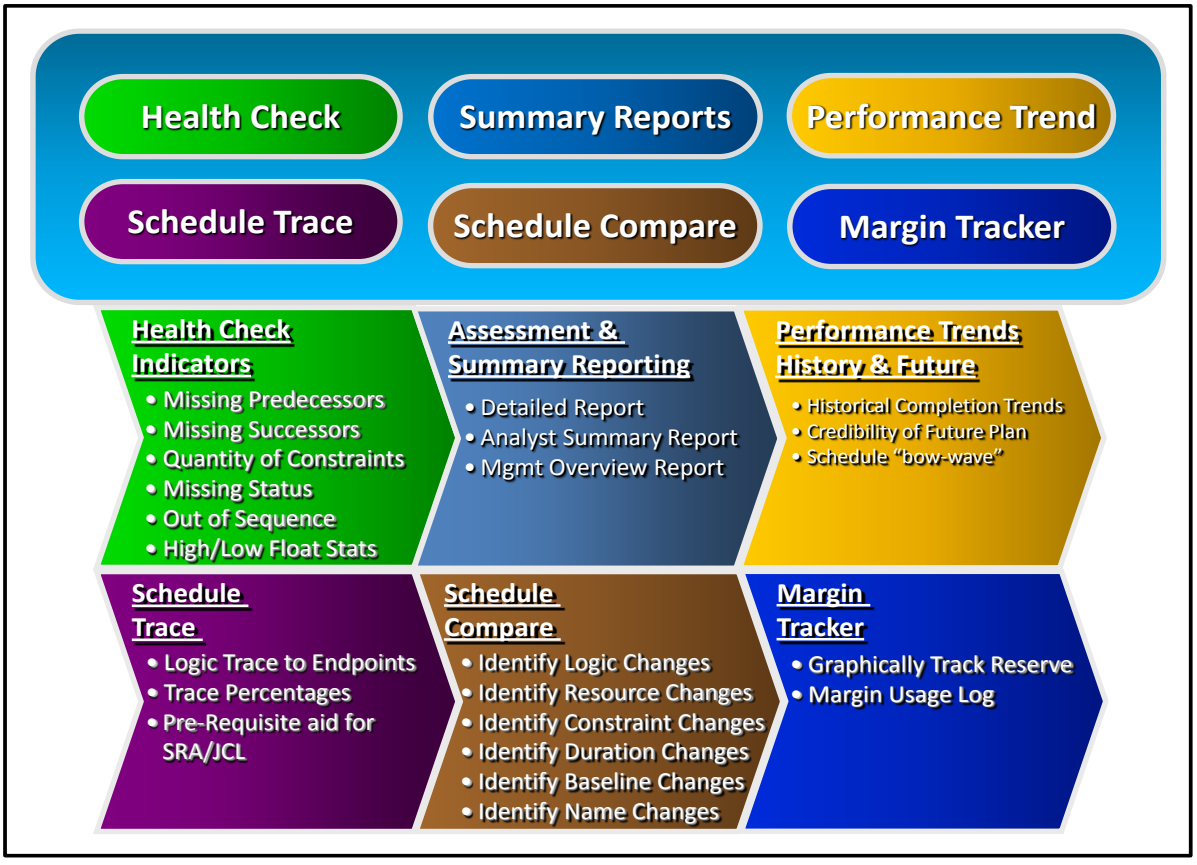
Schedule Test and Assessment Tool (STAT)

STAT 4.0 User's Guide



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Section 1: Overview and Purpose

Sound schedule management involves the establishment, utilization, and control of a baseline master schedule. Schedule management at the project level entails the creation of an Integrated Master Schedule (IMS) that contains a logic network made up of tasks and milestones, interdependency relationships, task durations, and valid date constraints. The IMS provides the framework for time phasing and coordinating all project efforts into a master plan to ensure that objectives are accomplished within project or program commitments. With the IMS playing such a critical role in achieving project success, it is crucial for project schedules to provide accurate and meaningful planning data for all levels of management oversight within both NASA and its contractor community. Regardless of the type project being implemented it is essential that the IMS contains credible schedule data that addresses the total scope of work at a level of detail to allow for discrete progress measurement, management visibility, and critical path identification and control. This approach provides management with greater schedule visibility and the capability to accurately plan necessary resources when needed to accomplish the work.

