 in the screen capture interface on page 1. Pressing the file maintenance button will bring up the dialog box illustrated on the following page. In the upper left corner of the interface, there are three radio buttons, one for each of the main sections where the main files accumulate: Projects, Xer Files and Temp Docs.

By selecting any of these three file sections, the radio button will be “checked” and the software will take you to the file interface section which makes up the main part of the form. Until a selection is made, the main part of the form is blank and blacked out.

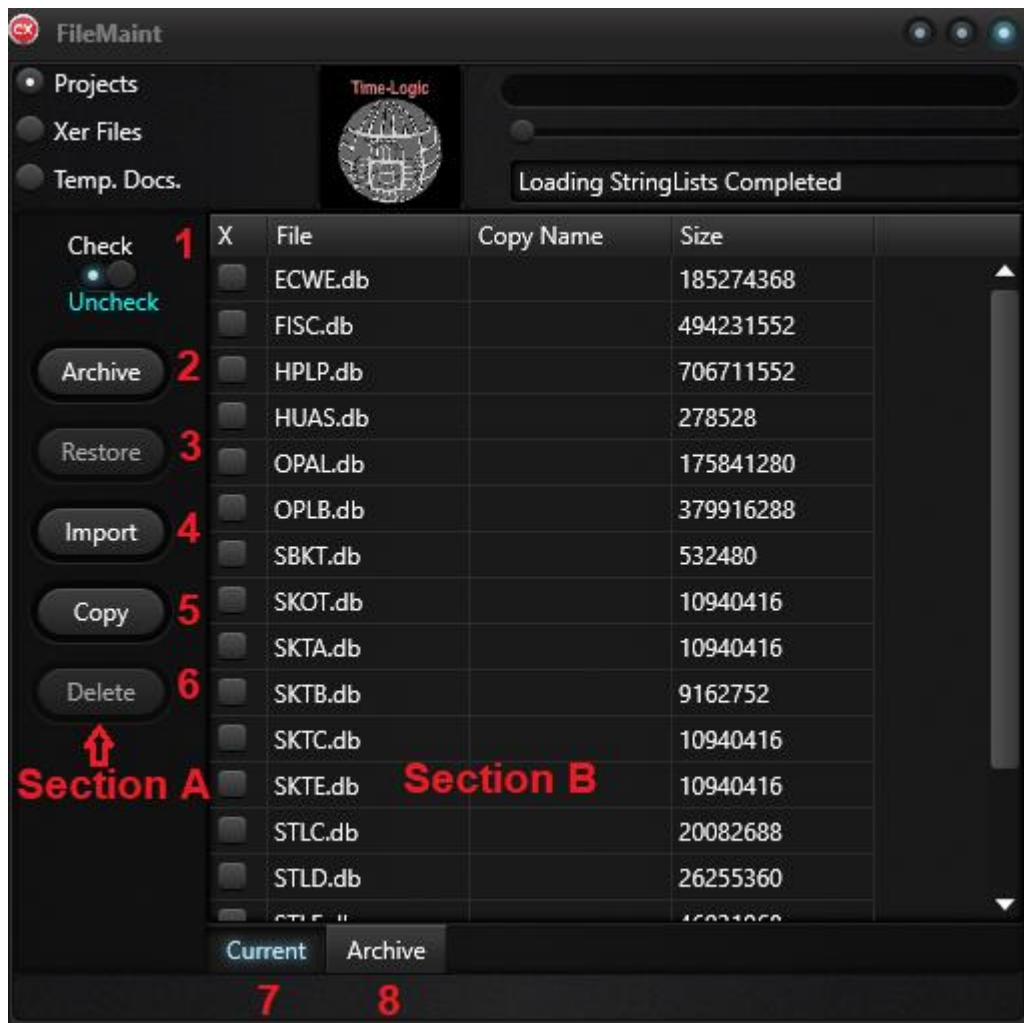


The first folder is the projects (database) folder, which holds each project as its own database. It is in the "Reticulum-XE10\\Database" folder. Each time a change is made to any of the project database, all the projects need to be reloaded. This can be time consuming if there are a lot of projects. Moreover, the project database cannot just be backed up or copied under a renamed folder, because the tables in the database are named after the project itself. So, just renaming a folder will cause the entire project database to become corrupt. For these reasons there are a series of file maintenance functions associated with the project databases.



To access these functions, select the "Projects" radio button on the upper left part of the form. This will activate the projects interface in the below main portion of the dialog box. The projects interface has two sections in the main form: **Section A**, which is the column to the left of the form. This area is made up of switches and the buttons which execute the primary functions to the project database files. To the right of this, is **Section B**. This section is made up of string grids, much like an excel spreadsheet.

These grids hold the project databases folder name, as well as, various attributes of entries for each of the database files.



This explanation will start with the Section B, string grid, as it will make the function of the buttons in Section A, easier to understand. In Section B, each row represents a separate project. The file name of the project is in the second row, which has the heading "File". There is a column just to the left of this, which is the first column. This column has the heading "X", and is made up of a series of "checkboxes", one for each project. Any of the functions of the buttons in Section A, will only be executed if the checkbox for the specific project is "checked". The column to the right of the "File" column, has the heading "Copy Name". This and the checkbox column, are the only columns, which require input from the user. The "Copy Name" column is used if you wish to make a copy of a particular project, which will be reviewed, when the "Copy" button function is reviewed in the next section. Finally, to the right of this column is the "Size" column, which just denotes the size of the file in bytes.

There are six switches and buttons which make up Section A. At the very top of Section A is a switch which by default is turned to the right (un-checked). This switch, when toggled will select all of the checkboxes or unselect all of the checkboxes. This function will make it easier to select projects, if your selection is almost entirely all the projects, or alternatively nearly none of the projects.



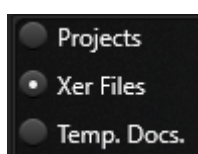
The first button (2) after the checkbox switch, has the caption "Archive". This button, if pressed, will send all the "checked" projects to the Archive folder with a time stamp. To toggle between the main project database and the archived projects, use the tabs at the bottom of the form entitled "Current" (7) and "Archive" (8). In order to restore an archived project, first you will need to select the "Archive" tab at the bottom of the form. This will enable the second button on the Section A form, has the caption "Restore". Like the Archive function, a project can be restored, by selecting the checkbox next to the project or projects you wish to restore, then pressing the "Restore" button.

If someone has sent a project database, which the user wants to import into the software, the "Import" button (4) provides that function. Pressing this button will activate a windows file selection dialog box. It will be filtered for project databased. Simply select the file to be imported into the software, and it will be moved to the "Reticulum-XE10\\Database" folder, where the software can find and utilize the information in it.

As previously mentioned, a project database cannot just be renamed, without renaming all the tables which carry the database name on them. To handle a copy function which both renames the database itself and all the tables inside of it, is the "Copy" button (5). In order to copy a project, there are two things to enable the function to work. First, you must enter the new name of the copied project, which, like all projects, must be a four-character name, the first character cannot be a number. Second, the copied project must have its checkbox "checked". Once both are done, simply press the "Copy" button (5), and a copy of the project will be placed in the database folder.

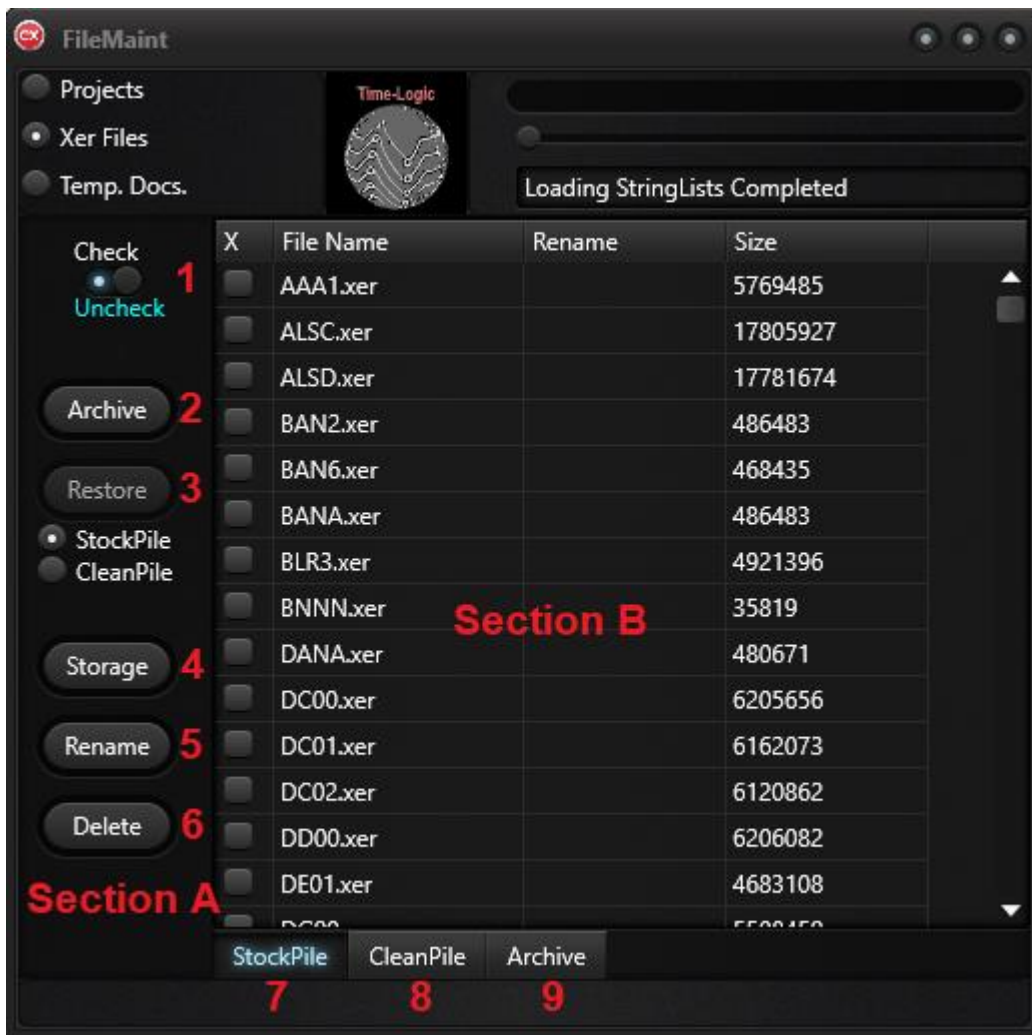
Lastly, is the "Delete" button (6), which allows project databases to be deleted. There is a safety feature in this function. Namely, you cannot delete a project directly in the file maintenance section. First, you must transfer the file to the archive, by using the previously described "Archive" button. Once this is done, switch the tab at the bottom to the "Archive" string grid (8). This action will enable the "Delete" button (6). Then select the project or projects to be deleted with the checkbox column, and press the "Delete" button. In this instance, deleting is a two-step process, moving the project database to the archive, then deleting it from the archive.

The next file maintenance section is for the primavera "Xer Files". The Time-Logic software functions as an add-on to Primavera P6 software. As such, at the core of all the delay analysis processes, are the Primavera files which are exported from Primavera. These files come in the form of tab delimited ascii files representing the various tables of each plan. So, each database project file, is made up of various plans (i.e. baseline and subsequent updates) whose information is imported from the Primavera Xer files. Each plan of every project is the information carried in these Xer files. There are two primary locations where the software imports these xer files into the various projects: "Reticulum-XE10\\XerImport\\CleanPile" and "Reticulum-XE10\\XerImport\\StockPile\\". Whenever these files are manipulated or imported by the functions of the Time-Logic software, these files are not only relisted, but the software goes into each xer file and extracts basic information such as the project start, progress, and finish date, as well as, the number of activities and relationships. As these files begin to pile up, it takes longer to list them out, in order to utilize the functions of the software. Because of this, it is important to manage these files efficiently, in a similar manner as was previously described for the project databases.



To access the file maintenance functions for the Xer files, select the radio button, just beneath the "Projects" radio button, with the caption "Xer Files". Selecting this radio button will activate the Xer file maintenance section, which like the previously reviewed "Projects" portion of the form, is made up of two sections:

Section A with the button functions, and Section B where the string grids list out the various primavera plans in either the “StockPile”, “CleanPile” or “XerArchive” folders. To view the xer file contents of any of those folders, toggle between the tabs at the bottom of the form with captions: “StockPile” (7), “CleanPile” (8) and “Archive” (9).



The format of this section of the form is nearly identical to that of the “Projects” section. In Section B, the first column is the checkbox column. Any function executed by Section A on the Xer files in the three separate folders (Stockpile, CleanPile and XerArchive), will need to first be selected by the checkboxes next to the xer file or files.

The four columns in Section B is as follows. First is the checkbox column. The second column, is the “File Name”, which, as the name implies, is just the xer file name. The third column has the heading “Rename”. This is used by the rename function button (5), which will be reviewed subsequently. The fourth column is the size of the xer file in bytes.

At the top of Section A is a switch, which by default is turned to the right (un-checked). This switch, when toggled, will select all of the checkboxes or unselect all of the checkboxes. This function will make it easier to select Xer files, if your selection is almost entirely all of the files, or alternatively nearly none of the files.

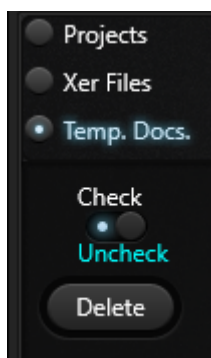
The first button (2) after the checkbox switch, has the caption "Archive". This button, if pressed, will send all the "checked" files to the Archive folder ("Reticulum-XE10\\XerImport\\XerArchive"). To toggle between the xer files in the "StockPile", "CleanPile" and the "XerArchive" folders, use the tabs at the bottom of the form entitled "StockPile" (7), "CleanPile" (8) and "Archive" (9). In order to restore an archived xer file, first you will need to select the "Archive" tab at the bottom of the form. This will enable the second button on the Section A form, which has the caption "Restore" (3). Like the Archive function, an Xer file can be restored, by selecting the checkbox next to the Xer file or files you wish to restore, then pressing the "Restore" button. Since there are two different folders that you can restore to, the proper folder should be selected by the radio buttons just beneath the "Restore" (3) button.

If someone has sent an Xer file, which the user wants to import into the software, the "Storage" button (4) provides that function. Pressing this button will activate a windows file selection dialog box. It will be filtered for Primavera Xer files. Simply select the file to be imported into the software, and it will be moved to either the "StockPile" or "CleanPile" folders, depending on the radio button selection just underneath button "Restore" (3).

As will be seen in subsequent sections of this manual, there are many Xer file manipulations which Time-Logic software performs. Often these functions rename the xer file, which may need to be renamed back to a four-character xer file, which can be imported into a project created by the software. Or alternatively, it is most often the case, that the xer file names either begin with a number or are more than 4 characters long. In order to be able to rename these files without leaving the Main Application, the "Rename" button (5) is utilized. To use this function, press on the tab at the bottom where the xer file or files are located, which the user wishes to rename. Select the file or files using the checkbox column. Then enter the new name of the xer file under the third column with the header caption "Rename" and press the "Rename" button (5).

Lastly, is the delete function, which deletes the file selected by the checkbox column. Navigate to the folder where the xer file you wish to delete using the tabs at the bottom. Then select the xer file, and press delete.

The third and last file types which the file maintenance form addresses, is the "Temp. Doc." files. These document files are created automatically when you select to view a document which has been stored in any project. These can pile up in the "Reticulum-XE10\\TempDoc\\" file folder.



The only function for these files is to delete them. To delete these files, first you must select the "Temp. Docs." radio button at the top of the form. Like the other two sections (Projects and Xer Files), at the top of the form is a checkbox switch which operates like the previous ones, to select or unselect all the files. Then in the central section of the form, like in previous sections, the user must check the files that should be deleted using the checkbox column, which is the first one on the form. Once the file selection is made by the checkboxes, simply press the "Delete" button under the checkbox switch, and the selected files will be deleted.

## The Twelve Primary Function Buttons of the Software



**Creates a new project.**

**Searches and finds xer files for further analysis or importing.**

**Edits basic information about an existing project.**

**Imports selected xer files into a selected project.**

**Defines the periods of time each plan will be used in the “aggregate” master plan.**

**Records daily prolongation costs and associated documents.**

**Calculates and retrieves the delay analysis, or sends out projects for backup files or for Reports.**

**Loads a plan or group of plans into the detailed findings section.**

**Edits and recalculates the delay event information.**

**Creates excel reports of the findings of the loaded project.**

**Creates xer files for support of the analysis findings.**

**Deletes the selected project.**

## Major Software Functions



**Creating a new project** - This is done by pressing the “New” button, which is the first button on the vertical tool bar on the left of the main form. When this is pressed a dialog, box will appear. Enter the basic project information here.

The 'Create New Project' dialog box includes the following fields and controls:

- Project ID:** Text input field with a red '4 Characters' label below it.
- Start Date:** Dropdown menu showing '19-Sep-15'.
- Finish Date:** Dropdown menu showing '19-Sep-15'.
- Last Update:** Dropdown menu showing '14-May-16'.
- Create:** Red button with a right-pointing arrow.
- # Mile:** Label next to the 'Create' button.
- Owner, Engineer, Contractor:** Text input fields.
- Brief Description:** Text input field.
- Project Abstract:** Large text area.
- Contract Amount:** Text input field with '0'.
- Currency:** Text input field with 'USD'.
- LDs per day:** Text input field with '0'.
- LD Cap:** Text input field with '0'.

Once you finish entering the data, press the create button. This will initiate a check of the general information entered, which will be displayed in the “New Project Check” dialog box shown below.

The 'New Project Check' dialog box displays the following table of findings:

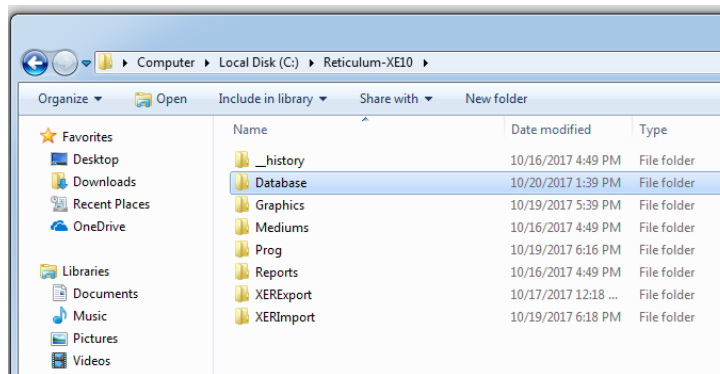
Notification Type	Notification	Action
Error	Project Name not 4 Characters	Abort Calc
Error	Brief Description Field not Completed	Abort Calc
Error	Owner Field not Completed	Abort Calc
Error	Engineer Field not Completed	Abort Calc
Error	Contractor Field not Completed	Abort Calc
Error	Start Date > or = to Finish Date	Abort Calc
Error	Brief Project Abstract not Completed	Abort Calc
Warning	Contract Amount set to Zero	None
Warning	Liquidated Damage Amount set to Zero	None
Warning	LD Cap, set to Zero	None

These information check dialog boxes all take the same general form. They have three columns of the findings: Notification Type, Notification and Action. The second column is a description of the notification. The third column, “Action” relates the action which will be taken by the application because of the notification. The first column (as the header describes) displays the type of notification, which takes three forms: “Observation”, “Warning” or “Error”. As the names imply, they are varying in



degrees of significance. The type “Error” will stop the creation of a new project by disabling the “Continue” button at the top of the form. There are two of these process buttons at the top of the form: “Continue” and “Abort Proj”. Pressing the “Abort Proj” button will stop the creation of the new project. Pressing “Continue” button will continue with creating the new project. The new project is made by Creating an SQLite database named after the Project ID (4 characters) entered in the “New Project” dialog box, and placed in the database directory of the software (e.g. c:\Reticulum-XE10\Database).

Unlike Primavera, the structure of the data in Time-Logic has every project as a separate database. The schedules are then kept as separate tables of the project database. So, each project can contain an unlimited number of schedules (e.g. baseline, updates, revisions etc.). This is done, so that if the data is somehow corrupted, it does not corrupt the information in any other project. It also makes it easy to transfer a project via email or thumb-drive by simply copying the entire database.



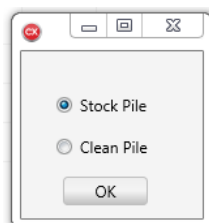
Name	Date modified	Type	Size
WHOT	10/20/2017 1:39 PM	Data Base File	48,888 KB
ADSF	10/19/2017 4:15 PM	Data Base File	2,128 KB

This is basically the project container for all the Primavera schedules. When a project is created, the software also creates an empty

plan called “Aggregate”. This plan is an aggregate of various selected plans of the project, put into one single combined plan (made up of one or more plans, which are designated with the “Plan Periods” button explained later in this text).



**Selecting the Xer file** – After creating the project database, the next step is to select a Primavera P6 schedule for importing. This is started by pressing the “XER” button on the vertical toolbar which is the third button down. Pressing this button will bring up a small dialog box(A) which queries whether you want a list of xer files found in the “StockPile” folder or the “CleanPile” folder. These two folders are located in the software’s “Xer Import” folder (e.g. C:\Reticulum-XE10\XerImport\StockPile C:\Reticulum-XE10\XerImport\CleanPile).



The “StockPile” folder is where the original xer files are to be stored and the “Clean Pile” was initially where the xer files are stored after they have been purged of errant links in the logic which block the continuity of the delay analysis. However, this has since just become another storage space which you can



direct your xer files to. Any xer file which you drop into the “CleanPile” or the “StockPile” directories will be displayed depending on which file you selected to see the contents of. If the computer does not list the file, then either the file name contained the term “xer” or “.” (which should be renamed omitting these key characters). Alternatively, it could be that the file settings are not set to the American standard windows for currency and dates. Check your windows settings, as the interchange of “,” and “.”, and the day month year time settings can cause the xer listings not to function properly.

Once the appropriate folder has been selected then the software will create a list of all the xer files found in the folder along with some of their basic plan information. When it is finished compiling the list the software will select the “XER” tabbed section of the main form (B). This section is where all the xer functions are executed.

The screenshot shows the TIME-LOGIC software interface. The 'XER' tab is selected in the top navigation bar. On the left, a sidebar lists various projects with checkboxes, including ECWE, EGLI, FISC, FNCH, FNCS, HPLP, HUAS, HUSC, IFCC, KGSC, KLSC, KPLG, KPSC, OPAL, OPLB, ROSN, SCCP, SCTL, SGCP, SKOT, and STFV. The main window displays a table of XER files. The table has columns for XER Name, Plan Description, Activities, Logic Ties, Start Date, and Prog Date. The first few rows are highlighted in blue, indicating they are selected. The table is divided into two sections: 'Section 1' on the left and 'Section 2' on the right. The bottom of the interface shows a toolbar with buttons for Selection, Project, Plan, Loading, Calculate, Importing, and Aggregat.

XER Name	Plan Description	Activities	Logic Ties	Start Date	Prog Date
AA11.xer	Advance Tunnel for Scarborough Subway Extension - Recovery Works Schedule - DD 202...	3333	5553	12-Jan-21	31-Jan-22
AA1.xer	SaGCP - SATELLITE GCP PIPELINES - CONTRACT NO # 6600042365 DD 30 October-20 U...	5470	20298	24-Jun-18	26-Mar-21
AAB8.xer	Advance Tunnel for Scarborough Subway Extension - Recovery Works Schedule - DD 202...	2918	5178	12-Jan-21	31-Jan-22
ALMG-Actual, Transfe...	FWLRT_Progress Works Schedule_R03 - Merge	11907	21682	3-May-18	31-Mar-21
ALMG-OrigDur_Trans...	FWLRT_Progress Works Schedule_R03 - Merge	11907	21682	3-May-18	31-Mar-21
ALMG.xer	FWLRT_Progress Works Schedule_R03 - Merge	11907	21682	3-May-18	31-Mar-21
ALSC.xer	FWLRT_Progress Works Schedule_R03 - Merge	10410	20336	3-May-18	31-Mar-21
ALSD.xer	FWLRT_Progress Works Schedule_R03 - Merge	10410	20336	3-May-18	30-Apr-21
AlstomMar.xer	CITADIS 750V - Finch-rev(L-2)- 30-Apr-2021	1547	2661	1-Jan-17	30-Apr-21
BAN2.xer	SKOTRA AIRPORT HANGAR - Update 09 MAY 2015 Rev.00	297	380	16-Mar-14	9-May-15
BAN4.xer	SKOTRA AIRPORT HANGAR - Update 09 MAY 2015 Rev.00	297	380	16-Mar-14	9-May-15
BLR3.xer	SaGCP - SATELLITE GCP PIPELINES - CONTRACT NO # 6600042365 MR List revised-ACT...	5470	8117	24-Jun-18	14-May-21
DANA-C.xer	SKOTRA AIRPORT HANGAR - Update 09 MAY 2015 Rev.00	297	381	16-Mar-14	9-May-15
DANA.xer	SKOTRA AIRPORT HANGAR - Update 09 MAY 2015 Rev.00	290	373	16-Mar-14	9-May-15
DC00.xer	SaGCP - SATELLITE GCP PIPELINES - CONTRACT NO # 6600042365 DD 26 June-20 Upd...	5937	23146	24-Jun-18	26-Jun-20
DC01.xer	SaGCP - SATELLITE GCP PIPELINES - CONTRACT NO # 6600042365 DD 13-Oct-20	5948	23168	24-Jun-18	13-Oct-20
DC02.xer	SaGCP - SATELLITE GCP PIPELINES - CONTRACT NO # 6600042365 DD 11-Jan-21	5948	23168	24-Jun-18	11-Jan-21
DD00.xer	SaGCP - SATELLITE GCP PIPELINES - CONTRACT NO # 6600042365 DD 26 June-20 Upd...	5937	23146	24-Jun-18	26-Jun-20
DE01.xer	SaGCP - SATELLITE GCP PIPELINES - CONTRACT NO # 6600042365 MR List revised (ACT...	5470	8192	24-Jun-18	30-Jun-20
DG09.xer	SaGCP - SATELLITE GCP PIPELINES - CONTRACT NO # 6600042365 DD 30-Oct-22	5936	21112	24-Jun-18	30-Oct-22
EPBL.xer	EPCC-9_Rev-5 (Actual Sch) Till 15 31-Mar-15	2019	3615	14-Mar-11	25-Apr-15
EPB.xer	EPCC-9_Rev-5 (Actual Sch) Till 15 31-Mar-15	2019	3493	14-Mar-11	25-Apr-15
EPCC-9 Rev4(Actuals)...	EPCC-9_Rev-4 (Actual Sch)	4037	7108	14-Mar-11	15-Dec-13
ES02.xer	R713 - del CTS delay event and USE HMQE delay to match Rev.6 Analysis	1706	2955	1-Feb-15	30-Jun-20
FB12.xer	FWLRT_draft WORKS SCHEDULE_R03 - 20180507	7538	15344	3-May-18	29-Feb-20
FB13.xer	FWLRT_draft WORKS SCHEDULE_R03 - 20180507	7543	15354	3-May-18	29-Feb-20
FB14.xer	FWLRT_Updated Works Schedule_R03 - 20190228	7660	15587	3-May-18	28-Feb-19
FB15.xer	FWLRT_draft WORKS SCHEDULE_R03 - 20180507	7543	15354	3-May-18	29-Feb-20
FB16.xer	FWLRT_draft WORKS SCHEDULE_R03 - 20180507	7538	15344	3-May-18	31-Jan-20
FB17.xer	FWLRT_draft WORKS SCHEDULE_R03 - 20180507	7655	15600	3-May-18	31-Jan-20
FB18.xer	FWLRT_draft WORKS SCHEDULE_R03 - 20180507	7538	15344	3-May-18	29-Feb-20
FB19.xer	FWLRT_Progress Works Schedule_R03 - (DD20201031)	10329	18779	3-May-18	31-Oct-20
FB1F.xer	FWLRT_Progress Works Schedule_R03 - (DD20201031)	9007	17791	3-May-18	31-Oct-20

On the XER tabbed section of the main form, there are two major sections: the first section from the left is a list of the files selected. The right section is a list of the xer files found. This list is in a table format, with a checkbox in the first column, after this is the xer file name in the second column. The plan’s description is in the third column. Next in the fourth and fifth columns are the number of activities and relationships, and the last two columns are the project start date and the progress date that the plan had been updated to (“data date”). **All the xer file functions are executed only on the xer files selected in section 1. In order to move an xer file from Section 2 into Section 1, simply check the checkbox in the first column.**

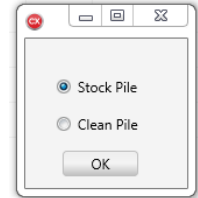


There are five function buttons at the top of the Main XER tab, which perform various procedures directly to the xer files selected in section 1.



**Clear List** – This button clears the xer files that were selected in Section 1.

**Refresh List** – This button will refresh the list of xer files which are found in Section 2, and it also clears the list in Section 1. When selecting this button, the XER tab will close and the user will be prompted again to choose from the xer files from the Stock Pile or the Clean Pile folder.



**Sub Project** – This button functions, to create a new xer file, which is a sub-project of the original xer file selected. This is used to create new projects based on Milestones or to separate subcontractor work or using a related function to gauge if certain areas of the work became critical, and if they did, during what periods.

This function works primarily by taking the activities selected, then taking their predecessors, then the predecessors to the predecessors, then the predecessors of those predecessors, until the path is exhausted, when it runs into activities without predecessors. In this way, whatever activity is selected, you can calculate the critical paths driving completion of the activity or activities selected, for every day on the project.

There is an important distinction between these sub-projects and a sub-project simply arrived in Primavera through WBS or Activity Code filtering, because that would not necessarily contain all the related activities which could affect delay, but which are not in the scope of the subcontractor’s work. This is a true logic extraction that creates an independent xer file with only activities related to the milestone or subcontractor completion activities selected. There is also a related function which goes through all the successor activities in a similar manner. This function is included as it enables an extraction of all the paths, forward and backward, which are related to a certain activity. This is useful to do a comparative run to an overall project with a subcontractor’s milestone completion to see if and during what periods their work was critical.

To use this function, make sure a project is selected in Section 1, before pressing the “Sub Project” button. And by selected, it is meant that the xer file in Section 1 is not only on the list, but highlighted in blue. It is not necessary that the checkbox to the left of the xer file is checked (the checkbox is used for Primary and Target selection, to be discussed later in this section). Once highlighted press the “Sub-Project” button at the top of the “XER” main tab. This will initiate the function. It may take a minute or so for the Sub-Project form to appear. When it does appear, it will be in the center of the main application. The form will have a list of the Activity IDs and accompanying descriptions of all of the activities located in the section labeled A on the illustration below. To the left of this list, will be a checkbox. To single out or narrow down the activities to extract from, begin typing what you are looking for in terms of the activity ID or description into the search field labeled B in the below illustration. As an example, if you type “Testing”, the list of activities will be

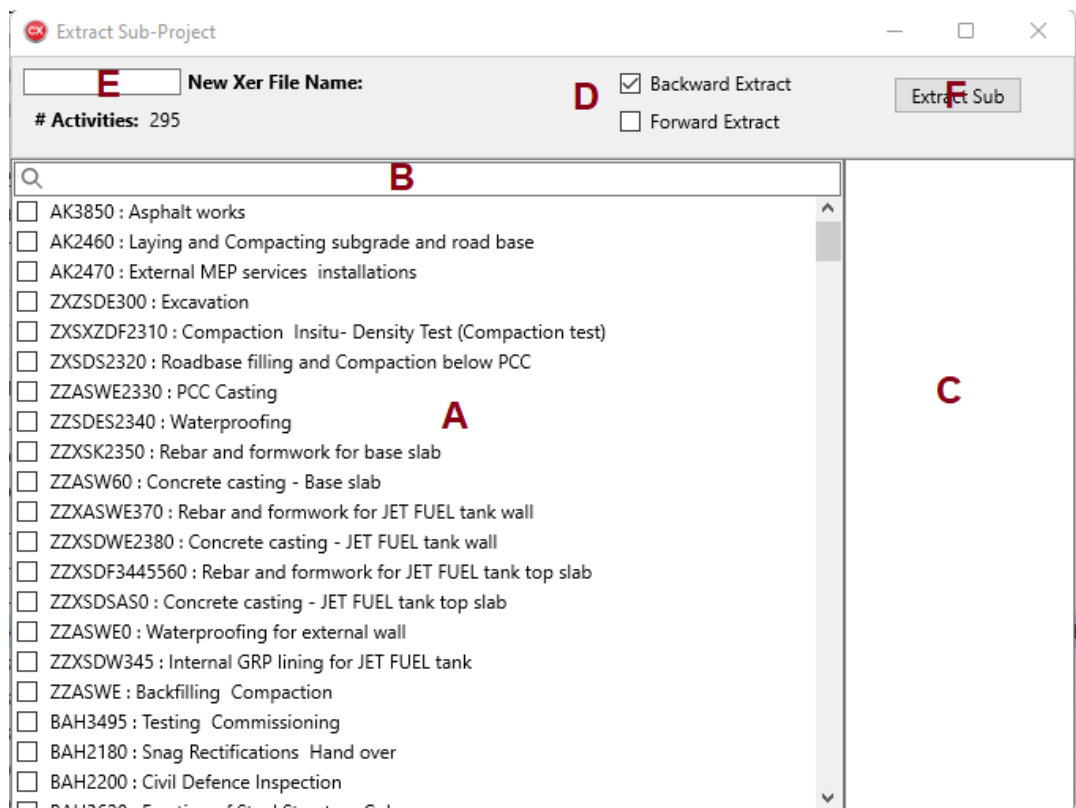




narrowed down to all activity ids and descriptions which have the work “Testing” in it. This search field is not case sensitive. When the field is sufficiently narrowed, so that you see the activity you wish to isolate for the sub-project, simply check the checkbox and the activity will appear in the list labeled C below. You can select more than one activity to extract the sub-project from.

Once you have made the selection of all the activities necessary to extract your sub-project from, next you need to decide whether the extraction should be through the predecessors, the successors or both. If you wish to extract all the predecessors to get a subproject of a milestone, for instance, then the “Backward Extract” and only the “Backward Extract” should be checked. This will then take the predecessors and predecessors to the predecessors... etc. of all the activities listed in C. If, however, you need to determine how close a group of activities were to being critical during the daily windows analysis, then you should check both the “Backward Extract” and the “Forward Extract” checkboxes. This will select all the paths that run through the activities selected. If this is compared on a daily windows analysis with the same analysis of the overall project, then where the lines intersect, the paths running through the activities selected were critical during the times of intersection.

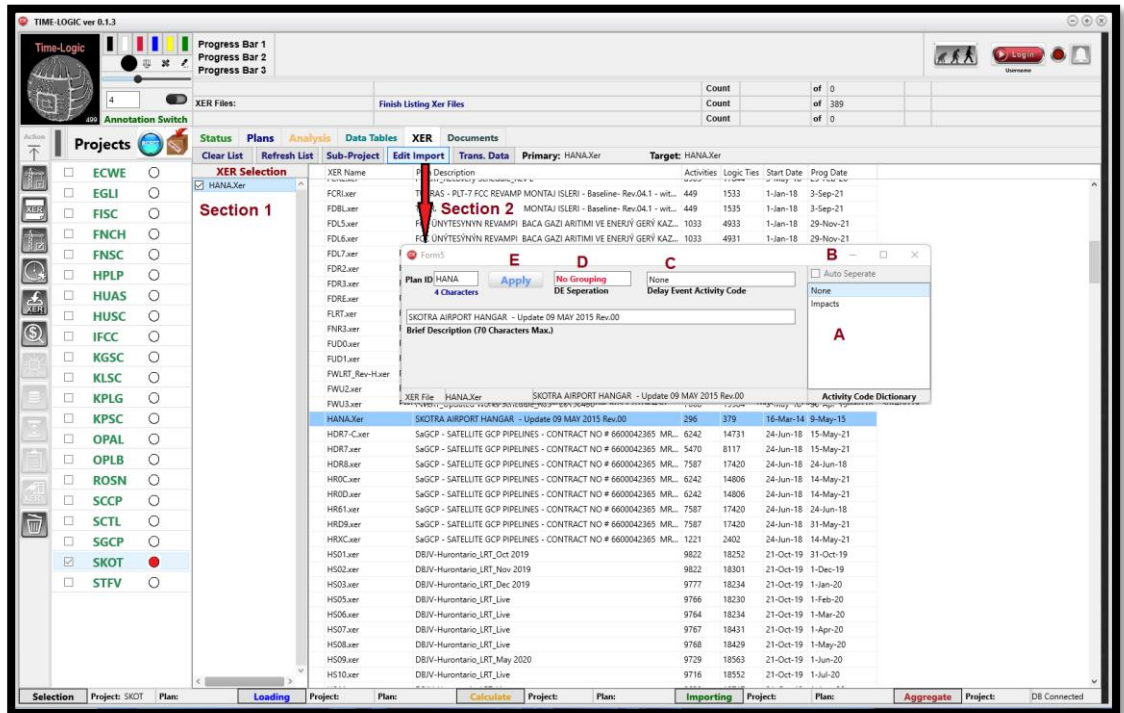
Once the activity selection has been made and the appropriate checkboxes have been selected, then the user must select a unique file name to name the new xer file which will be extracted. This is done in the section labeled E. There is no need to create a file extension, whatever is entered in the box labeled E, will be given the “.xer” extension upon finishing the extraction of the sub-project. Once all these



selections have been made, press the “Extract Sub” button on the right top of the form labeled F.

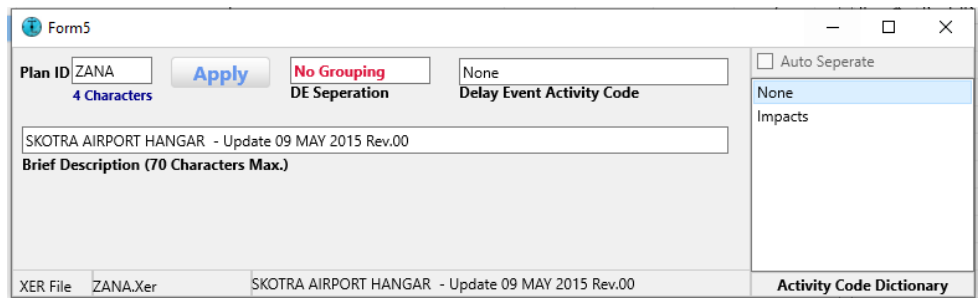


**Edit Import** - Once you have selected an xer file for importing into a project, it is critically important that you **designate and differentiate the delay events and extra work**, so that the computer knows when and which activities need to be suppressed or expressed. This is done in Primavera with the activity codes dictionary. You can use whatever coding system you wish. You only need to select which activity coding system you created in Primavera. This is done through the “Edit XER Import” Button.



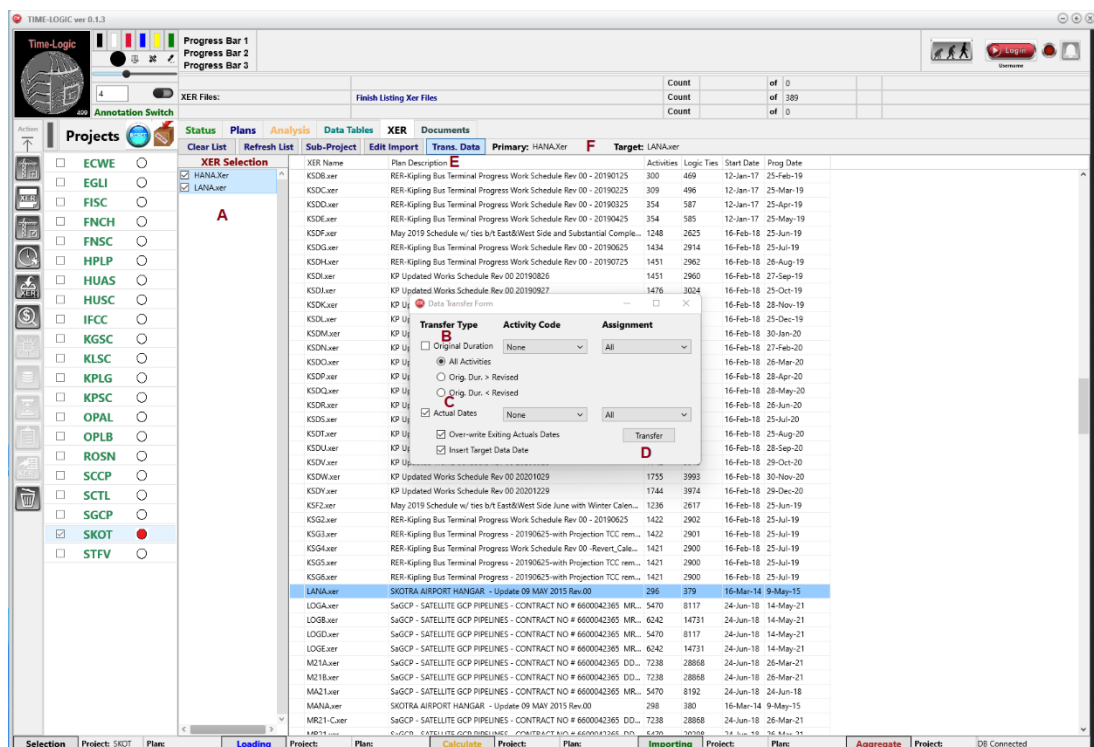
overtop of section 2, as illustrated in the above screen capture, which will bring up the illustrated dialog box.

On the right side of the dialog box is a drop-down list of all the activity codes found in the xer file. **Select the one that designates the delay events.** Directly above this drop-down list is a checkbox with the description “Auto Separate”. Check this box if you have not separated the different delay events with different code designations, but are using only a single activity for all of the delay activities. If this is the case and this checkbox is “checked”, then the software will automatically differentiate each activity as a different delay event. Once you have selected the right activity code press the “Apply” button found on the left of the dialog box.





**Trans. Data** – This function allows the user to transfer data from one xer file to another. There are currently 3 areas of data that can be transferred: Original Durations, Actual Durations and Delay Events. Like the “Compare” function, the transfer button requires for the user to designate the primary and target xer files. This is done in an identical manner as with the “Compare” function. Specifically, the user must select both a primary xer file and a target xer file from the list of xer files in Section 2. This is done by placing the two schedules in the xer selection list (A), starting with the Primary and then the Target xer file from the list, then checking the checkbox of first the Primary then the Target xer files (A). To see if this is done correctly, the Primary and Target xer file selected are labeled just to the right of the nine function buttons (F) currently being gone through. Pressing the “Trans Data” button (E) will bring up a dialog box which allows you to select the data you would like to transfer from the Target and into the Primary.



The dialog box as shown above has three columns. The first column (B) is a list of checkboxes, which the user should select from the three transfer categories: Original Duration, Actual Duration and Delay Events. Note that when transferring actual durations, you have further optional settings checkbox to indicate whether you would like to over-write existing actual dates and whether you would like the data date to be changed as well in the created xer file to the data date of the target xer file. You can further filter down the selection with the second column (C), which allows you to transfer the data only for those activity codes selected. The last column is do designate the information to only be transferred to selected categories of the selected general activity code. Once the selection has been made, press the “Trans” button (D) and the information will be transferred into a newly created xer file. The new xer file, when created, will have the name of the Primary xer file, plus a



“-“ and the type of information transferred. This will be stored in the same directory where the Primary xer file is stored, which is typically in the “StockPile” sub-directory or the “Import” directory.

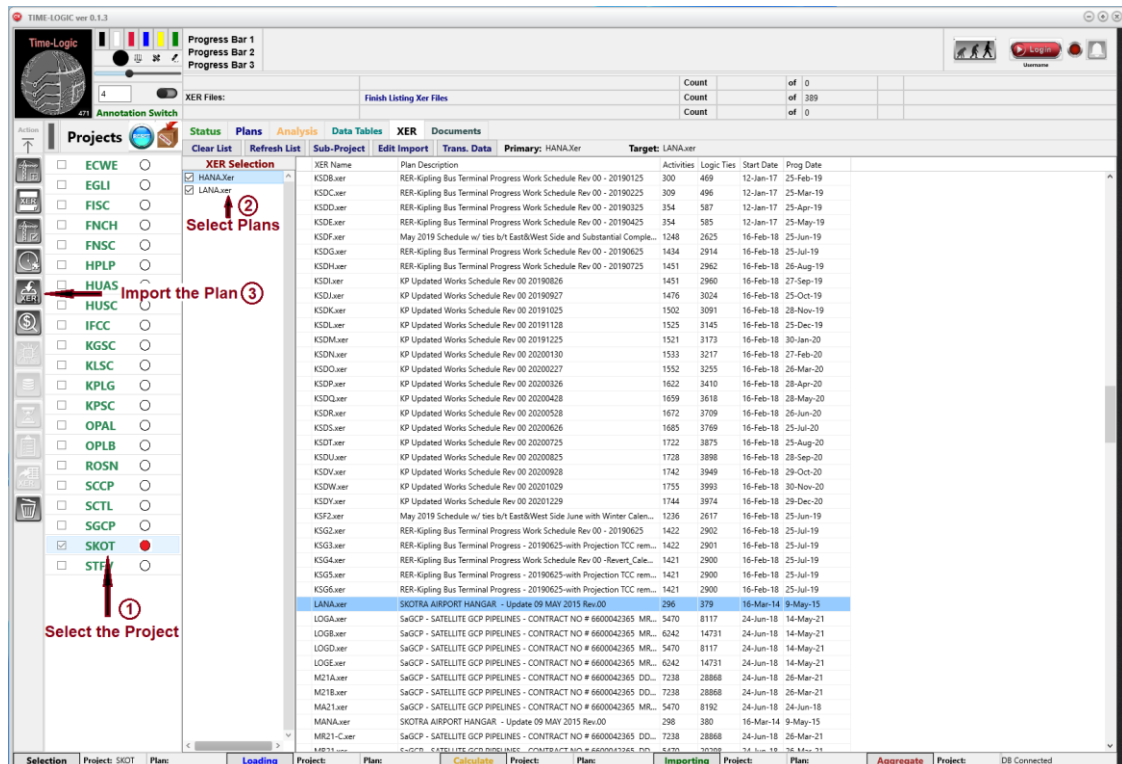
**Clean Xer** - The next section of the xer functions is the “Clean Xer” button, which is the 8<sup>th</sup> button from the left at the top of the xer list. There are specific logic ties which are detailed in the first section of this manual, which are allowed in precedence diagramming, but which run contrary to causality for delay analysis, because it allows the finish of an activity to dictate its start.