Schedule credibility can be determined by monitoring key indicators within an IMS that reflect both good and poor characteristics in the areas of schedule structure, maintenance, and performance. These indicators are based on both, the accepted rules of logic network development used in critical path method (CPM) scheduling techniques, and also the performance trending criteria established by the Office of Primary Responsibility for Project Planning and Control (PP&C) at MSFC.

The Schedule Test and Assessment Tool (STAT) was created to assist the scheduling community in the identification, measurement, and rating of key credibility indicators contained within a project IMS. By monitoring key indicators and incorporating necessary corrections, the STAT tool aids in the development of accurate project schedules, and also in their assessment of credibility within existing in-house and contractor schedules. This tool was also created to bring about greater efficiency in the development, assessment, and analysis of project schedules.

This schedule management tool was developed by NASA at the Marshall Space Flight Center (MSFC) in Huntsville, AL. Distribution of the STAT software is managed by the Performance and Capabilities Office (CS40) at MSFC. Contact information regarding the request or use of the STAT software is provided below.

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Section 2: Software Installation

Installation Instructions:

While the STAT tool is not a commercially developed application, it has been developed and packaged so that installation and operation processes are much the same as any commercial software product. The STAT version 4.0 will work with MS Project 2007 or 2010 and is 508 IT compliant for 2007. If the 508 IT compliant version is needed for 2010 a file can be provided. Installing the STAT application can be accomplished by following the steps provided below.

Note: When installing the STAT software, Microsoft Project must be closed.

Step One:

Save the STAT zip file to a desired folder.

Step Two:

If an earlier version of the STAT application exists on your personal computer then removal of that version is required first. This can be accomplished by making the following selections:

Windows XP	*Windows 7*
➢ Select **Start**	Select **Start icon** 
➢ Select **Settings**	Select **Control Panel**
➢ Select **Control Panel**	Select **Programs**
➢ Select **Add/Or Remove Programs**	Select **Uninstall a program**
➢ Select **STAT - - Tools Suite**	Select **STAT -- Schedule…**
➢ Select **Remove**	Select **Unistall**

Additionally, anyone who has previously installed the earlier "Schedule Health" macros, provided by the Marshall Space Flight Center (MSFC), must also remove that set of macros from the Microsoft Project application prior to installing STAT. This can be accomplished by making the following selections:

Microsoft Project 2007	*Microsoft Project 2010*
➢ Select **Tools**	Select **View**
➢ Select **Macro**	Select **Macros**
➢ Select **Macros**	Select **Macro for "old" Health Check**
➢ Select **Macro for "old" Health Check**	Select **Delete**
➢ Select **Delete**	

Step Three:

For Windows XP users unzip the STAT file by selecting "Extract". See the following figure (Figure 2-1). Two files and a folder will be extracted to the designated folder (e.g.,"ProjToolsAddinSetup.msi","setup.exe" and "Office2007PIARedist")
For Windows 7 just open the zip file and then open the folder inside to reveal the two files and the folder.