In other words, it allows for the future to define the past. This may be useful for project controls but it causes irregularities for delay analysis. By pressing the “Clean Xer” button the software will run through the original logic of the xer file and correct these anomalies. Once corrected it will store the revised xer file with the same file name, only expanded by the word “-Clean”, and place it in the “CleanPile” directory of the “XerImport” directory.

As an example, if you were to select the file “Zana.xer”. When the clean file button was pressed, a xer file called “Zana-Clean.xer” would be created in the “Cleanfile” directory.

**Importing the XER file** – After delay events have been designated through the activity code of the selected xer project (see above section under “Edit Import”), the xer file or files are ready to be imported into the selected project. This is done in three steps.

- Selecting the project.
- “Check” the checkbox for the XER file selection you wish to import.
- Press the “Import” button, which is the fourth one down on the vertical toolbar.





More than one xer file can be selected for importing, but the plans to be imported will be the ones whose check boxes are checked, and not the ones selected or highlighted. Once the plans for importing have been checked in the xer selection column (2 above), pressing the import button (3 above), activates a dialog box which summarizes the plan or plans to be imported, along with their basic information in a string grid.

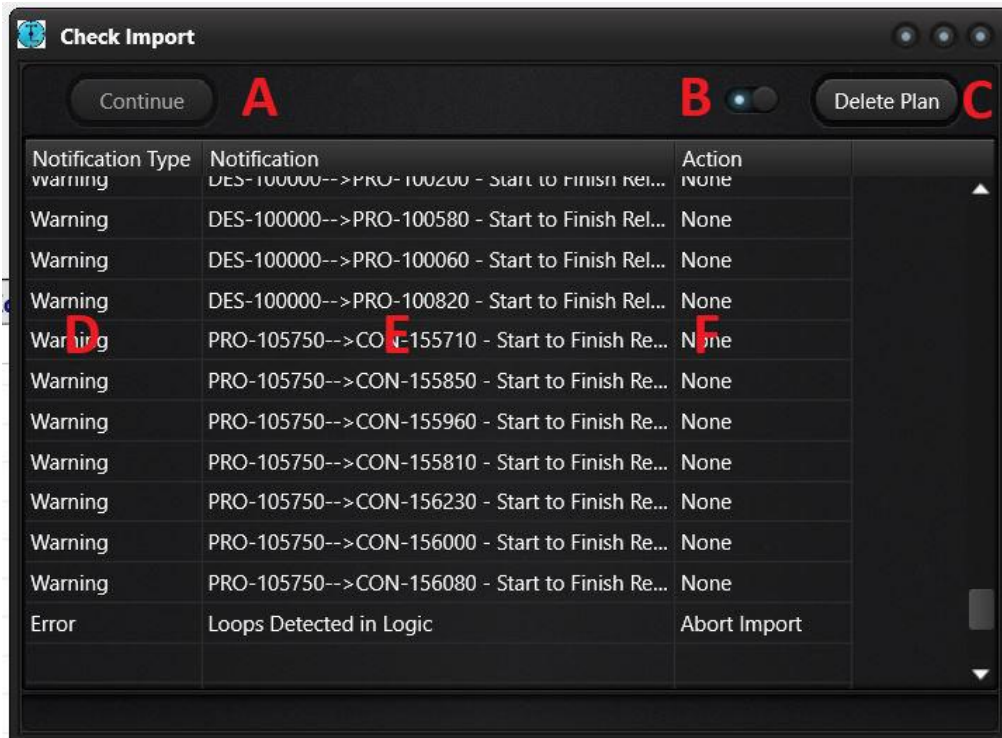
Clear List	Refresh List	Sub-Project	Edit Import	Sanity Check	Compare	Trans. Data	Clean Xer
<b>XER Selection</b>							
<input checked="" type="checkbox"/>	BANA.xer						
<input checked="" type="checkbox"/>	HANA.xer						
<input checked="" type="checkbox"/>	ZANA.xer						
<input checked="" type="checkbox"/>	XANA.xer						
	XER Name	Plan Description					Activitie
	BL11.xer	SaGCP - SATELLITE GCP PIPELINES - CONTRACT NO # 6600042365 DD...					7078
	BL8A.xer	SaGCP - SATELLITE GCP PIPELINES - CONTRACT NO # 6600042365 DD...					858
	BLJN.xer	REV 6 BL July 2018 OD with DE-All-Adj					18850
							18850
							6744
							6743
							6836
							7154
							7154
							4
							3
							1906
							2528
							3212
							4462
							3767
							802

This dialog box is illustrated on the bottom of the previous page, and allows the user to review the information prior to importing the xer file. The Dialog box has two sections: the top section, which is made up of selection buttons (A,B,), and the lower section of the form which is made up of a string grid similar to an excel spreadsheets, showing the findings.

The two buttons on the top are the selection choices. The first one on the left, is the “Continue” button (A). As the name implies, if you wish to continue to the calculation, you must select this button. The next button on the dialog box, is the “Abort Import” button (B). This button will abort the calculation close the dialog box and set the focus back on the main application.

If the user chooses to press the “Continue” button (A), then the software will begin importing the xer file information, creating a new plan or plans, for the project selected. Once this is completed, a message is given in the status section at the top of the main form.

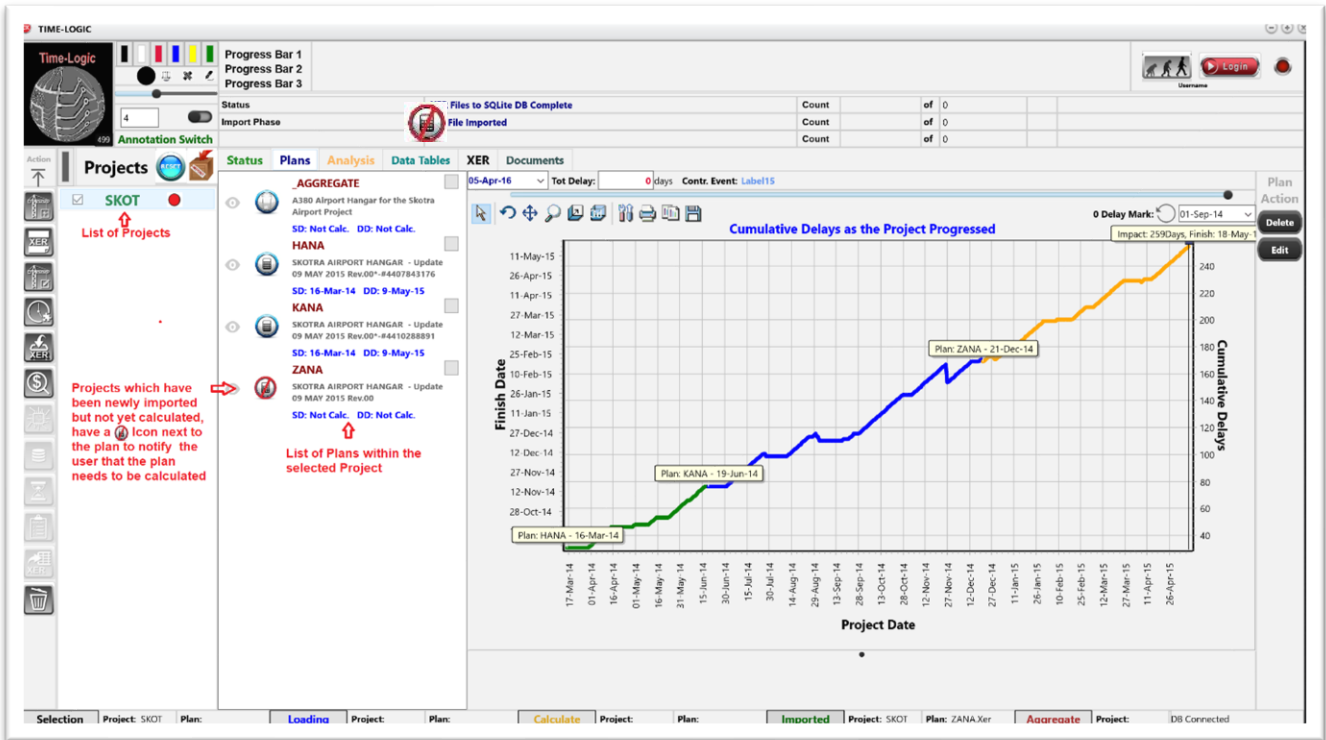
After this another check of the data is made as the software begins creating the various tables of the imported plan. After all the tables have been created, this dialog box will display itself, as shown below.



Like the other check dialog boxes, the lower section is comprised of the results of the xer file check, which is split into 3 columns: (D) Notification Type, (E) Notification (Description of Notification) and (F) Action. The third column, “Action” relates the action which will be taken by the application because of the notification. The first column (as the header describes) displays the type of notification, which takes three forms: “Observation”, “Warning” or “Error”. As the names imply, they are varying in degrees of significance. The type “Error” will force the deletion of the plan tables from the project by disabling the (A) “Continue” button at the top of the form, leaving only the (C) “Delete Plan” button to close the form.

At the top of the dialog box, there are two, just mentioned, process buttons: (A) “Continue” and (C) “Delete Plan”. There is also a (B) switch next to the (C) “Delete Plan” button, which needs to be switched on, in order to enable the (C) “Delete Plan” button. Pressing the (C) “Delete Plan” button will stop the incorporation of the new plan and remove all the tables that were created for that plan. Pressing the “Continue” button, (which will only be enabled if no errors were found) will continue to place the new plan into the project.

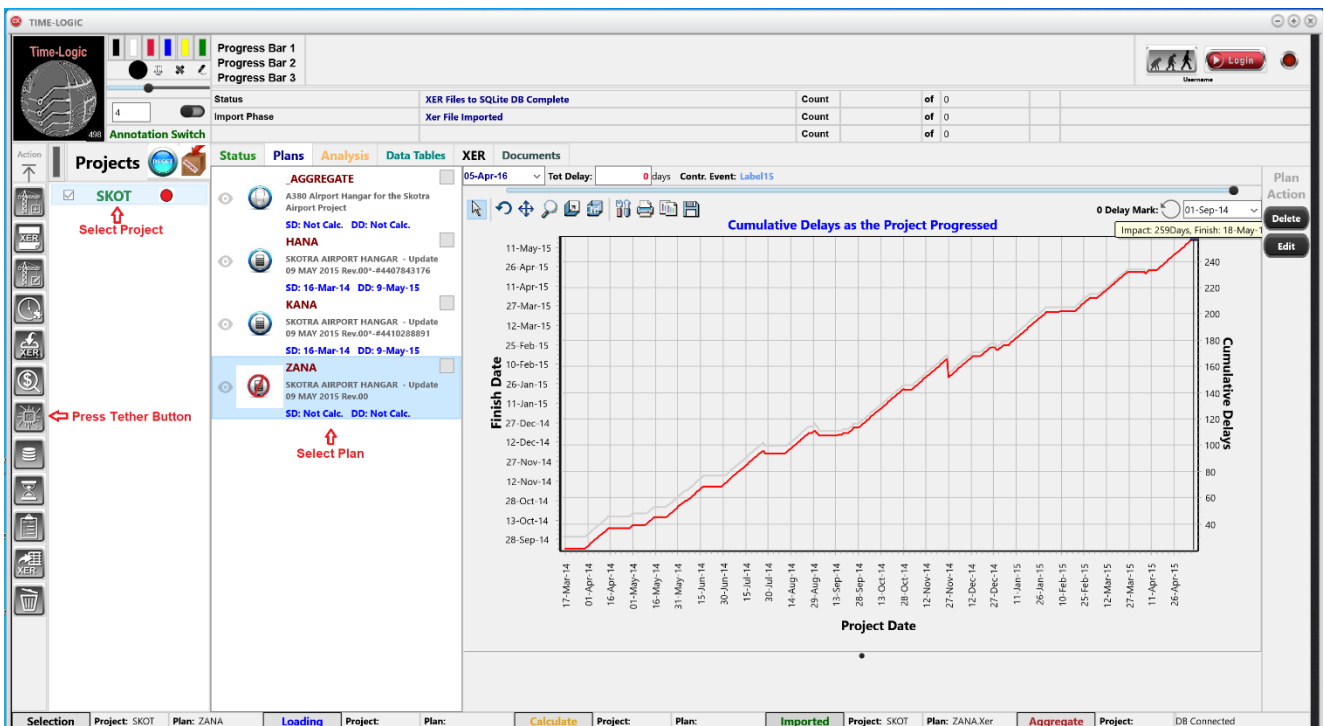
To see that the new plan has been imported, go to the “Plan” tab section. Once in this section, on the left there is a list of plans for every project selected in the adjacent projects list. When you select any project a list of the plans for that project will appear on the plan list. When a new plan has finished importing, there will be designated a new plan on this list, along with the plan ID and basic information.



To the right of the plan name and description is an icon which shows if the plan has been calculated, and if so whether it was a fast or detailed calculation. If a plan has just been imported but has not been calculated yet, the symbol will appear like the following: These designations are explained in detail in the next section: "Calculating the Plan."



**Calculating the Plan** – Once a plan has been imported into a project, calculations for the delay analysis must be made for every day of the project, from its start until





the latest update (data date). This done with the “Calculate” button, which is the seventh button down on the vertical toolbar.

The first step, is to select a project and a plan within that project to be calculated. To do this, click on the “Plans” tab, which displays the various plans of each project which is selected on the adjacent column. First select a project from the projects list and a plan from the plan list. When a plan for calculation is selected, the tether button will be enabled. It is also important **not to select the aggregate plan** for calculation. This plan is calculated by joining the various plan in the plan periods function.



When the “Calculate” button is first pressed, a dialog box will appear with radio buttons, with the title “Choice”. This may seem a little confusing, why the calculation button did not just go straight to the calculation dialog box. This is because, the Calculation button has been expanded to perform more than just the calculations, and should probably more appropriately be called the tether button.

The main application software does not perform the calculations, that is done on a separate application called the “IsoCalculator”. This application, as the name implies, does all the calculations of the project, but it has another primary function, and that is to get a copy of the project database from the main application to perform the calculations on, and return the calculated project when it is finished. This sending and receiving of project files is done through what is known as a “tether”. The tether is a way of two different applications to communicate and exchange data. The structure of communication of the tether, is fundamentally different than the typical FTP (file transfer protocol) used to transfer files through a server. Tethers run by pairing one computer to another, in the same manner as you would pair your headphones through Bluetooth to your cell phone. The structure is not hierarchical with Clients and Server, but is an equal exchange between all computers paired into the system. You can send a message of a file to the other computers paired, and they in turn can send back to you. It has a lot of advantages, as it is also platform independent, fast and can readily send messages, instructions, and files. It does have one disadvantage though, it is designed to operate within a LAN or local area network, and not designed for a wide area network such as the internet. This requires the user to be seen by the software as within the LAN, which is done through a VPN. The steps for using the VPN are detailed in the introductory section of this manual. Also, the software requires that you are logged in to use the calculator. The steps for logging in are also detailed in the introductory section of this document.

The framework of the software takes advantage of the fact that there is a means of physically transferring the database to a different location, so that we have expanded its roll to include sending the file as a backup of the project, or to other end users. In other words, the tether now has functioning beyond the original use of calculating a project. It can be used to send for a calculation, or to just send to store for later retrieval, or lastly, it can be sent, so that a report can be generated based





on a previously done calculation. For this reason, it is necessary to tell the application what the purpose of using the tether is. In this section, the focus will be on calculating the selected plan.

In order to calculate, when the “Choice” dialog box appears, select the “Calculate Out” radio button, then press “Continue”. This will start a procedure which will take all the tables of the database and put them into memory in order to perform several functions that check the integrity of the selected plan.

Once this process is finished, the CheckForm Dialog Box shown on the following figure, is displayed. This Dialog Box shows the results of the integrity check. The CheckForm Dialog box has two sections. The top section, which is made up of selection buttons (A,B,D) and a switch (C). The lower section of the form is a string grid, like an excel spreadsheets, which shows the findings of the CheckForm. The three buttons on the top are the selection choices. The first one on the left, is the



“Continue” button (A). As the name implies, if you wish to continue to the calculation, you must select this button. If a fatal error is found, which will prohibit the proper calculation of the plan, this button will be disabled. The middle button on the dialog box, is the “Abort Calc.” button (B). This button will abort the calculation close the dialog box and set the focus back on the main application. The third and last button from the left, is the “Delete Plan” button (D). Pressing this button, will delete the selected plan. This will be necessary if there is an error which cannot be fixed except by correcting the xer file and reimporting. In order to help ensure that the plan is not deleted accidentally, this button is disabled, and can only be enabled, by flipping the switch (C), located between the “Abort Calc.” button (B) and the “Delete Plan” button (D). Pressing the “Continue” button opens the tether dialog box, where you can finalize the settings of the calculation, as well as, set the parameters of the tether. The form for this, is shown in the following figure.

The form is divided into two sections. In the top section, there are three areas which relate to the calculation and the variable information on how you would like the IsoCalculator to Calculate the analysis. The lower portion of the form is related to the parameter settings, and is informational only.

The first area (A) from the left, of the upper portion of the “Calculate Plan” form, designates which dates the IsoCalculator should calculate the project for. By default, the dates are the start of the plan to the latest progress date of the xer file the plan was based on. But this can be narrowed, which decreases both the size of the project database file and the speed of the calculation. For instance, if this is a recovery schedule, which occurred substantially after the start of the project, you may want to only calculate the dates from the inception of the schedule, rather than the entire length of the project. As a rule of thumb, if a revision has an inception date, there is no need to calculate before that date. Also, if there are no changes to the logic or durations of an update, there is no need to separately calculate each month, because calculations are done using percent time. If there is no revision to a schedule, the results will be the same, whether you update monthly or over the entire period of the schedule revision.

The second area of the upper section form (B) determines how the calculation is to be performed. There are three different sets of options. First, from the top, is the “Windows Type” option for the daily windows analysis. This selection will either perform the analysis without inserting the influence of delay events (Objective), or alternatively, it will impact the schedule at the inception date of every delay event designated as such in the P6 xer file (modeled).



The next calculating option is for sequencing the activities. The “Actual” (progress over-ride) option refers to whether the system, when calculating, will recognize the network as it has progressed. This is a system of calculation known in P6 as progress over-ride. In this system of calculating, if an activity has started out-of-sequence from the plan, the calculator will acknowledge this and update the successors accordingly. The alternative to this is to hold to the original planned logic, which in P6 is referred to as “Retained Logic”. In a daily windows analysis, using logic which is no longer valid due to out-of-sequence logic usually result in exaggerated delays followed by abrupt and exaggerated recoveries (once all the predecessors of the out-of-sequence work have been actualized). Another reason to use progress over-ride is that it will pick up the impacts of out-of-sequence work frequently associated with accelerative efforts. There is considerable debate on this issue, but for retrospective daily windows analysis, its use tends to weaken the reliability of the results. Nevertheless, the method is currently in the testing process to ensure its agreement with P6’s algorithm.

The third set of options in area (B) has to do with the calendar used to determine the duration between events or lag. In most schedules, the predecessor activity determines the calendar used to calculate the duration of the lag. So, this is the default setting. However, some planners prefer to use the successor activity calendar. In order to reflect the planner’s schedule set-up, it is important to review the plan in P6 to determine which calendar was used, and reflect that in this setting.


The third and last area (C) of the upper form, contain the buttons that start the calculation itself. There are two buttons here. On the left is a button with caption “XER Memory”. This button is an internal calculation, which stores all the findings of the delay analysis in memory, so that xer files can be produced in support of the software’s findings. This is covered later in the manual. Next to this button in “tether out” button (C2). This is the primary button for calculation, and once all the other parameters have been set, pressing this button will start the calculation in motion. Before pressing this, however, the calculation target needs to be set in the top section of the form (G). Currently, there are two options to send the plan out for calculations: Local and HTTPS. The local setting, will attempt to send the calculation out to an IsoCalculator application that is open and operating on the computer being used or (if not found) to any IsoCalculator application running anywhere on the LAN (local area network). The file transfer in the local setting, is done through a tether. If you are outside of the LAN you could still calculate into the LAN, through a VPN. **It is important, if you are sending the file using a VPN, that it is running prior to opening the software.** If it is not running, then close this dialog box, and the main application, then start the VPN, before restarting the main application. It is also important to note that you will not be able to perform a calculation until you have logged in as a user. The other option to calculate the analysis, is to use the HTTPS setting. This setting will attempt to transfer the files for calculation to the server designated in the HTTPS settings.

In the bottom section of the form, there are three information areas where information is entered, displayed, or stored. The first, from the top, is a memo box (D). In this section all the parameters of the tether are stored as a text, which is sent



to the IsoCalculator, outlining what is to be done with the file sent. If it is a calculation, it will also store, what the parameters of the calculation are. This includes the name of the project and the plan to be calculated, the dates of the calculation, as well as, the unique date timestamp of the calculation. This cannot be edited and is displayed for information purposes only.