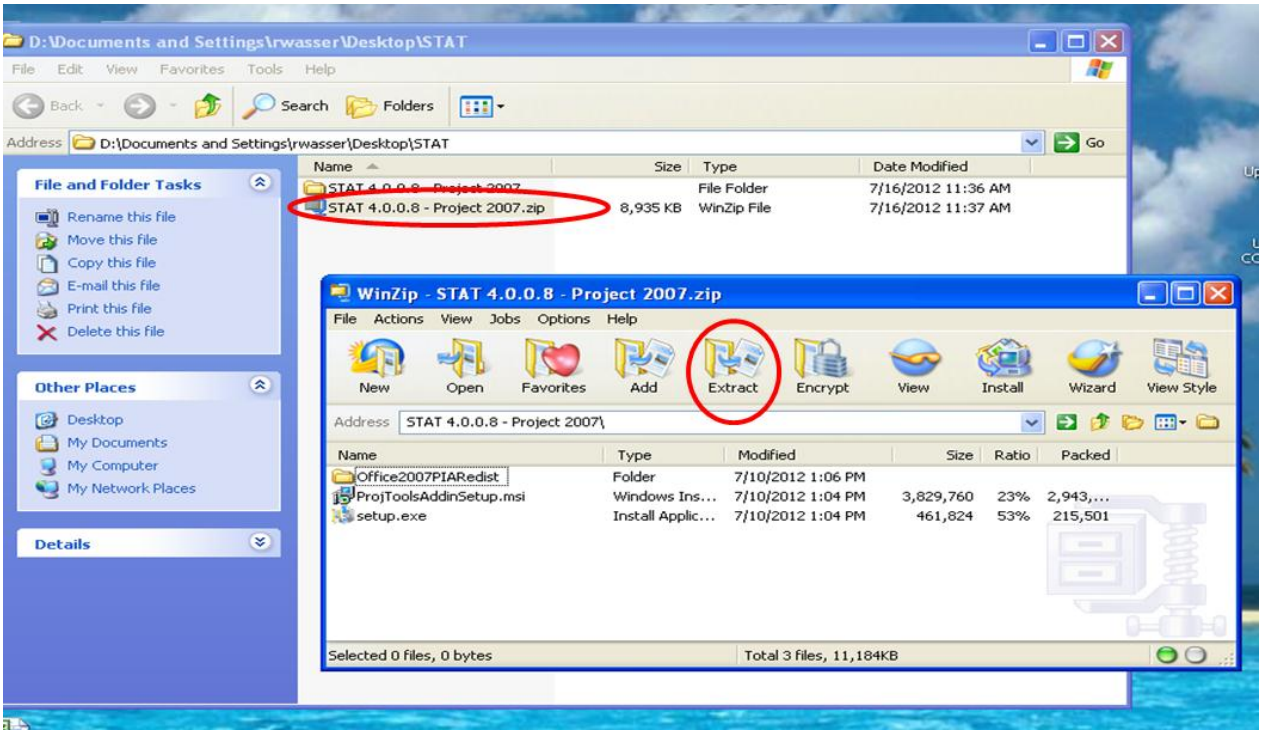


Figure 2-1: STAT Unzip and Installation Guidance

Step Four:

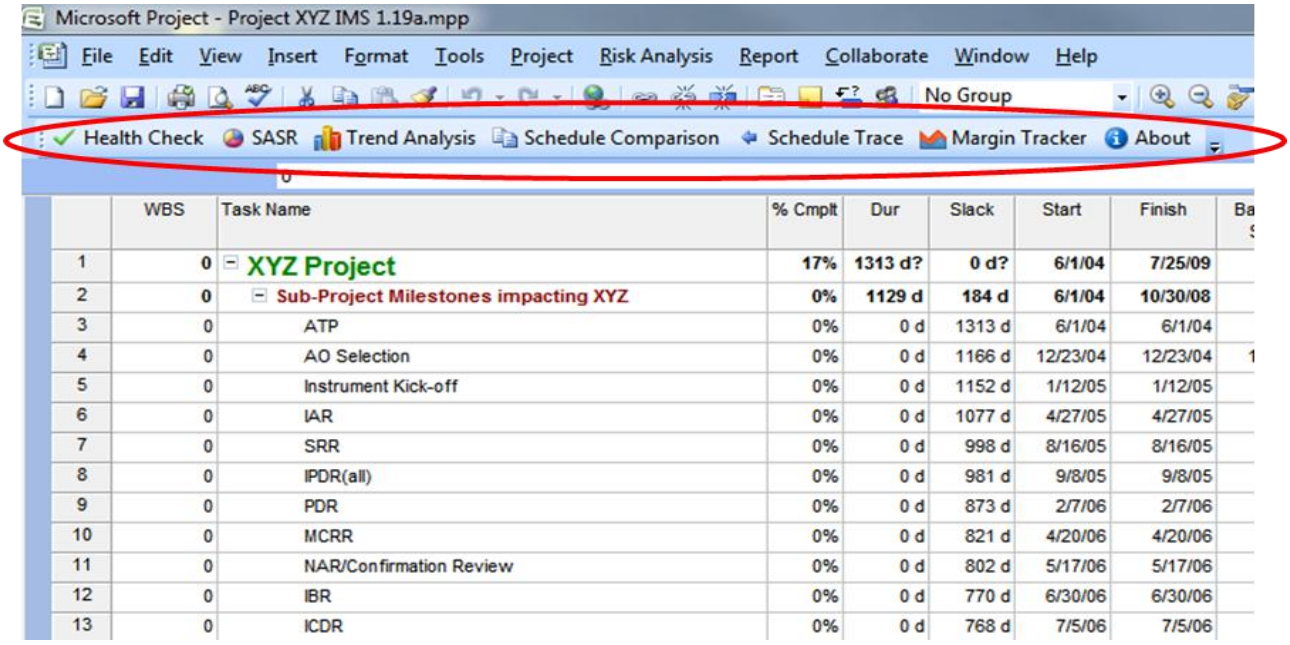
Select and execute the setup.exe file.