Below this is a text box where you can enter a brief description of the purpose of the tether. By default, this will be the settings selected in section (B). This is stored in the database, so that when you, or someone else, needs to retrieve this project, the retriever can see the purpose of the send. Below this is a progress bar (F), which will indicate the progress of sending the database. If the database is to be sent to the local IsoCalculator on your computer, then the target is “Local”. If you are in the LAN itself, then select the “Assembler LAN” option. If you are outside of the LAN then select the “Assembler VPN” option. **It is important, if you are sending the file using a VPN, that it is running prior to opening the software.** If it is not running, then close this dialog box, and the main application, then start the VPN, before restarting the main application. It is also important to note that you will not be able to perform a calculation until you have logged in as a user.

Once these options have been defined, then the software is ready to calculate the selected plan. To start this process, press the tether out button  (C2), this will start the preparation of the database file to send to the IsoCalculator, through the



tether or HTTPS. Before the database is sent, the file is given a unique name by the Project Name, Plan Name and exact date and time of the calculation request (time stamp). If calculating locally, the tether will

then search the network for the IsoCalculator and once found will pair, and then begin sending the information about the project being calculated, followed by the database file representing the project, which will place the project on the que for calculation. As a reminder, each project is its own separate database which resides on your computer under the database directory in the location that you installed the program to. Its file name is the name given when you created the project, with the file extension “.db”. If the file is successfully sent to the remote server, the dialog box will close and the “Tether Out” icon will appear next to the plan which was sent out to the IsoCalculator, to remind the user that the file has been sent out but not yet retrieved.



Once the “Tether Out” button is pressed, the form sends the database to the IsoCalculator. There are two of these IsoCalculators, which this form can send the



database to, for calculation. There is one that is local on the computer where the main application was installed (IsoCalculator.exe). This is in the same location as the main Time-Logic application (Reticulum.exe), when the software was installed (i.e., “C:/ReticulumXE10/Prog”). If the user is going to use the local calculator, it will need to be started prior to calculating. The IsoCalculator when started will appear as shown, if in calculation mode.



There is also a second and much faster IsoCalculator, which resides on an external server, where it can take advantage of the increased core and thread count of a server. This second location of the IsoCalculator application uses a parallel programming library to greatly increase the speed of the calculation. More on that later in this section. This form sends the project's database to the IsoCalculator with instructions to either store the database, calculate the database, or have a report made of the project. In this section, we are discussing the calculation of the plan.



If the user does not want to calculate the project, this tether can be used to simply store the project for later retrieval. In order to perform this exercise, it is identical to the calculation exercise, only when the initial selection purpose of the tether on the radio button "Choice" dialog box, instead of choosing "Calculate Out" choose "Backup" instead. Then press "Continue", and the application will take the user directly to the previously mentioned "Calculate Plan" dialog box. From there select where

you want the project database sent (G) followed by the tether out button. If you choose the local option, then a copy of the project database will be sent to the "Projects" directory under the following path: "C:\Reticulum-XE10\CollDistDB\Projects". The user may want to send the project database to the remote server, so that other end users can have the project and its findings. In any case, wherever the user chooses to send the project, you will have to choose the same location to retrieve the project. This is not done automatically, however, the selection (G) has no default setting, so that the retrieve button is disabled until the user selects where to retrieve the file from. If the user does not properly designate where the file is to be retrieved from, then it simply will not be able to find the file, and will inform the user, so another attempt can be made.

There is a third option to sending out a project. The user can send a project out for a report to be generated on the findings of the analysis. In this case, instead of choosing the "Backup" or "Calculate Out", choose the "Report Writer" option. If this option is chosen, followed by the "Continue" button, then a "Report Content" dialog box is opened as shown in the following figure.



**Report Content**

Word **A** Intro  TIA  **B** **C**  
 Wind.  Conclu

Rpt Star **D** Date: 24-Jun-18 Rpt Fini **E** Date: 26-Mar-21

Report Title: **F**

Prepared For: **G**

Prepared By: **H**

Standard  **Template** **I**

Intro	TIA	<b>Windows</b>	Conclusion	Appendix	Description
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>


**J**

At the top of the form are checkboxes for the four primary sections of the report (A): Intro (Introduction), TIA (Time Impact Analysis), Wind. (Daily Windows Analysis) and Conclu (Conclusion). Selecting any of these sections of the report will check all the subsections which are defined in the tabbed sections at the bottom of the form (J).

Below this is several general entries of the report, including the start date of the report (D), the finish date of the report (E), the Report Title (F), who the report is prepared for (G), and who the report is prepared by (H). Below this is a selection box (I), which allows you to select various predefined templates,

which dictate the font, title, and various headers selected for the report. Below this are the previously mentioned subcategories to the general sections selected in the checkbox at the top of the form (A). Here you can select any section of the report and check and uncheck the subcategories that you wish to appear in the report. The last tab (Description), is for a memo box in which you can detail a description of the report and its purpose.

Once you have selected what is to be included in the report, press the “Continue” button to move forward with creating the report, or the “Abort” button, if you wish to cancel the report’s generation.

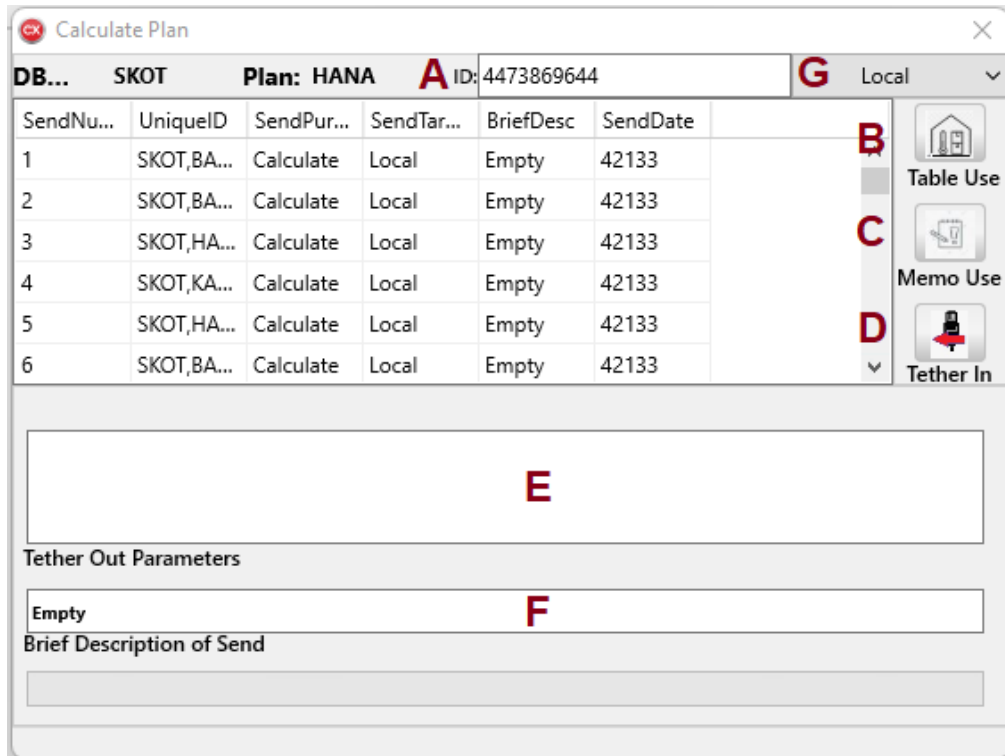
If you press continue, then the same “Calculate Plan” dialog box will appear that was shown in all the other options. In the target selection dropdown menu, be sure to select “HTTPS”, as this is the only target which will support report writing generation. Once done, press the tether out button  , which will send the project database to the server with instructions to generate a report.

Once a project is sent to a target location (for either storage, calculation, or report generation), retrieving the project is done by using the same “Calculation” main function button that was used to send the project database.



After pressing the main calculation button, the “Choice” dialog box appears. To retrieve any sent project, first you must select the “Retrieve/Restore” option in the “Choice” dialog box, then pressing continue. This will again bring up the “Calculate Plan” dialog box, only its appearance will be completely different on the top half of the form, and geared to the task of retrieving a previously sent project file.

Retrieving is done the same way regardless of the reason the file was sent, whether for calculation, storage or report writing. The appearance of the dialog box will be as shown in the following figure.



There are three different ways to retrieve a sent project. By default, if you have sent a project out, then from the main form simply select the Project and Plan that was sent, and that will be the project which will be retrieved when the “Tether In” Button (D) is pressed. However, make sure that the target location (G), is the same as the project that was sent.

Every project that was sent out from the user, is recorded in a table which is in the middle of the form (E). And every project which is sent and retrieved has a unique ID based on the time it was sent and the name of the project and the plan. If you wish to retrieve one of these projects that was sent, simply, select the sent project from the Table (E), then press the “Table Use” button (B), prior to pressing the “Tether In” button (D). This will tether to the selected location and retrieve the selected project in the table.

The second column in this table, designates the unique ID of each project sent. A third way to retrieve a sent project, is to enter this code directly in the “Tether Out Parameter” Memo Box (F), followed by pressing the “Memo Use” button(C), then

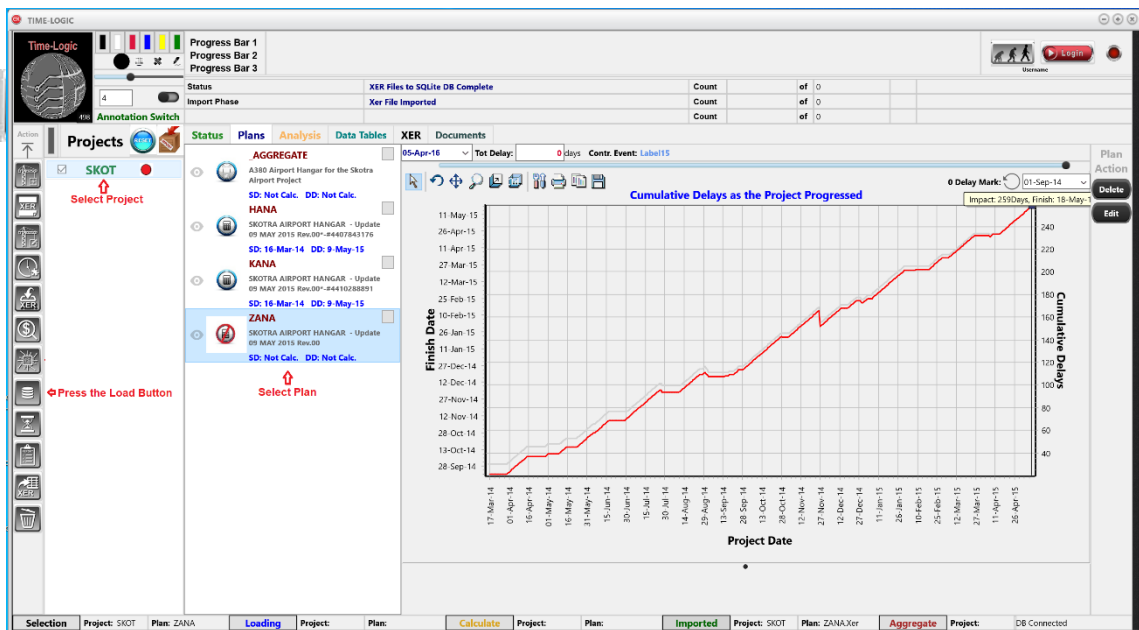




pressing the “Tether-In” button (D). This allows other users to retrieve a project which you have previously sent. All you need to do is copy the “Unique ID” field from the table of the project you wish to share and send it to the person you wish to share the project with. If that person, pastes the unique code into the “Tether-Out” memo box (F), then presses “Memo Use” button (C) followed by the “Tether-In” button (D), then when the tether is established, it will retrieve the project uniquely identified in the memo box.



**Loading the Project** – Once the project has been calculated and returned, the user can then load the project from the database back into memory to analyze the results. This is done by selecting the plan of the project which you wish to load and pressing the “Load” button on the vertical toolbar of the main form, which is the 6<sup>th</sup>



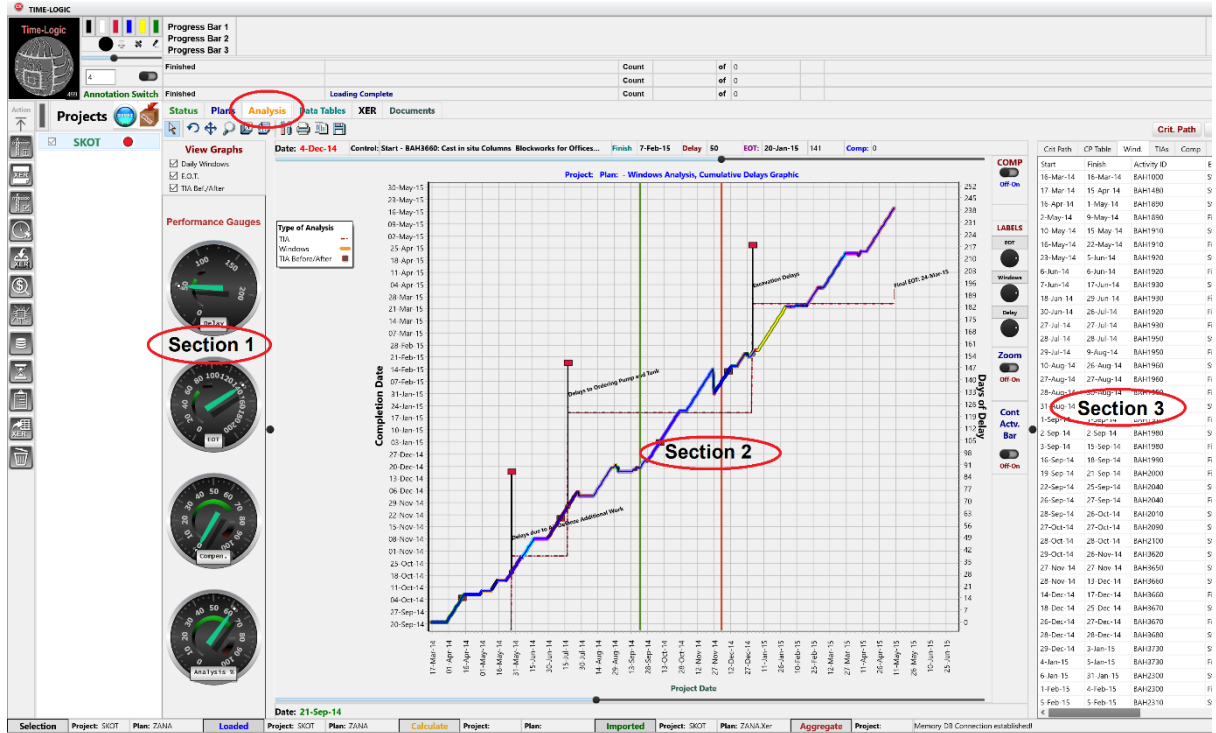
button down from the top. Pressing this button will initiate the loading process. Be sure to select a plan in the plan list for the selected project or else the software will not load, but will give you a message box instructing you to pick a plan before loading. Loading the project results in taking the information from the plan stored in the database during the calculation process and placing it in various graphic and tabular formats to flush out different aspects of the analysis findings. This process is monitored by the progress bars 2 and 3, and is displayed in the same graph that was produced during the calculation only with a much-limited scope.

When the loading is complete the status bar at the top of the main form will confirm the loading was finished, and the software will automatically select the “Detail Graphics” tab of the main form. This tabular section is where all the analysis information can be found. When the software selects this tab, initially there is a blinking red callout box with the text: “Select Date”. Pointing the attention of the user to the trackbar at the top of the form. This track bar, when moved, moves the date of the day being analyzed. A vertical red line will appear when you begin moving the trackbar along with all the status information which will be updated to



the day selected. This is the primary means of finding information about any day of the project or any period on the project.

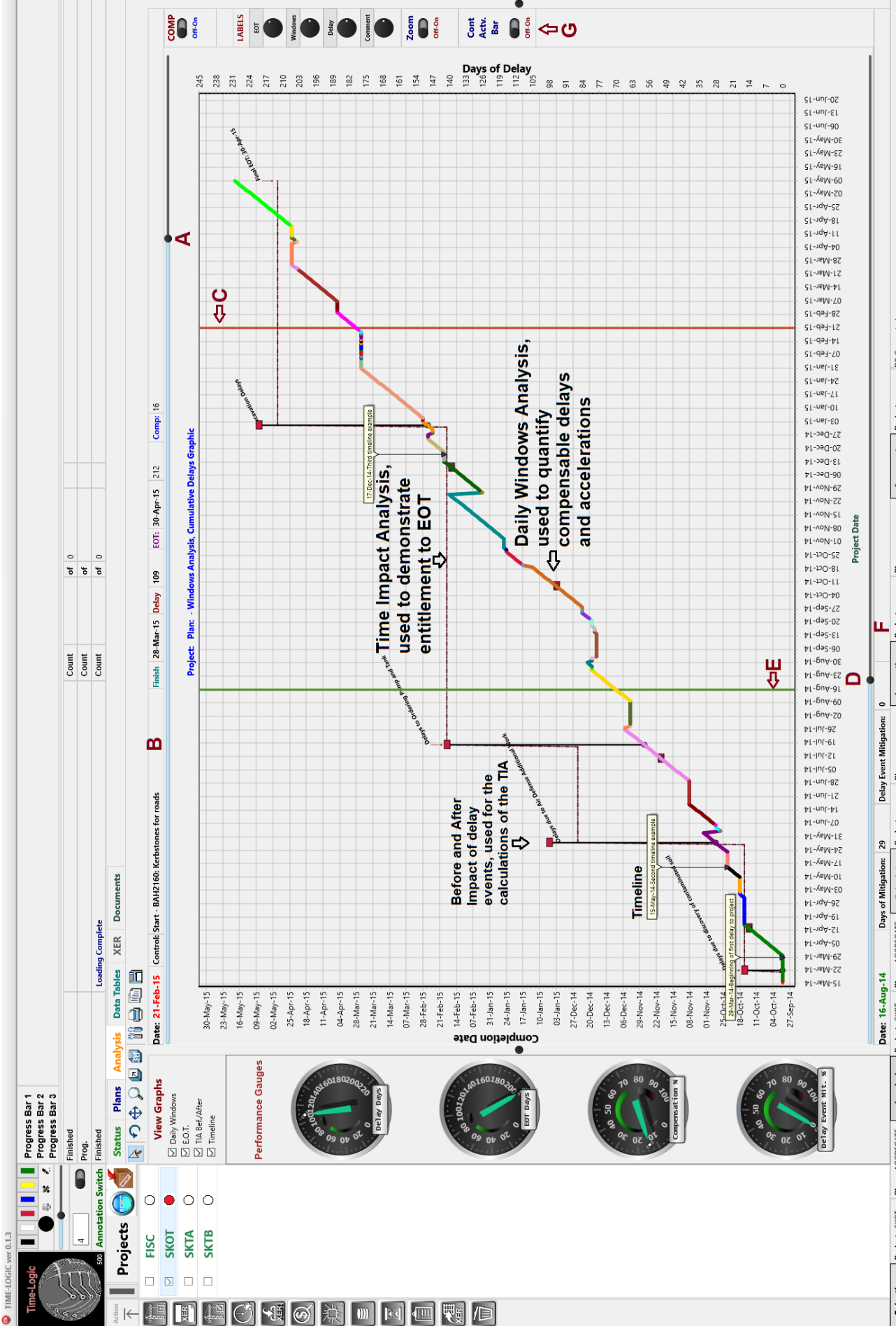
The “Analysis” tab section is divided into 3 areas. **Section 1** - On the left of the tab section are a series of 4 performance gauges. **Section 2** – Is the primary graphic section, and **Section 3** – Consists of mostly tabular spreadsheet quantifications of the graphics in Section 2.



In essence both sections 1 and 3 are dependent on the selections chosen in the central section 2. So, this explanation will start in the middle with section 2, which details the main graphic results of the delay analysis, then go to Sections 1 and 3.

### Section 2, Main Graphic Display

Before going into the controls of the graphic section, it is important to be familiar with its basic graphical format. The center section is where the primary interactive graphic is located. This section is made up of three separate but related graphs. The units of the graph are nearly identical to the primary graph created during the calculation run, except it has a great deal more functionality and detail. Its basic composition, however, is very similar. The bottom axis or x-axis corresponds to the progress date of the project. There are two y-axis which are directly related. On the left, the units correspond to the completion date of the project, which directly corresponds to the cumulative days of delay which make up the units on the right axis of the graph. Therefore, any positive slope on the graph will indicate periods where the project was in delay. Conversely, any negative slope would indicate periods of recovery, and horizontal sections are where the project was proceeding without impact.





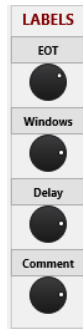
**In the following descriptions of the graphic Section 2, please refer to the illustration on the previous page.** With these basic axes, four graphs are plotted at the same time. The top stepwise dashed red line graph is a plot of EOT entitlements through a Time Impact Analysis, based on the delay events. This is basically chronological projection at the point-of-impact, of delay events on project or milestone completion. The Time Impact Analysis, is an industry standard for demonstrating entitlement for an extension of time. The vertical black lines with the red box at the peak, represent the independent impacts of each delay event. The base of this spike resides at the before impact completion date. The peak of this spike is at the after-impact completion date. The difference between the bottom and top of the vertical spike, represents the independent impact of each delay event. Their effect on EOT can be seen by the step rise of the EOT graph. The bottom-colored line represents the actual daily accumulation of delays. This bottom graph is known as a daily windows analysis. It is used to determine compensation, by finding the actual activity which caused delay each day as the project progressed and accumulates the impacts of those controlling activities over time. The software will determine what activity was responsible for delay for each day, and whether that activity is related to a delay event, but it will also determine if there are any other controlling activities equally driving completion. This is done so that if there is concurrent delay (where the responsibility is split between two equally controlling activities), there is no compensation given for that day. Qualitatively, the top EOT graph is a projection of how a delay event will affect project completion, the bottom daily windows analysis is how those delays accrued through time. There are many functions added to this graphic which either give you detailed information or allows you to manipulate the appearance to best represent any part of the analysis you wish to emphasize. The following section briefly describes these functions.

To get details for a specific day, there is a date selection slide bar at the very top of the graph (A). “Grabbing” the slide bar and moving right will engage a moving red line (C) whose position corresponded to the date selected. This is done “on-the-fly” and as the slider is moved the position of the line will also move with it, along with the date designated on the left status bar (B). Also, on this status bar (B), as the date changes, so will the cumulative delays as of the selected date, along with the amount of EOT found, compensation, total delay, and the controlling activity and its description. These quantities, are all changing to match their values on the date selected by the top slide bar.

On the bottom of the graphic is another slide bar (D). This slide bar is made so that a “from” date can be chosen, as well. This “from” date is displayed below the bottom slide bar on the left. And a corresponding green vertical line (E) will appear on the date selected (in a similar manner as the red line date selection). This effectively allows the user, by sliding the top and bottom slide bars, to confine the findings to a period between the two lines. Below the slide bar is another status bar (F). This status bar, in the farthest left data box, tracks the “from” date chosen on the bottom slide bar. There are two other data boxes: middle and right, which keeps track of the total mitigation, and how much this mitigation recovers against compensable delays. All of these status boxes are updated “on-the-fly” with the movement of the lower slide bar.



On the right of the graphics is a vertical control bar (G). These contain various switches and dials which effect the appearance of the graphic.



The user can show the value label of each of the graphs by pressing the labels button, corresponding to the graph you want marked. These buttons are located on a vertical toolbar on the right of the graphic. The button when pressed will show the labels if they are not visible, and hide them if they are. Below each label button is a circular spin dial. If the labels are present, then grabbing the spin dial with the mouse, and rotating it either clockwise or counter-clockwise will rotate the angle the labels are placed on the graph. This can be a useful function if the graph is cluttered and the labels are over top of each other with the default horizontal display.



Directly above the label controls is a switch captioned “COMP”. This changes the color coding of the daily windows analysis graph. By default, the graph line is color coded by activity, so that you can see the period and the impact of each individual controlling activity. By grabbing this switch and pulling it to the right, the daily windows analysis graph will be color coded by its designation. Periods of delay which are not related to a delay event are colored in blue. Periods of delay which are related to a delay event, but which are concurrent with contractor culpable delay are colored in yellow. Periods of time which are compensable are colored in red. Periods of time which were initially compensable but which were later mitigated by a subsequent recovery, are colored in green. Periods of recovery (negative slope) are colored in black.



You can also zoom in and out of any section of the graphic using the left mouse key. First, however, you must turn on the “Zoom” switch, which is located at the bottom of the vertical toolbar at the right of the graph. Once the “Zoom” switch is turned on, you can zoom into any section of the graph by holding down the left mouse at the top left corner of the area you wish to zoom in on and drag it to the bottom right corner of the zoom area. To zoom back out to the normal display, hold down the left mouse key anywhere on the graphic and drag it up and to the left.



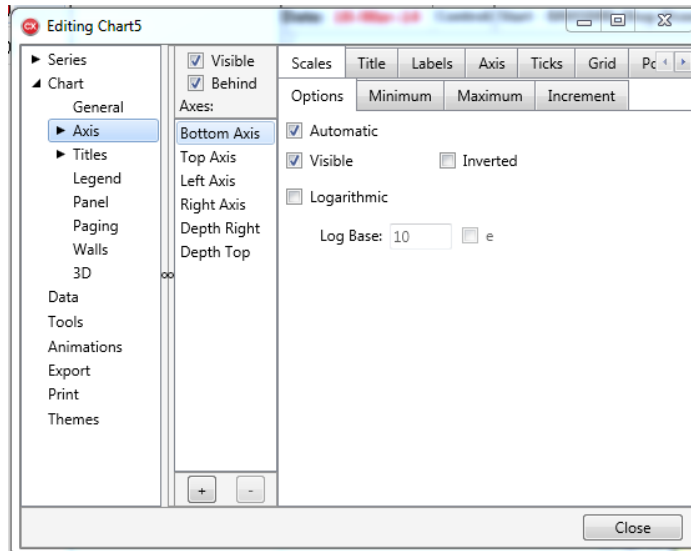
Below this switch is another switch labeled “Cont Actv. Bar”. This switch will change the main graphic into a Gantt Chart of the controlling activities. The duration of the controlling activities on the Gantt Chart do not reflect how much delay, acceleration, original or actual duration, but instead reflects the duration in which the controlling activity was in control of completion only. For example, a controlling activity could have been in control of completion for months, but never impacted the work because, while it was in control, the work proceeded on time.



Also, there is a graphic toolbar at the top of the graphic. This toolbar has nine separate functions, some way more useful than others. Case in point, the first button on the left when pressed allows you to rotate the graph around the x and y axis by moving your left mouse up and down or left and right. This is not very useful for this graph, but can be very useful with the radar view graphic which we will get to later. The



second button from the left allows you to shift the entire graphic up, down, left and right, by holding down the left mouse button. The third graphic tool will magnify the entire graphic rather than just one section as detailed earlier. This is done with the mouse wheel. The third and fourth buttons let you drag the chart to resize it in 3D. Again, this is done with the left mouse button. The fifth button is the settings button of the graph. This has too many functions to detail in this manual, but suffice

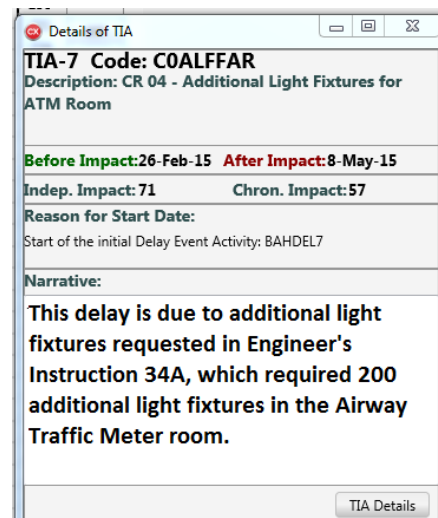


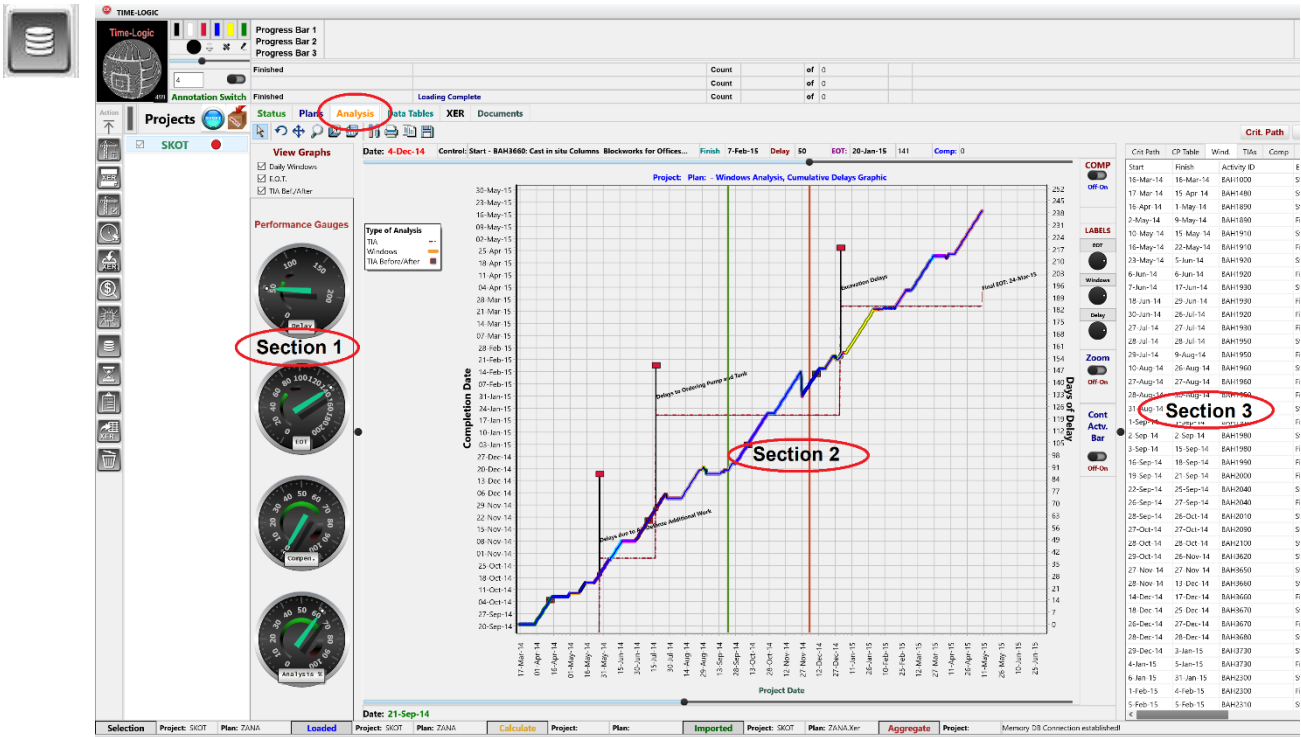
it to say, you can edit the appearance of the graph in almost any way you can imagine. Including the units, the axis, the labels, the legend, the titles of each axis and the overall graphic. The color and the placing of the graph line, the background, the boundaries, even the data itself. There is almost nothing that

cannot be manipulated with this edit function, which I've partially screen captured here. Be careful with this, as it is easy to get lost in a series of edits, which you may find difficult to get out of. This is nothing, however, that a restart of the software won't fix. The seventh button will print the graphic as it is currently displayed. This just summons the normal Print Set-up dialog box. After this is a very useful function, and that is the "copy" function. Pressing this button puts a bitmap copy of the graphic which can be directly pasted into Word, Excel or Paint, or any other software which recognizes a bitmap on the clipboard. Lastly, is the save function, which just saves the graphic in a teechart graphic file format, which can be opened and read by other programs which recognize this format.

Additionally, if you click on any of the red boxes at the top of each delay event, a dialog box will appear which gives a brief detail of that delay event and its impact. This will also activate the critical path graphic to the right of the main graph, which will display the after-impact critical path of that delay event.

At the bottom of this dialog box is a "TIA Details" button. If you press this button, a voice synthesized narration of the delay event will occur with text and graphics explaining how this delay event effected completion.





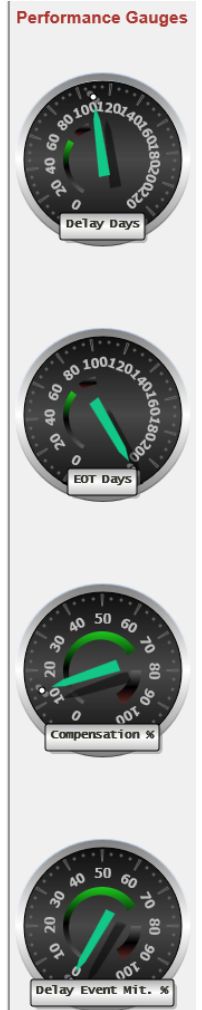
### Section 1 – Performance Gauges and Graphic Selection.

**View Graphs**

- Daily Windows
- E.O.T.
- TIA Bef./After
- Timeline

At the top of this section is a group of checkboxes showing each of the four graphs in which are plotted in section 2. The color line graph is the daily windows analysis graph. The stepwise red dashed graph, is the Time Impact Analysis used generally to prospectively designate entitlement to Extensions of Time. The before and after impact of each delay events is represented by the vertical lines with the red squares on top. These are used to calculate the EOT in the Time Impact Analysis. Lastly, is the timeline graphic, where the user can designate events in time and attached documents to them. Each of the four graphs can be looked at separately or as a pair with another. This is done by turning on and off any of the three graphs by checking and unchecking it in the “View Graphs” checkbox group, found on the left of the graph.

Below this are a series of 4 “Performance Gauges”, shown on the right. These gauges give the running quantities of the analysis, as the date selection slide bar is moved. The top gauge indicates the total amount of delay in days. The second from the top, displays the number of days of EOT entitlement as of the day selected. The third gauge shows the number of days of compensation, as of the day selected, and the last gauge from the top, displays the percentage of acceleration which recovered against compensable delay events.





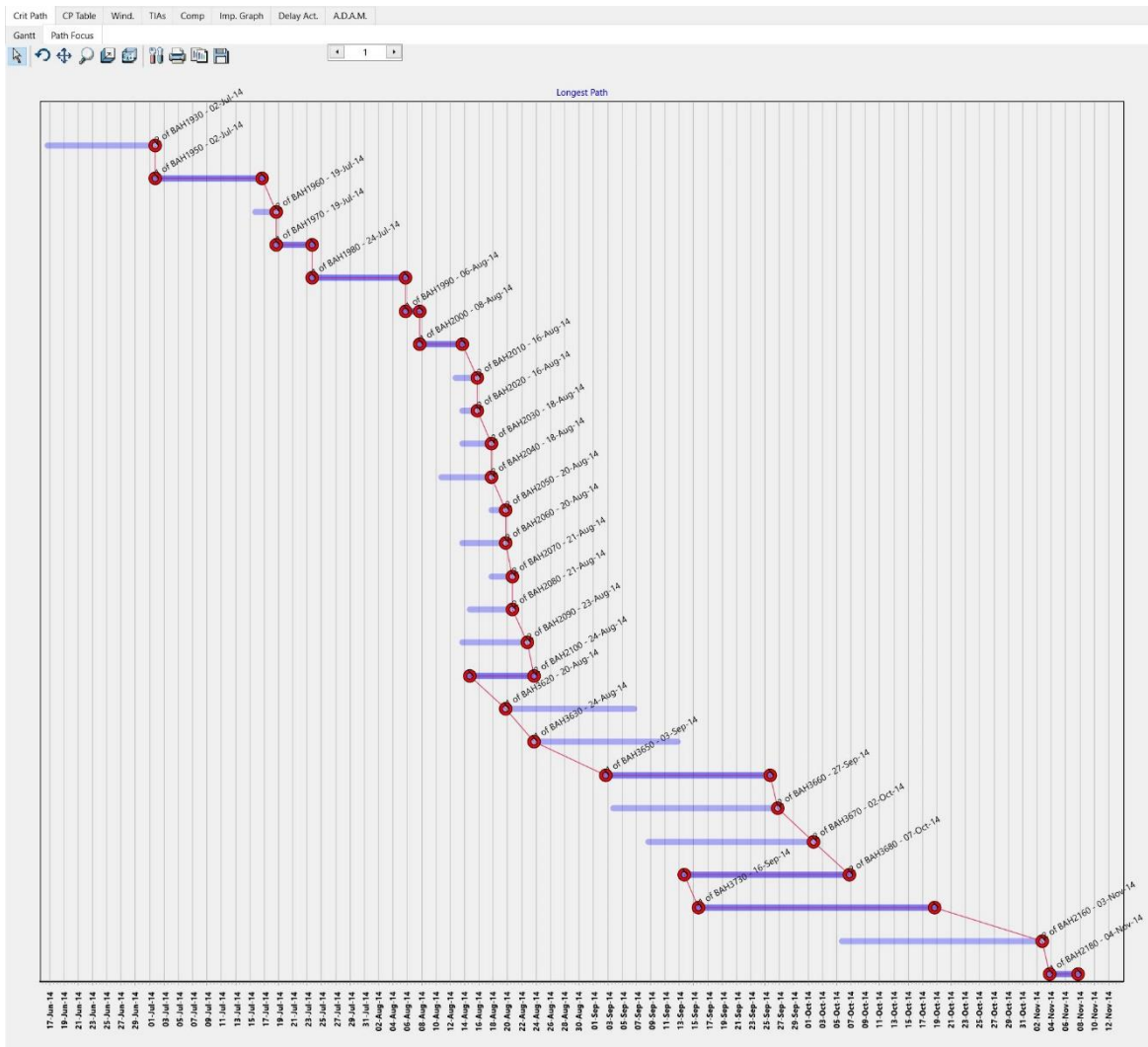
### Section 3 – Details of Findings

As previously detailed, in the middle area (Section 2) is the area of the Cumulative Delay Graphic. On the right is the Details of Findings section, which will be the focus of this section of the manual. The two main sections of this tab can be narrowed or widened with the screen splitter found in between the two forms as shown in the adjacent graphic.

This section is made up of eight different tabs: Crit.Path, CP Table, Wind, TIAs, Prog., Imp. Graph, Delay Act and Radar View.

Crit Path	CP Table	Wind	TIAs	Prog.	Imp. Graph	Delay Act	Radar View	Graph Switch	3D Model	Crit. Path	Status
Start	Finish	Activity ID	Event	Description	Impact	Mit. Imp.	History	Shift Reason	St. Comp	Fn Comp	
16-Mar-14	26-Mar-14	BAH1040	Start	Shop Drawing Approval	0	0		Initial controlling activity	0	0	
27-Mar-14	23-Apr-14	BAH1035	Finish	Shop Drawing Submission	0	0		Shifted to the subsequent activity...	1	0	
24-Apr-14	28-Apr-14	BAH1120	Start	Layer by layer filling of road base (200mm) and Compaction	5	0	*351-5	Critical path overtaken by delays t...	2	0	
29-Apr-14	1-May-14	BAH1120	Finish	Layer by layer filling of road base (200mm) and Compaction	0	0		Shift to finish of same controlling a...	3	0	

**Crit. Path** – The first tab holds a Gantt chart of the critical path or paths for the day selected in the Cumulative Delay Graphic section. To display the critical path, you



must first select a day with the date trackbar detailed in the previous section, then press the critical path button on the upper right portion of the form. This will





generate a Gantt chart. It is different from a bar chart because it shows the logic from activity to activity with a red line and the controlling event designated with a donut shaped red sphere. The Gantt Chart is shown in the “Crit Path”, which will automatically be selected when the “Crit Path” button is pressed.

**CP Table** - If the user wants to see the critical path in a cellular format, simply press the tab to the right of the “Crit. Path” tab, entitled “CP Table”, which will display a table of the activities and events of the critical path for the day selected.

Crit Path	CP Table	Wind.	TIA's	Comp	Imp. Graph	Delay Act.	A.D.A.M.			
Activity ID	Event	Description					Start	Finish		
BAH1930	2	Backfilling and Compaction - Gravel base 250mm					17-Jun-14	2-Jul-14		
BAH1950	1	Layer by layer filling of road base (200mm) and Compaction					2-Jul-14	17-Jul-14		
BAH1950	2	Layer by layer filling of road base (200mm) and Compaction					2-Jul-14	17-Jul-14		
BAH1960	2	Anti termite treatment					16-Jul-14	19-Jul-14		
BAH1970	1	PCC casting					19-Jul-14	24-Jul-14		
BAH1970	2	PCC casting					19-Jul-14	24-Jul-14		
BAH1980	1	Rebar and formwork for footings					24-Jul-14	6-Aug-14		
BAH1980	2	Rebar and formwork for footings					24-Jul-14	6-Aug-14		
BAH1990	1	Concrete casting - footings					6-Aug-14	8-Aug-14		
BAH1990	2	Concrete casting - footings					6-Aug-14	8-Aug-14		
BAH2000	1	Rebar and formwork for Neck Columns					8-Aug-14	14-Aug-14		
BAH2000	2	Rebar and formwork for Neck Columns					8-Aug-14	14-Aug-14		
BAH2010	2	Fixing Anchor Bolts					13-Aug-14	16-Aug-14		
BAH2020	2	Concrete casting - Neck Columns					14-Aug-14	16-Aug-14		
BAH2030	2	Two coats of Bitumen paint					14-Aug-14	18-Aug-14		
BAH2040	2	Backfilling and Compaction upto tie beam PCC boottom level					11-Aug-14	18-Aug-14		
BAH2050	2	PCC below Tie beam					18-Aug-14	20-Aug-14		
BAH2060	2	Rebar and formwork for Tie beams					14-Aug-14	20-Aug-14		
BAH2070	2	MEP Sleeves					18-Aug-14	21-Aug-14		
BAH2080	2	Concrete casting - Tie beams					15-Aug-14	21-Aug-14		
BAH2090	2	Two coats of Bitumen paint					14-Aug-14	23-Aug-14		
BAH2100	2	Backfilling and Compaction upto boottom level of grade slab					15-Aug-14	24-Aug-14		
BAH2100	1	Backfilling and Compaction upto boottom level of grade slab					15-Aug-14	24-Aug-14		
BAH3620	1	Erection of Steel Structure Columns					20-Aug-14	7-Sep-14		
BAH3630	1	Erection of Steel Structure - Purlins and other secondary elements					24-Aug-14	13-Sep-14		
BAH3650	1	Precast Solid walls erection works for External & Offices/Toilets/ Pantry					3-Sep-14	26-Sep-14		
BAH3650	2	Precast Solid walls erection works for External & Offices/Toilets/ Pantry					3-Sep-14	26-Sep-14		
BAH3660	2	Cast in situ Columns & Blockworks for Offices/Toilets/ Pantry					4-Sep-14	27-Sep-14		
BAH3670	2	Lintel Beams & Top Beams for Offices/Toilets/ Pantry					9-Sep-14	2-Oct-14		
BAH3680	2	Hollow Core Slab for Offices/Toilets/ Pantry					14-Sep-14	7-Oct-14		
BAH3680	1	Hollow Core Slab for Offices/Toilets/ Pantry					14-Sep-14	7-Oct-14		
BAH3730	1	MEP works ( Lightings,Piping, Wiring and Light Fixing)					16-Sep-14	19-Oct-14		
BAH3730	2	MEP works ( Lightings,Piping, Wiring and Light Fixing)					16-Sep-14	19-Oct-14		
BAH2160	2	Kerbstones for roads					6-Oct-14	3-Nov-14		
BAH2180	1	Snag Rectifications & Hand over					4-Nov-14	8-Nov-14		
BAH2180	2	Snag Rectifications & Hand over					4-Nov-14	8-Nov-14		



**Wind.** – This tab displays, in a spreadsheet format, the results of the windows analysis. Each row is separated by the period the controlling activity controlled project completion without interruption. The start of the period is in the first column labeled “Start” and the finish of the period is in the second column labeled “Finish”. After this are a series of self-explanatory columns detailing the impact and which activity was responsible, along with its relation, if any, to the delay events.

**TIAs** – The next tab is also in a spreadsheet format. This tab displays the results of the Time-Impact Analysis. The columns show all the primary results including the description, date the delay occurred (inception date), the independent impact, chronological impact, EOT date, etc.





**Prog.** – The fifth tab is the daily progress tab. This tab shows the impacts and related information for every day analyzed in the plan loaded.