Step Five:

Follow the on-screen instructions provided during the installation.

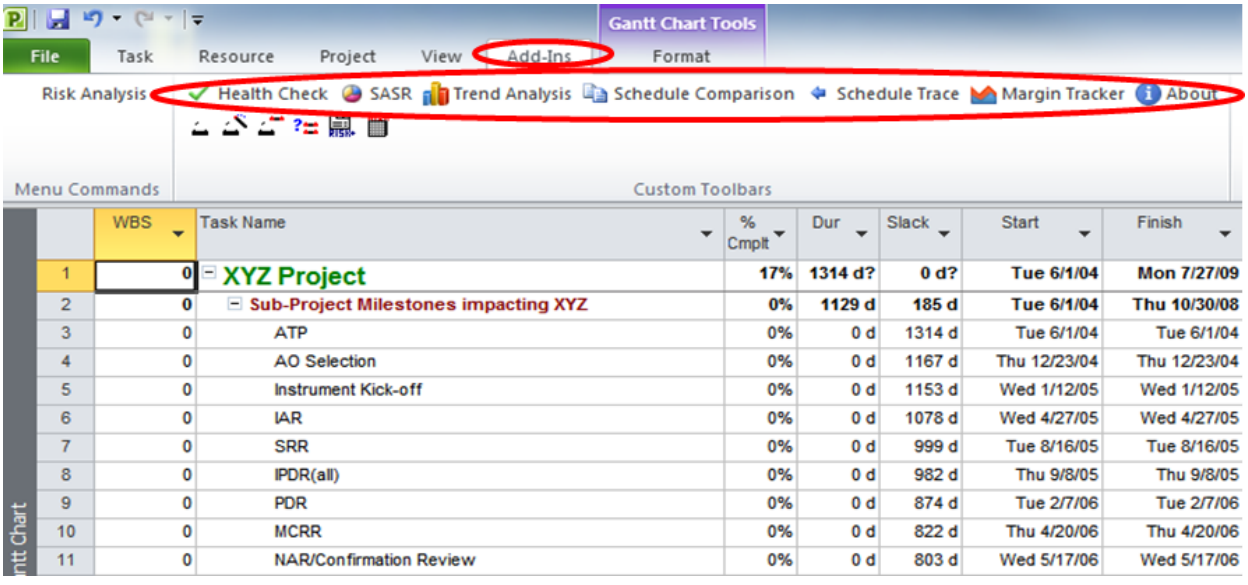
Step Six:

Verify that the STAT toolbar is visible by opening MS Project (versions 2007 or 2010) the STAT toolbar should have 7 selection buttons – Health Check, SASR, Trend Analysis, Schedule Comparison, Schedule Trace, Margin Tracker and About). See Figure 2-2 for an example of MS Project version 2007. The toolbar will be in the Add-Ins Tab in MS Project 2010. Figure 2-3 is an example of MS Project 2010. The selection button labeled "About" will indicate the version of STAT. *(Note: the "About" icon provides the STAT version identifier)*