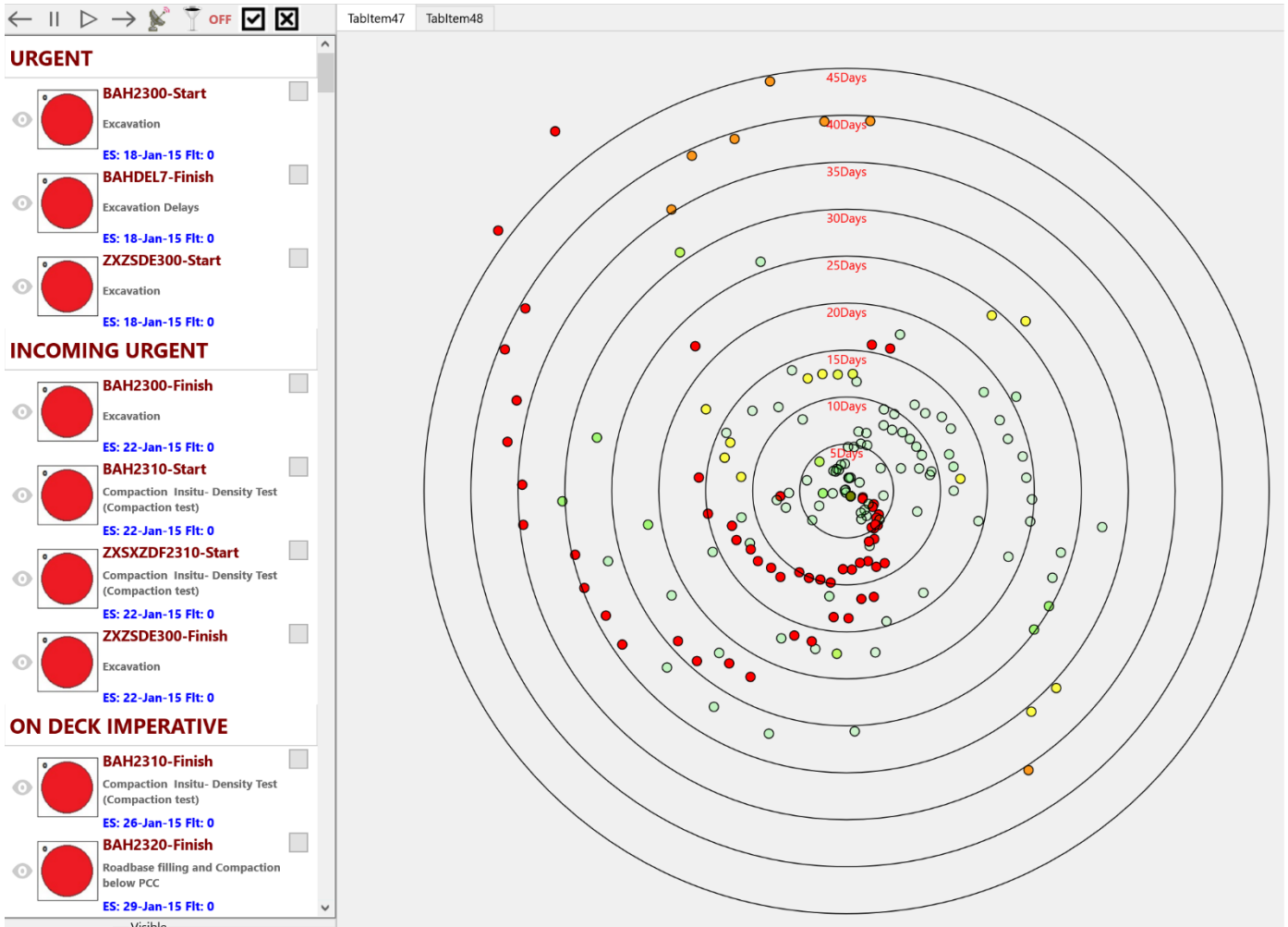
**Imp Graph** – This tab is the impact graphic. It is used by the status period explanations. It displays a walk-through of all the causes of delay for a designated period. This display is accompanied by a voice synthesized explanation of what impacts occurred and whether they are related to any delay events on the project. The period is outlined using the start and finish track bars at the top and bottom of the Cumulative Delays Graphic. After the period is designated  with the trackbars, then press the status button in the upper right portion of the form. The software will then automatically open this tab and start the detailed explanation of what occurred during the period selected.


**Delay Act.** – This section, like most of the others, is in a spreadsheet format. It details all the delay activities which make up the delay events.

**Radar View** – This section is only activated if the selected plan was calculated using the detailed calculation. It is a polar graphic of events upcoming (within 65 days), color coded to show the criticality of each event as of the date selected with the trackbar date selector at the top of the Cumulative Delays Graphic. On the left of the polar graphic is a list of the events in order of their criticality. To determine which activity is displayed in the polar graphic, you can click on it with your left mouse and a dialog box will appear with details of the event selected.



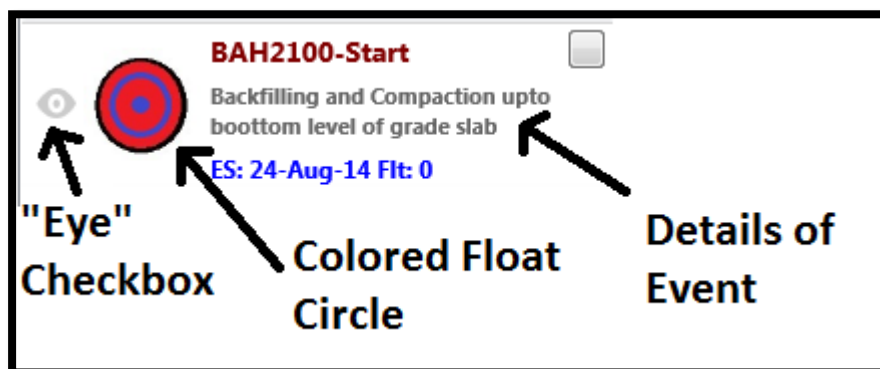
At the top of the aforementioned list of critical events is a number of radar view functions which can be used to isolate and animate selected events. From left to right the purpose of these buttons are as follows. The left arrow button  will take the radar view back in time one day. The pause button  will pause a day-by-day animation of the radar view. The right arrow  will move the radar view forward one day. The play button  will start an animation moving



the radar view forward one day per second. This will only occur if the radar view has been activated which is done by pressing the radar button. 




Isolating a selected number of events is done through the previously mentioned critical events list located to the left of the polar graphic. Each event in this list has three sections: The “eye” checkbox, the colored float circle and the details section.



The “Eye”

checkbox is used to designate which events are selected in the filtered view of the polar graphic. To activate the filtered view, first you must check the “Eye” checkbox

of every event the user would like to follow, which will change the appearance of the eye from opaque to black. Then, when you are finished selecting the activities you wish to isolate in the radar view, press the  filter button. Once pressed the filter status to the right of the button will change from “Off” to “On”. If the button is pressed again it will toggle the filter off.



**Designating the Plan Periods** – This button is used to designate the plan periods of the selected project, which is stored in the first plan of every project. This plan is called “Aggregate”, and it is automatically created and empty when you create each project.



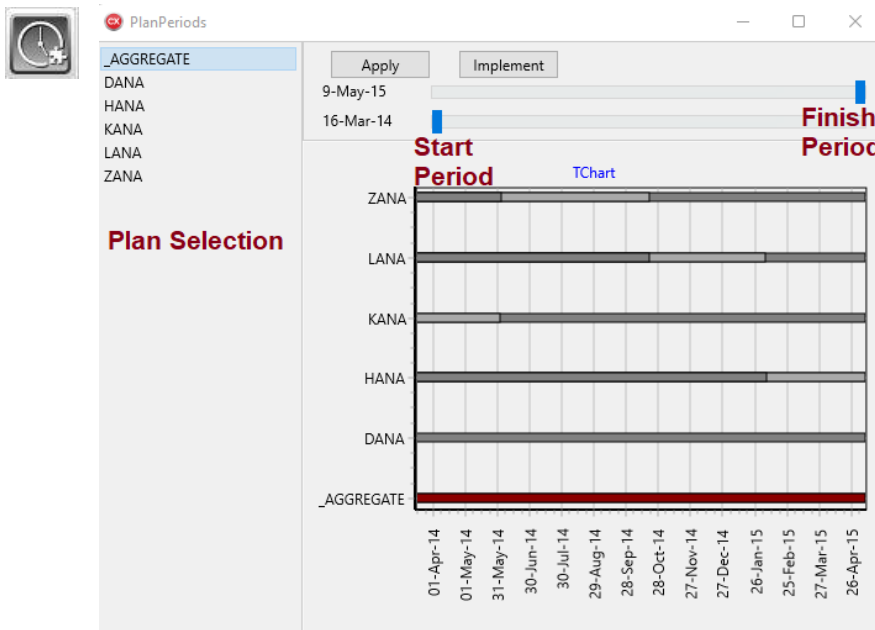
The purpose of this aggregate project is so that there is a master plan, which is the aggregate of other plans in the project. For instance, originally there is a baseline plan. At some point in time this was probably outmoded and replaced with a revision of that original schedule. To adequately follow the

evolution of the plan through time, it is often important to integrate revisions when they are incorporated into the project. This software allows for that, through this plan period function. This is done so that on the inception date of the revision, the new plan will be incorporate and follow the impacts, as well as, quantify the time lost or gained by the revision itself. This section allows you to designate which plans are used for which periods of time in the master “Aggregate” plan.

When the “Plan Periods” button is pressed, the dialog box illustrated on the next page, is displayed in the middle of the form. The top section of the form has a dropdown box for selecting plans, and two buttons: “Apply” which applies the plan changes, and the “Implement” button, which closes the dialog box and adds the plan periods selected, to the aggregate master plan.

Just below these buttons, are two trackbars. The bottom trackbar designates the start of the period of the selected plan and the top trackbar designates the finish period of the selected plan.

The lower portion of the form consists of a series of bars, one for each plan with the aggregate plan at the top. Whatever plan is currently selected will be in color. Specifically, the yellow part of the bar will be the time periods not used in the aggregate plan and the red part of the bar will be the time periods being designated for the aggregate plan. Plans not selected will have bars that are grayed out.



When designating plan periods, first you need to select a plan in the list box on the left side of the form. When a plan is selected, its associated bar on the graphic will become colored. After you have selected a plan move the upper and lower trackbars to frame the time period you wish to designate this plan in the aggregate master plan. Then press the “Apply” button at the top of the form and the new designated period will appear in red. Do this for however many plans whose periods you want in the master plan. When you are finished, then you can go to the “aggregate” master plan itself, and designate the periods you want to analyze the project for. This is done in the same manner as the other plans, with the start and finish trackbars, then press apply. When you have adequately framed out the period of the analysis as the periods of the various plans then press the “Implement” button and the dialog box will close and the process will begin to stitch the various plans together as you have shown. If there are gaps in the master plan which have not been designated, then a message will appear notifying you as much, and the plan period dialog box will remain open so that you can fill the gap. Once this process is complete, you will be able to load the aggregate master plan in the same manner as you can any other plan to see the details of the findings of the analysis.



**Delay Events Editing and Recalculating** – This button is used to edit the delay events in the plan, and to choose which delay events to use, then recalculate the impact to the project with the delay events selected. When the “Delay Events” button is pressed a dialog box appears in the middle of the form as shown below.



Use	Inception	ID	Type	Plan	Description	EOT	Before	After	Ind	Chron	Cum	Code	Start Reason	Finish Reason	Details
<input type="checkbox"/>	16-Mar-14	0	OC	ZANA	Original Contract Information	31-Aug-14	31-Aug-14	31-Aug-14	0	0	0	OCI	Contract Start	Contract Finish	-
<input type="checkbox"/>	13-Apr-14	1	DE	ZANA	CO 01- Optional External MEP...	4-Sep-14	31-Aug-14	4-Sep-14	4	4	4	COEEMW	start of the L...	finish of Delay E...	-Insert Narrativ...
<input checked="" type="checkbox"/>	28-May-14	2	DE	ZANA	CR 31 Specification Change on...	29-Dec-14	13-Sep-14	7-Jan-15	116	116	120	C3SCOHB	start of the L...	finish of Delay E...	-Insert Narrativ...
<input type="checkbox"/>	11-Jul-14	3	DE	ZANA	CR 24 - WIP Zone Variation W...	29-Dec-14	2-Oct-14	19-Nov-14	48	0	120	C2WZWW1	start of the L...	finish of Delay E...	-Insert Narrativ...
<input type="checkbox"/>	18-Jul-14	4	DE	ZANA	CR 1 & 18 - Variations	12-Mar-15	9-Oct-14	12-Mar-15	154	73	193	CL&LV	start of the L...	finish of Delay E...	-Insert Narrativ...
<input type="checkbox"/>	9-Oct-14	5	DE	ZANA	CR 23 - External MEP Works fo...	12-Mar-15	31-Dec-14	31-Dec-14	0	0	193	C2EMWVY1	start of the L...	finish of Delay E...	-Insert Narrativ...
<input type="checkbox"/>	10-Dec-14	6	DE	ZANA	CR 03 - Revised IFC Drawing fo...	12-Mar-15	12-Feb-15	12-Feb-15	0	0	193	CORIDGDP	start of the L...	finish of Delay E...	-Insert Narrativ...
<input type="checkbox"/>	1-Jan-15	7	DE	ZANA	CR 04 - Additional Light Fatur...	8-May-15	26-Feb-15	8-May-15	71	57	250	COALFFAR	start of the L...	finish of Delay E...	-Insert Narrativ...

At the top of the form are two execution buttons. The one labeled “Re-Calculate”, which recalculates the impact of the delay events selected in the first column checkbox. The other button labeled “Apply to DB”, applies the changes made to the delay events (which is done on the lower section of the form) to the database and closes the form.

Below these buttons are three sections. Directly below the buttons is a list of the delay events in a spreadsheet format. The very left-hand column is a checkbox. You can toggle on or off this checkbox to designate which delay events you want to choose for the analysis. Any delay event that is selected on this list with your mouse or arrow keys will be highlighted in blue, and its information can be edited in the section directly below this list, or in the case of editing the narrative of the delay event directly to the right of the list. The section directly below the list has four edit boxes, one for the unique code of the delay event, the description, then below that, the reason for the start of the event and the reason for the finish of the event.

These can be directly edited in the box. Once you have edited a delay event, you can insert it into the list above by pressing the “Insert Change” button on the upper right section of this area of the form.

Inserting this change into the spreadsheet list, will not incorporate these changes into the database. This is done once all the changes have been made, by pressing the aforementioned “Apply to DB” button.

To the right of the form is a section which has a splitter bar to widen and narrow its appearance. This section is for editing the narrative of the delay event selected on the list. This operates identically as the lowest section of the form, only it is exclusively for the narratives. This has been done separately because the narratives can be long, so they are edited using a memo box. This memo box can be cut and pasted directly from a Microsoft Word document, or any other editor which is OLE compliant.

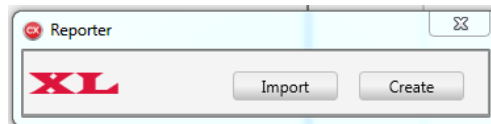


**Creating Excel Reports** – Creating an excel report of the results of any plan calculation is very straight forward, but requires you to first select the project and



the plan in the selection area, then load the project using the load button discussed earlier.

Once you have loaded the plan you wish a report on, then press the “Report” button and the below dialog box will appear. If you wish to create a report, press the Create button and a report will be generated and placed in your “Report\Xcell\bin\ directory. The title of this report will be the selected project followed by a date stamp character string, which assures that each report is unique, in the event that you make more than one for this plan. **Remember that the report will be for the currently loaded plan of the current project, and not the currently selected plan and**



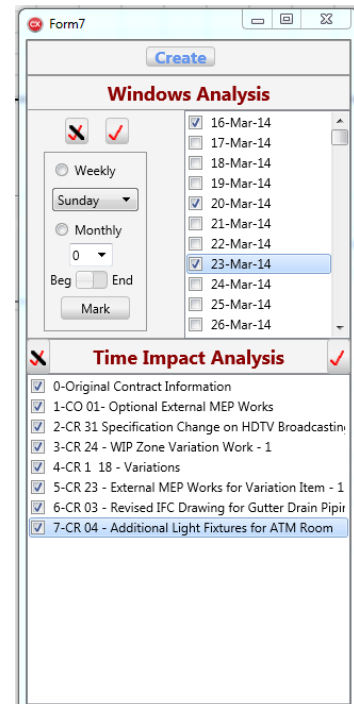
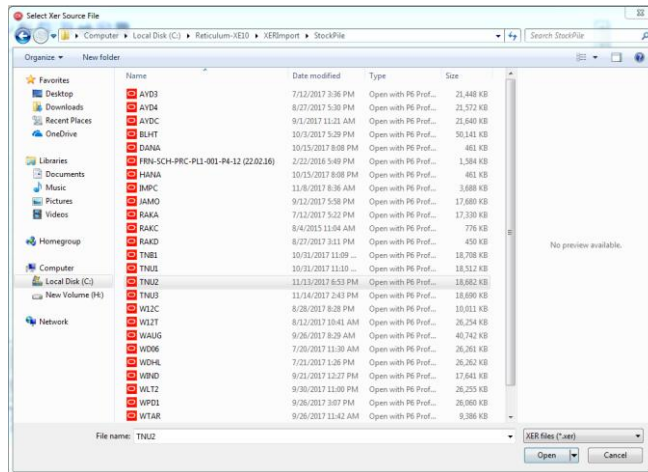
**project, which can be different.**

You can edit the delay fields in this report and then import it, by pressing the import button, and selecting the file to import from the file dialog box, which is activated once you select the import button. You can only edit the delay information, which is in the “TIA-Narrative” tab at the bottom of the spreadsheet.



**Creating XER Support Files** – This button is form the creation of xer files in support of the findings of the daily windows analysis and/or the time impact analysis. It can create an xer file for any day from within the analysis period to support the daily windows analysis, and it can also create before and after xer files for the time impact analysis.

It is necessary before this will work, that the project and plan are not only loaded but re-calculated so that all the information to create the file is in memory. If you

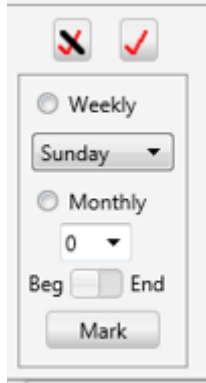


attempt to create the file when the project has not been recently calculated, you will be prompted to re-calculate. When the calculations are in memory, press the “Export Xer” button and the below dialog box will appear. This dialog box is to select the base xer plan which you want to use as the template for your xer files. When you have selected the appropriate file press the “Open” button at the



lower right corner. This will bring up another dialog box meant for selecting the dates for which you want the xer file to be produced.

The form is split into two sections: the top section is used for the windows analysis, and the bottom section of the form is for the time impact analysis. On the right side of the upper section is a list of dates with corresponding checkboxes. These dates are for every day of the analysis. When the "Create" button at the top of the form is pressed, any date that is checked will produce an xer file for that date, which corresponds to the windows analysis for that day. The file will be placed in the "ReticulumXE-10\XerExport" folder and will be named after the project and the progress date of the xer file exported.



As displayed here, on the left half of the upper section are tools for periodically checking  dates.  Beg  End This  button will uncheck all the days. Similarly, this  button will check all the days. If the radio button is checked, then every week will be checked on the day  Weekly selected in the box just below it. If the radio button is checked, then every month will be checked either at the beginning of the month or the end of the month, depending on the switch selection directly below it. Whether the weekly or monthly radio button is activated, the dates will not be marked until the "Mark" button is selected. This button is directly on the bottom left of the upper section of the form.

Like the upper section, the lower section will produce before and after xer files for every delay event selected on the lower section of the form. These files will be named after the delay event "TIA" number and either with the word "before" or "after" depending on which one it is. Like the windows analysis, these files will be placed in the "ReticulumXE-10\XerExport" folder.



**Edit Controls**

From Date: 21-Apr-18 Prolongation Cost Per Day: 0  Use

To Date: 21-Apr-18 Document Number: 0  Use

Make Change Apply to Database

Date	Cost \$	Doc#
20-Apr-17	0.00	
21-Apr-17	0.00	
22-Apr-17	0.00	
23-Apr-17	0.00	
24-Apr-17	0.00	
25-Apr-17	0.00	
26-Apr-17	0.00	
27-Apr-17	0.00	
28-Apr-17	0.00	
29-Apr-17	0.00	
30-Apr-17	0.00	
01-May-17	0.00	
02-May-17	0.00	
03-May-17	0.00	
04-May-17	0.00	

**Cost Spreadsheet Area**

**Cost Bar Graphic**

14-Jul-17 12-Oct-17 10-Jan-18 10-Apr-18

**Entering Cost Information** – This control button is used to enter prolongation cost information and documentation. When the “Cost” button is pressed a dialog box appears as shown below. This form is split into three sections: the top section is used for entering and editing the cost information, the middle section is the current prolongation information in a spreadsheet format and the bottom section of the form is a vertical bar chart graphic of the daily prolongation costs and the document numbers associated with each one.

Cost information is entered via the edit controls in the top section. Since prolongation costs are likely calculated for various periods, the form allows you to designate and enter cost information which is the same over any period on the project. This is done by entering the start of a period in the “From Date” edit control at the upper most right area of the Edit

**Prolongation Cost**

From Date: 21-Apr-18 Prolongation Cost Per Day: 13245  Use

To Date: 30-Apr-18 Document Number: 2  Use

Make Change Apply to Database

Date	Cost \$	Doc#
18-Apr-18	0.00	
19-Apr-18	0.00	
20-Apr-18	0.00	
21-Apr-18	13245.00	2
22-Apr-18	13245.00	2
23-Apr-18	13245.00	2
24-Apr-18	13245.00	2
25-Apr-18	13245.00	2
26-Apr-18	13245.00	2
27-Apr-18	13245.00	2
28-Apr-18	13245.00	2
29-Apr-18	13245.00	2
30-Apr-18	13245.00	2
01-May-18	0.00	
02-May-18	0.00	

**Cost Bar Graphic**

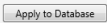
14-Jul-17 12-Oct-17 10-Jan-18 10-Apr-18

Controls section. You can either enter the date by clicking on the edit control and entering a date, or you can press the down arrow control button on the right, which will bring up a calendar form which you can select directly from. Likewise, you choose the end of the period by making an entry in the “To Date” edit control just below the “From Date” control. There are two kinds of entries you can make for the date period designated. The first is the prolongation cost per day for the period designated. This is done by making an entry in the “Prolongation Cost Per Day” edit box on the upper right area of the Edit Controls section. After you enter the amount, then you must check the “use” checkbox. In a similar manner, you can enter supporting documents for the same period, by entering the document number corresponding to the prolongation costs for this period. As with the prolongation cost, if you want to use the



document number entered, the “use” checkbox must also be checked. There is an explanation in the following “Documents” section explaining how to enter documents into the software.

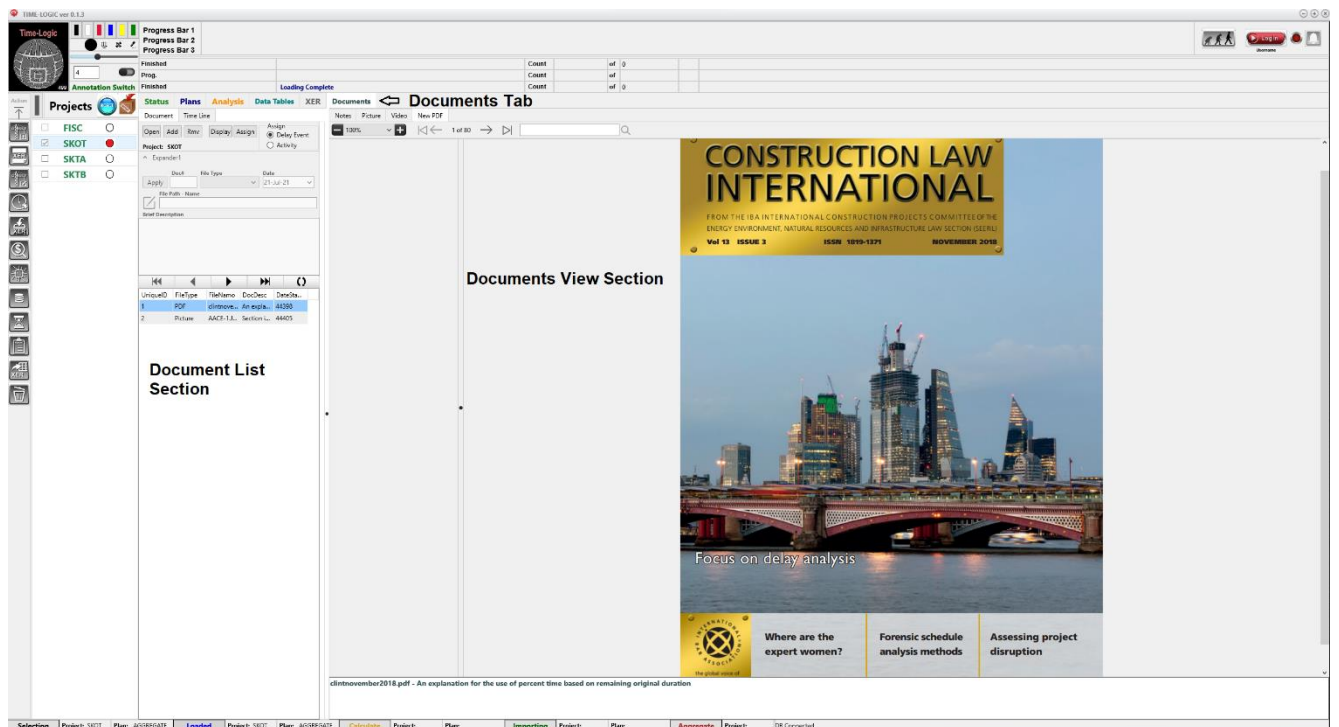
Once you have defined the period, prolongation and supporting document number information, then, by pressing the “Make Change” button just below the “To Date” edit box, the information is entered onto both the spreadsheet and bar chart graphic sections. This information, however, has still not been added to the database. This is so that if there are more entries or if the current entry needs editing before adding it to the database.

Once you are satisfied that the information represents what you wish to enter into the cost database, then press the “Apply to Database” button on the lower right quadrant of the top section of the dialog box. This will enter the information into the database, and the formerly red bar chart  graphic will be colored blue to indicate that it is now in the database. You can close the form using the upper right corner “X” bringing you back to the main form. If you re-enter the cost form the information and blue graphic will be present.



**Deleting a Project** – This button is virtually self-explanatory. When you press this button, whatever project is selected, will be deleted permanently. You will have one last chance, if it is accidentally pressed as a dialog box will appear giving you an option to abandon the deletion.

# Documents

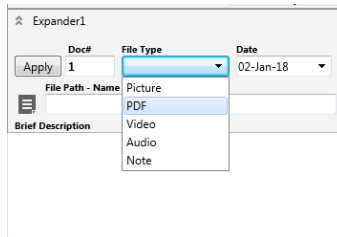


**Documents Section** - Documents can be stored in the Project’s database and then assigned to either activities, delay events or prolongation cost. The software allows the storage and view of PDF files, Picture files, Video and Sound files. Each document file is associated with individual projects and can be stored, viewed and retrieved with a description.


To access the documents section, press the sixth tab on the outermost main form of the software as shown in the above illustration in red. This will activate the documents tab of the main form which is divided into 4 different areas. In the upper left area of the documents tab area is the “Primary Controls Section”.

- ① The primary controls section is where all the major functions of the documents tab are primarily executed. There are four buttons in this section. The “Open” button opens the documents database of the selected project. When the documents tab is first displayed, all but this function button is disabled. This is because, the other three buttons require the documents database table to be opened, which is exactly what the “Open” button does. When it is pressed the documents table, for the selected project’s database, is opened and a list of the documents currently stored is put into Section 3, the “Document List Section”.
- ② Additionally, all the other three function buttons in Section 1, are enabled. These three other functions buttons are as follows: the “Add” button, which expands a hidden panel section (Section 2), to allow you to add documents to the project; the “Display” button, which allows you to display the selected document from Section 3; and the “Assign” button, which allows you to assign any project document to a delay event or activity (to assign a document to prolongation cost, use the “Cost” major function button detailed above).

Section 2 is where you can add a document into the project document list which is displayed in Section 3, the Document List Section. The panel is hidden until the “Add” button is pressed in the “Primary Controls Section”. Once the “Add” button is pressed the panel is



expanded into view as shown. The first entry box, next to the “Apply” button, is the “Doc#” edit box. This box will already have the next available document number in it. These document numbers are unique to each document added to the project, and are used as the primary key, or reference to assign, view and reference a document. Next to this from the

left is the “File Type” drop down selection box. When the box is selected with the mouse, a drop-down selection is displayed as shown on the right. Here you select whether the document is a picture file, a PDF document, a video file, or audio file or just a written text, or note. You must select one to add a document to the project. Next to this from the left, is a date edit box. Here you can select the date in which the document was made or referenced. Below  this is a file selection button which appears as follows: This button when pressed will open a file selection dialog box. Once you have selected a file, it is displayed in the “File Path – Name” edit box to the right of this button. Below this is a memo section where you can add a brief description of the document. Once these details have been entered, pressing the “Apply” button on the top left of the panel, will add the document and its descriptors to the documents table of the project’s database which should then be listed in Section 3.

3

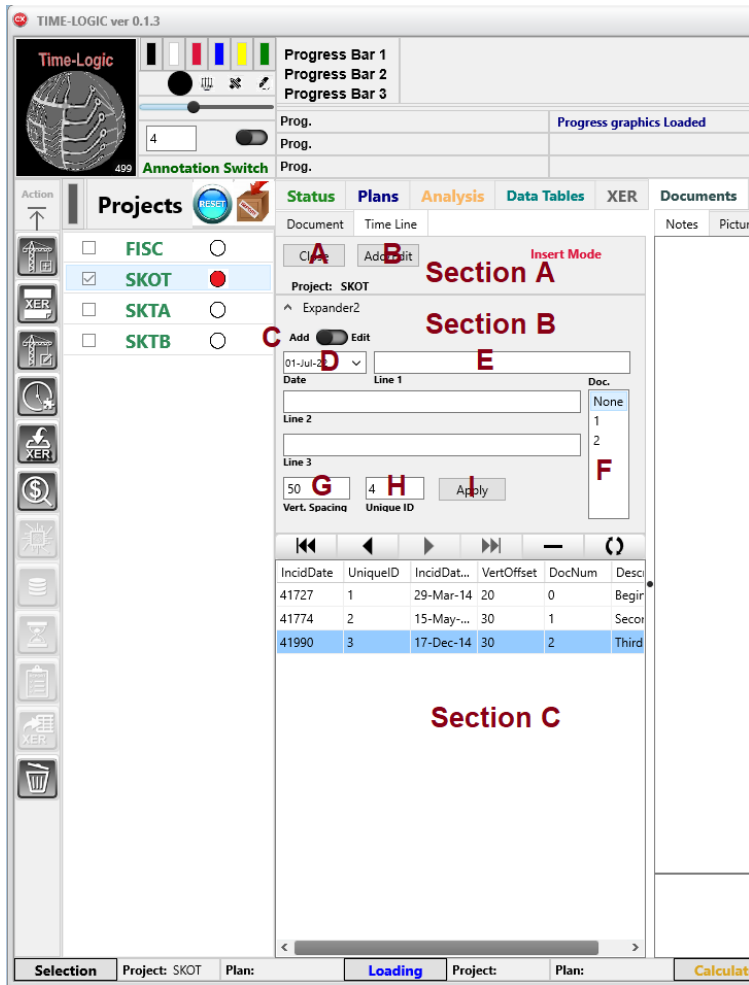
Section 3 is just a list of the documents in a cellular spreadsheet format. It consists of columns of all the fields of the documents database: document number, file type, file name, description and date. Any document which is added in section 2 will appear in the list of section 3.

4

Section 4 is where the documents are displayed. There are four different tabs in this section, one for each type of file: Note, Picture, Video/Audio and PDF. When a document is selected in section 3 and the “display” button is pressed in section 1, then the appropriate tab of the document will be automatically selected and the document shown. Each has controls appropriate to manipulate the document selected, and shows the description at the bottom of the section 4 panel.

**Timeline Section** – There are two sub-tabs under the main application’s Document Tab. The first is the storage of the documents itself, which was detailed in the previous section. The second sub-tab is for creating entries onto a timeline which is displayed as one of the four main graphics on the Analysis tab (see section “Loading the Projects”).

To display these entries there is a separate database table. The timeline tab is where the information is entered into this table. As well as creating timeline information, any timeline entry can also be associated with any document that has been created in the previously discussed Documents Section. Double clicking on any timeline entry in the main graph of the Analysis Tab, will create and display the document associated with the timeline entry. The document is displayed next to the main graphic in Section 3 of the Analysis Tab.



Section A of the timeline tab is where the user opens the database, which is done with the “Open/Close” button (A). Once open the database is set to either create a new timeline entry or to edit an existing one. This is done with the “Add/Edit” button to the right of the open database button. Pressing this “Add/Edit” button will create a new Section B, which will drop down from above Section A.

Section B is where new timeline entries are created and stored into the timeline database table. At the top left of Section B is a small switch, and to the left of the switch is the label “Add”. Moving the switch to the left toward the “Add” label will put the table into

append mode for the addition of a new entry. Similarly, moving the switch in the direction of the “Edit” label on the right of the switch will set the table into edit mode. In this mode the table entries can be edited.

There are five different entries which should be made for the timeline: Date (D), Description (E), Document Number (F), Vertical Spacing (G) and Unique ID (H). The date entry is done through a drop-down calendar. This date is the date that the timeline activity will appear on the project date (x-axis) in the main display graphic on the “Analysis” tab. Next is the timeline entry itself. If it stretches beyond the length of the edit box, use the line2 and/or line 3 entry space. Next is the document number. By default, there is no document attached which corresponds to the timeline event, which corresponds to the “None” first selection. The list box of document numbers in (F) is the same list of documents and numbers on the documents tab to the left of the timeline tab. So, you can toggle between the two tabs to make sure that you are attaching the right document to the timeline. The next entry, is the vertical spacing entry (G). This integer represents how many pixels above the timeline, that the timeline entry will appear. This is so the user can space timeline entries vertically, on the graphic, so that they do not appear over top of one another. Finally, there is the unique id. As the name suggests, this must be a unique integer value which distinguishes this entry from the others in the table. The software will pick the earliest available integer automatically, when you put the table into append mode. So, there should be no need to edit this entry. Once all entries are made, press the apply button (I), to create the new entry.

# XerCom Application

**A1** Progressbar1 Status

**A2** Trackbar1 Status

**A3** Search Text

Prev. Act. Count: 295

Next Act. Count: 296

Removed: 0

Added: 2

Prev. Rel. Count: 378

Next Rel. Count: 379

Changed: 0

**Section A**

Login

Incarnation Co.

Chng #	Modification	Activity ID	Activity Description	Type	Duration	Cal	Actual St	Actual Fn	Data Line	?	Query Comment
1	Added Activity	BAHDEL17	Delays due to discovery of contaminated soil	TT_Task	192	7-Da...	2014-03-22 0...	2014-04-14 1...	295		
	Added Succ. to Act	BAH1480	Excavations for Foundations	PR_FS	0				674		

**B1** Search

**B2** Row/Column

**B3** Compare

**B4** Report Template

**Section B**

Word Query

Word Notify

Excel Query

Excel Status

Compare File

Generate

Query CheckBoxes

Allow CheckBoxes

Invert CheckBoxes

**Section C**

**C1** Dark

**C2** Report Template

**C3**

ProjCom is a separate application, bundled in the Time-Logic Software, which compares Primavera Xer files to each other. The application is like other xer comparison software, but distinct in a few of its functions. The software operates using the blockchain to ferret out changes from one xer update to another.

The software distinguishes itself in the manner in which it organizes the changes and also in its ability, once the changes are identified to incorporate or ignore distinct changes, so that a hybrid xer file can be created using only the changes acceptable to the user. As a background to the xer files, they are simply ascii (text) files which are tab delimited. They represent the database tables for a plan in Primavera's P6 planning software which is currently the industry standard for project planning. The first entry of each line is a % sign followed by a character which represents what aspect of the table is being displayed on that line. For instance: %T is the table name, %F are the fields of the table, %R is the table entries under those fields.

On the preceding page there is a screen capture illustration, which is broken into 3 sections, delineating the three main panels of the software. Section A is primarily used as a monitoring feedback interface which gives information about the xer files being imported. Section B is where the primary action buttons of the application are located. These buttons, designate and store information about the initially entered xer file, referred to here as the "Prev. Xer" (Previous xer file), the succeeding xer file, referred to here as the "Next Xer", and a comparison between the two.

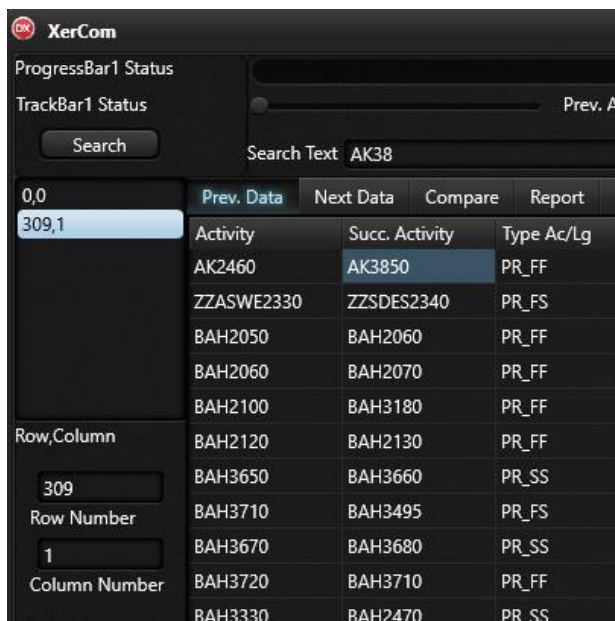
**Section C** consists of 8 different tabbed panels:

1. "Prev. Data" – This spreadsheet represents the data extracted from the initial xer file which was imported into the application.
2. "Next Data" – This spreadsheet represents the data extracted from the second or next selected xer file which was imported into the application.
3. "Compare" – This spreadsheet displays the results of the comparison of the two xer files. This format is just the raw data findings of the differences found.
4. "Report" – This spreadsheet displays for results of the comparison of the two xer files. It is similar as the "Compare" tab, only in this spreadsheet the results are organized according to the initial activity of logic that was changed, removed, or added. As an example, if an activity were removed, then it would be grouped not just listing the activity which was removed, but the logic relationships that were removed as a result.
5. "Prev. Xer" – This spreadsheet shows the initial xer file imported, in its native Primavera format.
6. "Next Xer" – This spreadsheet shows the second or next xer file import, in its native Primavera format.
7. "Hybrid Xer" – This spreadsheet represents a hybrid xer file of the acceptable changes that were found between the two xer files.
8. "Dark" – Is just a dark blank page which the application moves to while it is filling out another spreadsheet.

The entirety of Section C, is just where the information about the xer files and their comparison findings, are displayed in a spreadsheet type format. In the following paragraphs an in-depth explanation will be made for each of the remaining sections, A & B of the application. The areas will be located according to the sections and sub-sections outlined in the preceding illustration.

**Section A** - The top panel of the application, Section A, consists of the basic information found when importing the xer files and comparing them to each other. At the top of the panel is a progress bar (A1), which illuminates in blue to show the progress of a direct calculation. Just below that is a slide bar (A2). This slide bar also calculates progress of all of the calculations being done for the function called (i.e. importing xers or comparing xers). In short, the progress bar shows the progress of individual calculations, and the slide bar, the overall progress of the function being executed.

Underneath and to the right of the progress and slide bar, is a series of labels, which provide the ongoing counts being loaded with the two xer files when imported they are imported. These labels are counts of the number of activities and logic ties between them. Directly below these count labels are another set of labels. There are three of these: “Added”, “Removed” and “Changed”. These are also self-explanatory, and count the added removed and changes activities between the two xer files when compared. To the far right of these labels, is the log-in button. When the application is first started, the “Login” light indicator is red, indicating that the user has not logged in. Pressing the Login button will activate a dialog box where the user can log into the database. Once logged in, the indicator light will illuminate green, and the functions of the software will be enabled.



**Section A/Section B** - Finally, at the far left of this panel is a search feature, which has features in both the far left of Section A and the very top of Section B.

To use the search feature, enter any text value in the Search Text edit box, then press the “Search” Button. If results are found, their locations are displayed in a listbox at the top of Section B. This listbox displays the location of the found text by its row and column number in the spreadsheet tab which is currently open. Selecting any of the row and column entries listed, will highlight the selected entry, and move the spreadsheet to it.



**Section B** – On the right side of the form is Section B. At the very top of this section is an intersect of the previous Section A search function which has been explained in the previous paragraph. The remainder of Section B, executes the primary functions of the software, each of which are represented by a button. These buttons are found in the middle of the section, which are placed vertically in the order that the functions should be executed. On the succeeding pages, each of these five functions will be explained in depth and in order of execution.



**Prev. Xer** The “Prev. Xer” button, when pressed, will open windows file explorer, with the filter for the xer file extension in place. Once opened, select the xer file which represents the initial file that the user wants imported into the application.

Once this selection is made, the software will begin importing the contents of the xer file in its native Primavera file format and placing the results in the spreadsheet labeled, “Prev. Xer”. When the file is completely imported, then the application will begin to extract the pertinent database information into a separate spreadsheet, “Prev. Data”. After the information is placed in “Prev Data”, the software will open the “Prev Data” page.

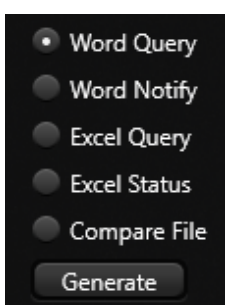
**Next Xer** The “Next. Xer” button, when pressed, will open windows file explorer, with the filter for the xer file extension in place, in the same manner as the “Prev.Xer” button. Once opened, select the xer file which represents the second file to be imported into the application. This file will be compared to the Prev. Xer file selected.

Once this selection is made, the software will begin importing the contents of the xer file in its native Primavera file format and placing the results in the spreadsheet labeled, “Next Xer”. When the file is completely imported, then the application will begin to extract the pertinent database information into a separate spreadsheet, “Next Data”. After the information is placed in “Next Data” spreadsheet, the software will open the “Next Data” page.

**Compare** The “Compare” button, when pressed, will compare the initial xer file (Prev. Xer) and the second imported xer file (Next Xer). The differences between the two files are then placed in the “Compare” spreadsheet.

Once these differences are mapped-out in the “Compare” spreadsheet, the software will begin organizing the findings into an easier to follow spreadsheet, which is labeled “Report”. And once this is complete, the application will switch the active tab to the “Report”.

The purpose of the report spreadsheet, is not only to display the differences found, but also, in their organized format, to have a platform for which to make selections of the changes, which the user wishes to query a third party on. To this end, the software will produce reports of the findings in both Microsoft Excel and Word.



At the top of the panel on the left, are a series of radio buttons, the selection of which, determines the content of the report. In order to understand how the selections are processed to go into the report, an explanation of some of the details of the spreadsheet itself, needs to be made.

In the report spreadsheet, there is a column #10, with the title “?”. This column is made up of checkboxes. Checking-off any of these boxes will result with the checked item being included in the “Query” report. The idea of the Query report is to query a third-party as to the reasoning behind changes that were made to the plan. If you select the “Word Query” report, both a word report and a more in-depth excel spreadsheet will be produced as part of the report. If, however, the “Excel Query” radio button is selected then only the Excel report will be produced. All reports are stored in the file C:\Reticulum-XE10\Compare\Reports\Bin, and will be represented by the “QueryReport”, separated by a dash and a time-stamp (i.e. QueryReport-447355209311458).

Once a response of the Query report is made, then the user is ready to produce the “Notify” report. This report is heavily tied into the idea of the hybrid xer file. As earlier stated, the 10<sup>th</sup> column “?” is associated with querying third party to explain differences in a revised xer file. Once these explanations have been determined, there is a related 13<sup>th</sup> column with the title “Alw”, which stands for allow. Like the “?” column, this is a checkbox column. Changes which have been made and checked-off will be allowed into the new hybrid xer file. Changes which are not checked-off will be removed from the xer file. In this way it provides a means of obtaining a bilateral xer file of the changes which all parties agree to. The changes allowed and checked-off, will be included in the “Word Notify” report. Like the Query report, there is an accompanying Excel spreadsheet of the changes which are allowed and checked-off. If the spreadsheet alone needs to be produced, that is what the “Excel Status” radio button is for, which will generate reports in the same format as the query report with a trailing time stamp. There is one final report called “Compare File”, which is the last radio button in the group. This selection will result in an ascii formatted text file of all the changes detected in the comparison. Once a report radio button has been selected, simply press the “Generate” button at the bottom of the grouping to create the report.

**Hybrid** This brings us to the Hybrid button in Section B, which is the fourth from the top in the grouping. As explained in the reporting section above, the changes that are to be incorporated into a hybrid xer file, are designated using the “Alw” (allow) column checkboxes. Changes which are checked-off on this column will be incorporated into the hybrid xer. Those that are not will be excluded from the hybrid xer. Once the appropriate boxes have been checked, then simply press the “Hybrid” button and a spreadsheet in the Primavera file format will be produced and stored in the “Hybrid” tab at the top of the form.

**Create XER** To turn this spreadsheet into an actual hybrid xer file, enter the file name in the edit box at the bottom of the button grouping, which is entitled “New Xer File Name”, and press the “Create Xer” button, which is the last function button in the series. This will result in a hybrid xer file being produced and stored in the previously mentioned bin file of the “Compare” file folder.