	WBS	Task Name	% Cmplt	Dur	Slack	Start	Finish
1	0	XYZ Project	17%	1313 d?	0 d?	6/1/04	7/25/09
2	0	Sub-Project Milestones impacting XYZ	0%	1129 d	184 d	6/1/04	10/30/08
3	0	ATP	0%	0 d	1313 d	6/1/04	6/1/04
4	0	AO Selection	0%	0 d	1166 d	12/23/04	12/23/04
5	0	Instrument Kick-off	0%	0 d	1152 d	1/12/05	1/12/05
6	0	IAR	0%	0 d	1077 d	4/27/05	4/27/05
7	0	SRR	0%	0 d	998 d	8/16/05	8/16/05
8	0	IPDR(all)	0%	0 d	981 d	9/8/05	9/8/05
9	0	PDR	0%	0 d	873 d	2/7/06	2/7/06
10	0	MCRR	0%	0 d	821 d	4/20/06	4/20/06
11	0	NAR/Confirmation Review	0%	0 d	802 d	5/17/06	5/17/06
12	0	IBR	0%	0 d	770 d	6/30/06	6/30/06
13	0	ICDR	0%	0 d	768 d	7/5/06	7/5/06

Figure 2-2: STAT Toolbar Icons after Installation (MS Project 2007)



	WBS	Task Name	% Cmplt	Dur	Slack	Start	Finish
1	0	XYZ Project	17%	1314 d?	0 d?	Tue 6/1/04	Mon 7/27/09
2	0	Sub-Project Milestones impacting XYZ	0%	1129 d	185 d	Tue 6/1/04	Thu 10/30/08
3	0	ATP	0%	0 d	1314 d	Tue 6/1/04	Tue 6/1/04
4	0	AO Selection	0%	0 d	1167 d	Thu 12/23/04	Thu 12/23/04
5	0	Instrument Kick-off	0%	0 d	1153 d	Wed 1/12/05	Wed 1/12/05
6	0	IAR	0%	0 d	1078 d	Wed 4/27/05	Wed 4/27/05
7	0	SRR	0%	0 d	999 d	Tue 8/16/05	Tue 8/16/05
8	0	IPDR(all)	0%	0 d	982 d	Thu 9/8/05	Thu 9/8/05
9	0	PDR	0%	0 d	874 d	Tue 2/7/06	Tue 2/7/06
10	0	MCRR	0%	0 d	822 d	Thu 4/20/06	Thu 4/20/06
11	0	NAR/Confirmation Review	0%	0 d	803 d	Wed 5/17/06	Wed 5/17/06

Figure 2-3: STAT Toolbar Icons after Installation (MS Project 2010)

Section 3: The Schedule Health Check

Initiating the Schedule Health Check:

The purpose of the Health Check is to provide the user a very quick assessment of schedule soundness and credibility. Schedule integrity is determined by monitoring key indicators within an Integrated Master Schedule (IMS) that reflect both good and poor characteristics of schedule structure and maintenance. Examples of key indicators within an IMS logic network that must be monitored include the following: number of missing predecessors and successors, out of sequence task relationships, number of task constraints, omission of task status, improper status on future tasks, logic ties to/from summary tasks, inaccurate logic ties, and improperly reflecting tasks as milestones. These indicators are based on standard rules of logic network development utilized in critical path method (CPM) scheduling techniques. The automated Schedule Health Check assists in quickly monitoring and assessing these key indicators within a project schedule. To initiate this assessment function, select the Health Check icon from the MS Project toolbar. Note: The toolbar is found on the "Add-Ins" tab in Microsoft Project 2010. The icon initiates the Schedule Health Check Wizard. This wizard leads the user through four simple steps to produce a Schedule Health Check output report.

Step 1 produces a wizard dialogue box that allows the user to set the schedule "Status Date" on which the resulting Health Check data will be based. After selecting the desired status date click "Next" (see Figure 3-1). *Note: The schedule should have a Status Date that represents the "as-of" date which the schedule was updated through*. If the date is missing or obviously incorrect it should be added/changed. Also the user can select the desired baseline version to use in determining the correct schedule baseline information. The version denoted as "Baseline" is the default, if no other version is selected, but Baseline versions 1-10 can also be selected.