## Appendix A: Article in Construction Law International Magazine

# CONSTRUCTION LAW INTERNATIONAL

FROM THE IBA INTERNATIONAL CONSTRUCTION PROJECTS COMMITTEE  
OF THE ENERGY ENVIRONMENT, NATURAL RESOURCES AND INFRASTRUCTURE LAW  
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**Focus on delay analysis**

Focus on delay analysis





Credit: Nikola Barbutov/Shutterstock

## Continuity in analysing delay

**Thomas Long**  
*Reticulum DMCC,  
Dubai*

**T**here is a basic misinterpretation of data in delay analysis that is common practice in assessing delays. Specifically, it is to quantify delay using the estimated per cent complete of ongoing work found in progress updates. In doing this, an inconsistent unit of measure is being introduced, and the results can cause a premature assessment of delay or recovery and a breakdown of continuity. This practice is derived from confusing per cent work (an integral measure in planning) with per cent time (an integral measure in delay analysis). Although both the work and time for an activity start simultaneously at zero per cent and end at 100 per cent, their paths along the way are typically very different. It is a common misconception that because the work done for an activity does not necessarily progress linearly, using a linear distribution of time in delay analysis poorly approximates the work. On closer inspection, the exact opposite is true: using the per cent work poorly approximates the time. This is because time is the fundamental unit in the critical path method (CPM) and it progresses linearly (actually, time does not exactly progress linearly, but close enough if you are not approaching the speed of light or under the influence of an intense gravitational field

where you would probably have things other than delay analysis on your mind anyway).

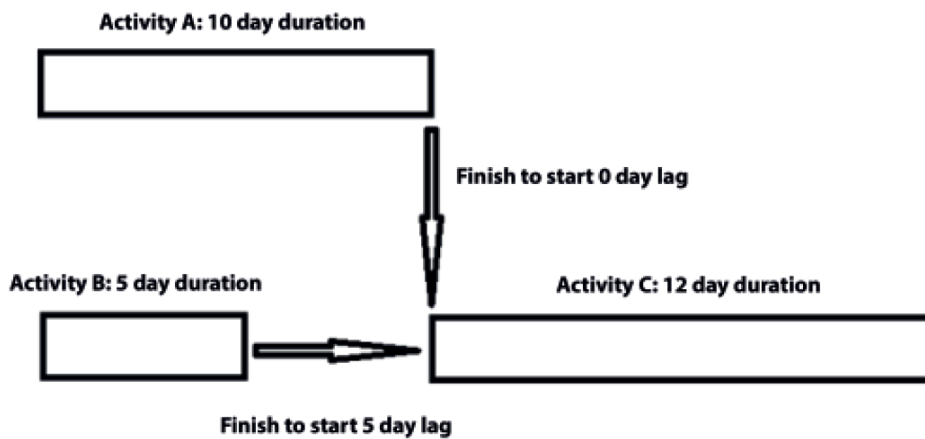
To have reliable results in any nested calculation, it is important to use consistent units of measure and apply them uniformly over the scope of an analysis. In quantifying impacts, the use of per cent complete values based on the work accomplished involves using data with a different unit of measure than initially used in the baseline plan. Also, it is being applied in a non-uniform manner and is based on needlessly subjective data. The per cent complete of in-progress activities already has an objective quantification based on its allotted time. The CPM at the heart of planning software has only one original and fundamental unit of measure, and that is time (planned duration). To hold the units consistent, as an activity progresses, the per cent of the planned duration is the most reliable unit of measure to use when analysing delay.

To understand why this is so important, it is first essential to understand how the CPM computer model measures project time. The CPM is used in almost every form of forensic delay analysis. It is the basic model used by nearly all planning software. At its heart is a simple path finding algorithm that has nodes

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that are point-in-time events, and a distance between nodes that is measured in time. An activity in the CPM does not measure an amount of work; it measures the amount of time to do that work. More specifically, it measures the amount of time to get from one node, the start, to another, the finish. The plan is made up of either the measure of time between the start and finish of an activity, or the measure of time between activities, which is known as lag. Together, they make up the core of the network.

**Activity structure**



**Network structure**

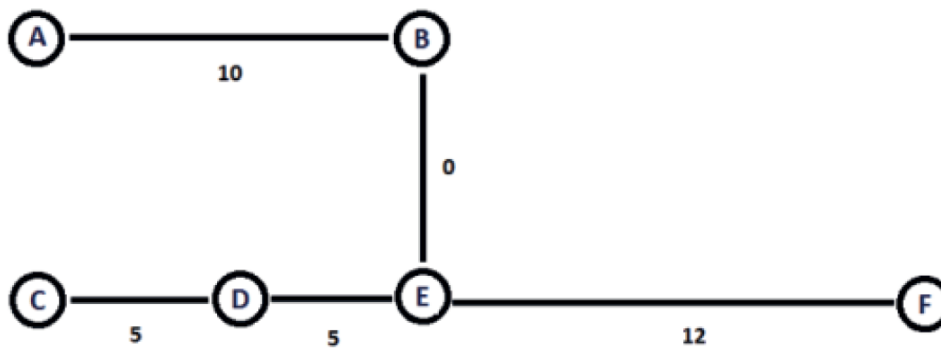


Figure 1: node structure of the CPM computer model

The computer travels down every possible path of this network, primarily to find the sequence of nodes with the longest duration. This longest chain is the critical path, which is the barometer of how long the project will take to complete at any given point in time. Because the measure between the start and finish nodes of an activity is the allotted time between them, to maintain continuity, the per cent complete value for in-progress activities should be the per cent complete of the allotted time and not the per cent complete of the allotted work.

The concept of updating in-progress activities using time goes against the grain of how project controls are taught, which is often projected onto delay analysis. It seems counterintuitive, as an example, if almost no work has been done on an activity, to declare it 90 per cent complete just because 90 per cent of the time has expired. But for reliable results in delay analysis, that is precisely the appropriate measure to use. In delay analysis, to say that an activity is 90 per cent complete does not mean the work is 90 per cent complete, but that the allotted time is 90 per cent complete. That is what you are measuring in a CPM schedule when using it for delay analysis. The amount of work does not have a bearing on quantifying actual impact until it crosses the threshold of the allotted time or it finishes. You lose sight of that threshold if the units in your calculations change from allotted time to allotted work. That is a subtle difference between planning and delay analysis. And that is why, for delay analysis, it is important to keep the units you are measuring consistent. To be clear, it is *not* being stated here that the per cent work of an in-progress activity is immaterial. In planning, it is essential to know where you are, and for progress payments, resource allocation, earned value, cost and project controls. However, it is not a consistent unit of measure for quantifying impacts in forensic delay analysis. This is because, in switching units to work, essentially lateness or potential earliness is being assessed before an activity is due. To express the difference simply, it is like any assignment with a due date, for example, a homework assignment: if you have ten days to do it, then you can do essentially nothing for nine days and pull an 'all-nighter' on day nine. If you can deliver it by the due date, then no harm is done. It's not late, until it's late. Using per cent work on in-progress activities is analogous to the

teacher looking at your work on day five, noting that you are running five days behind and marking your paper down for being five days late before it is even due. By contrast, by using per cent time of planned duration, at the end of day one, you have exhausted ten per cent of the time and have nine days to complete the assignment. On day two you have exhausted 20 per cent and have eight days to complete it. If you have not completed it by day 11, then you are one day late; by day 12, two days late, etc. Once consistent units of measure are used in delay analysis, continuity is exposed, which can uncover not only a clear and precise quantification of impact, but if used actively in planning alongside the per cent work, it can expose potential delays virtually in real time, and often before they impact a project.

As an example of why this is important in analysing delay, consider the following scenario of a simplified plan for building a wall with only three activities: wall permit, material delivery and wall building. In this example, we assume that once the wall permit is submitted, it is typically approved in 18 days. Let's also say it will take 20 days for the materials to be delivered to the site, and once you have both the permit and materials, you can build the wall, which takes 15 days.

This baseline plan would appear as illustrated, with the wall permit activity initially having two days of float (time before the activity becomes critical). Let's assume the following progress: on day one, the permit was not submitted because there was a disparity in the survey. Let's also assume that the truck was loaded with the materials for delivery on the first day, but on the following morning, because of a mechanical failure, it was stuck at the warehouse until the end of day 19. On day 20, the materials were put on a plane and flown to the site, arriving as agreed in the baseline plan. On the permit side, let's assume that the resolution of the survey problem did not occur until day 20. The application was received on that day and approved 18 days later, and the wall construction began.

If this plan was updated and impact was assessed using per cent work, the finish of the material delivery would be responsible for all of the delay, despite it starting and finishing on time. In addition, using the per cent work, the permit application was never responsible for any delay. This is despite the obvious fact that

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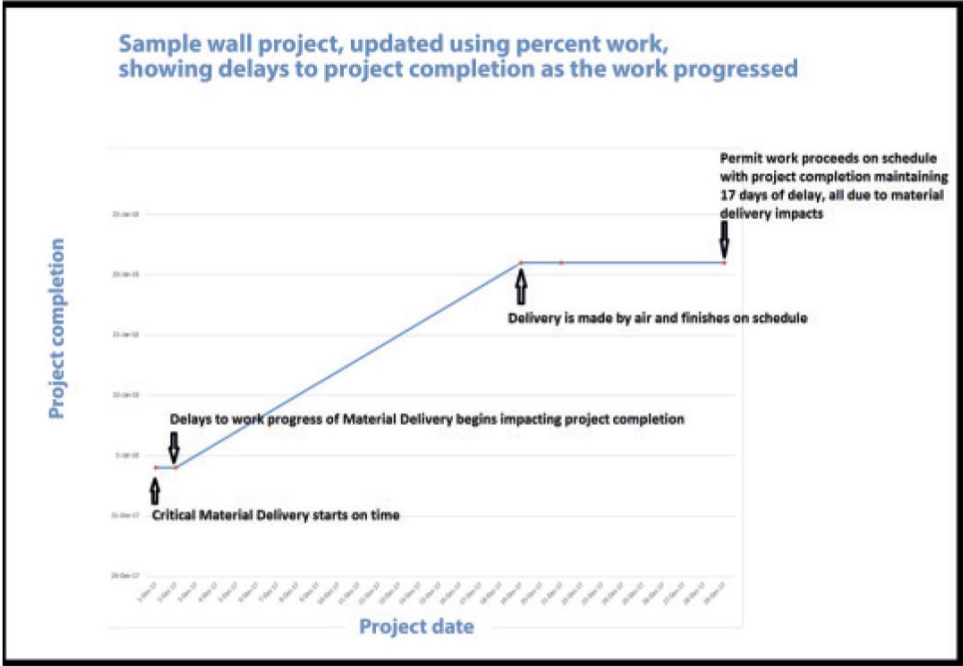
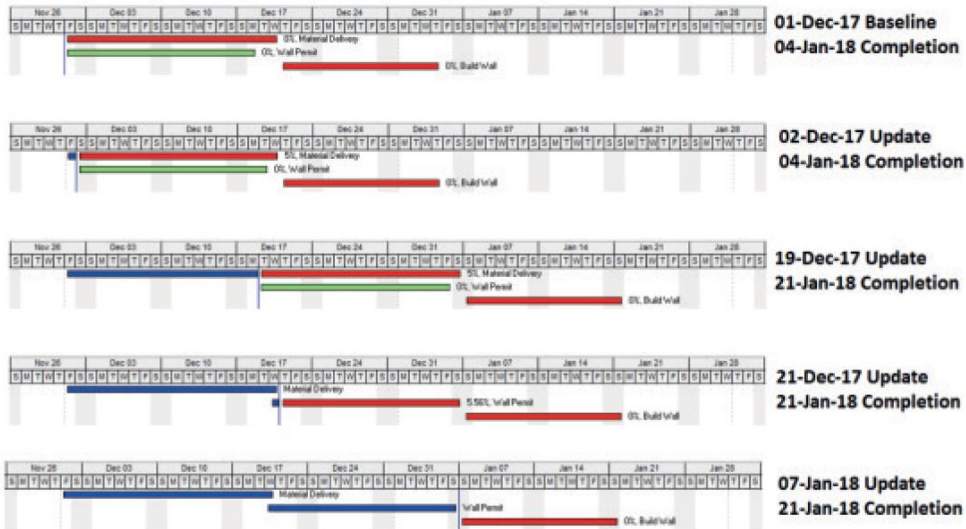


Figure 2: impact analysis using % work for in-progress activities



the permit approval was the sole reason for the delayed start of the wall, because the materials were on site, but wall construction could not begin because of a wait of 17 days for the permit. The reason the delay analysis is flawed is because, although a critical activity (material delivery) was 18 days behind schedule at a certain point in its progress, it could not have impacted the project at that time for the simple

reason that it was not yet due. But the due date is lost in the calculus if you are updating progress using the estimated per cent of the work rather than the per cent of the time. Using per cent work, the impact is assessed before the time has expired to do the work. There is no commitment in a plan to have 60 per cent of the work done when 60 per cent of the time has expired; the commitment is to

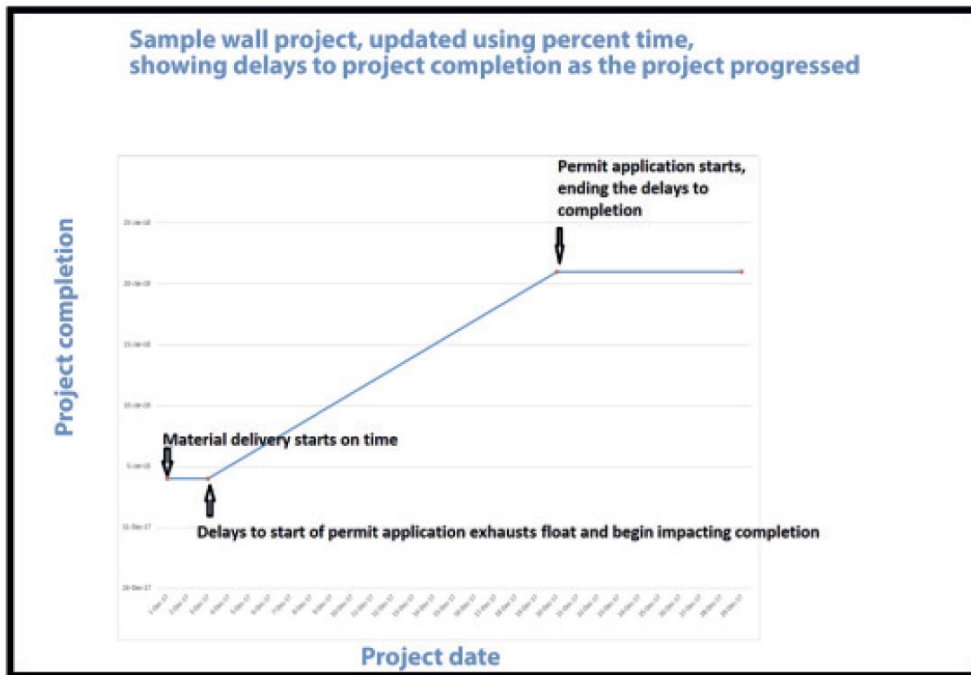
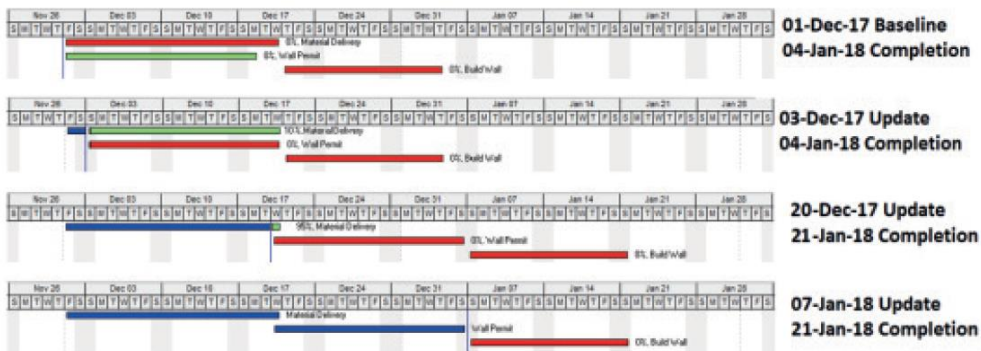


Figure 3: impact analysis using % time for in-progress activities

have 100 per cent of the work done when 100 per cent of the time has expired.

To further underscore the unreliability of using per cent work in delay analysis, suppose the same material delivery activity was represented as two milestones: one for 'begin loading materials' and the other for 'deliver materials on site', with a 20-day lag between them. Under this scenario, it would be updated completely differently than the model that made the same representation using a single activity. This is because lag between activities is progressed using per cent time. In this instance, the method of progress would not be applied uniformly: you would be progressing half the model using per cent work and the other half using per cent time, with completely different outcomes using the same basic data. There is also the matter of the subjective nature of using per cent work. It is an ambiguous unit that is estimated by a person responsible for the data. If one person believes it is ten per cent and another that it is 11 per cent, then the completion date, critical path and impact can be entirely different.

In the wall scenario, if per cent time of the planned duration is used for quantifying impact, the results are consistent and uniform in both measure and application, and they agree with common sense. Namely, delays to submitting the permit were the sole cause of the 17 days of delay, which

began after the late start consumed the two days of float, and ended when the permit application was submitted. The findings are the same whether you represent the activities as a single task or two milestones with a lag. But there are considerably more benefits to using a consistent unit of measure for in-progress activities. It opens a whole range of possibilities to impact analysis because it brings speed, accuracy and, especially, continuity to updating and assessing impacts. This is because per cent work is based on a subjective judgement, and it proceeds in a nonlinear manner, whereas time progresses uniformly. This means that between the actual start and actual finish of an activity, you know precisely what the per cent complete is, and so you can use a computation to progress plans through time, instead of stopping at periodical intervals to make a subjective estimate. With less effort and more accuracy, the typical 30-day time windows for analysis can be converted to daily window analysis in a fraction of the time, and quantify exactly how a project loses and gains time. Additionally, if using time impact analysis, it can be performed on the exact day of impact rather than the beginning of a monthly update. In fact, the entire plan, instead of being an aggregate of disconnected updates, can become a single fluid plan, which evolves through time,

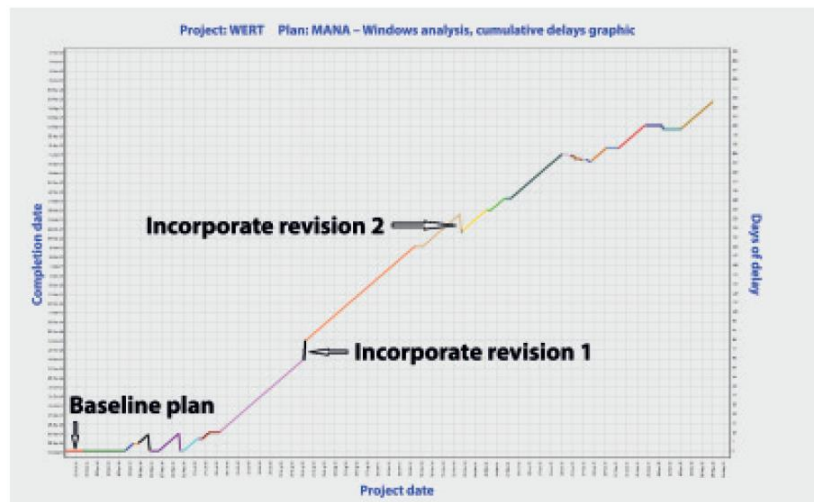
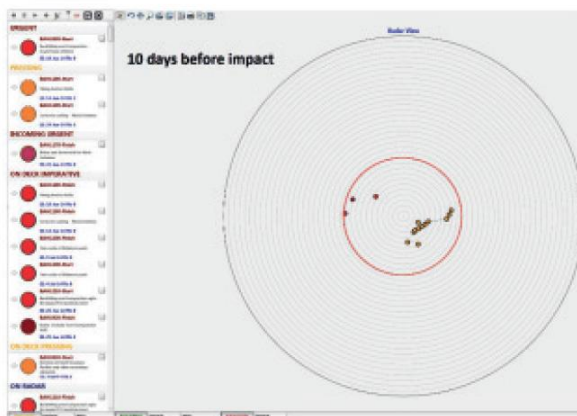
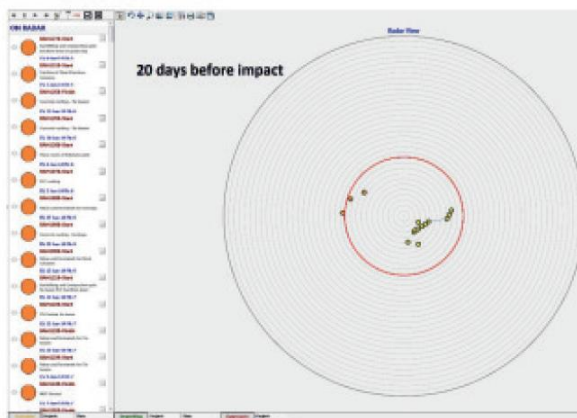
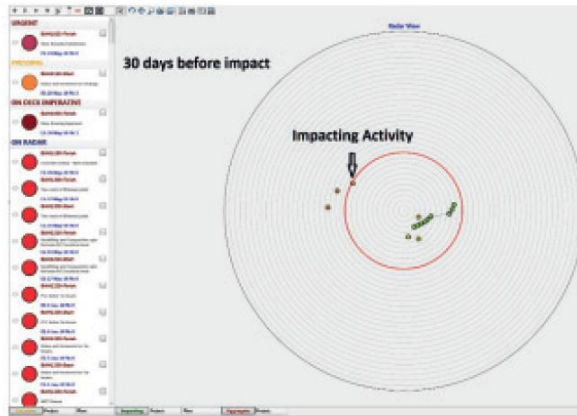


Figure 4: continuity with assessing delays over a project's duration, with revisions incorporated as the project progresses



incorporating revisions and actual dates as it progresses towards completion.

Moreover, because of this continuity, patterns can emerge that can forecast delays before they impact a project. Take, for example, the radar view graphic. Activities are represented by coloured dots. Their location radius in the graph corresponds to the early start date and the colour indicates how critical the activity is: green is non-critical and red is critical. Because of the continuity of using per cent time of the activity's duration, you can view the project status at any time selected or animate project activities as they progress. For most delays, if you move through time from a position prior to an impact, you can often detect a pattern developing that forecasts an impending impact long before it actually occurs. Using the radar graph, this can be detected by seeing critical activities coming in from the side, or rapidly advancing their colour from green to orange to red. A computer algorithm can be used to warn of an impact before it occurs and accurately document it during and after. The screenshots in Figure 5 are of progress on a project 30, 20 and ten days before an activity impacted project completion. The impacting activity can be seen closing in on the centre of the screen and changing colour from orange to red as it is animated through time and comes closer to its due date, and is more critical along the way.

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