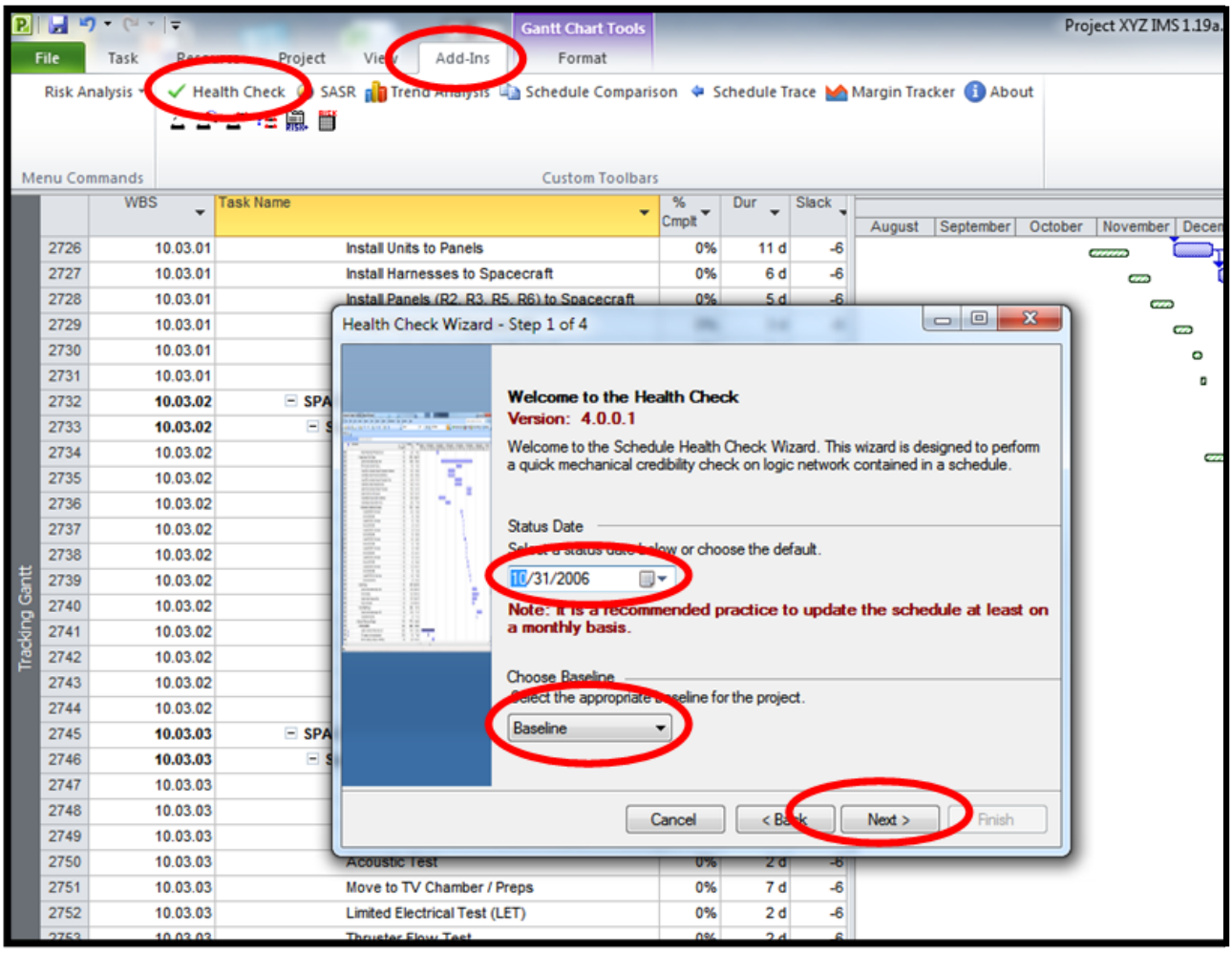


Figure 3-1: Health Check Wizard - Step 1

Step 2 of the Health Check Wizard produces a dialogue box (see figure 3-2) that allows the user to set the percentage threshold for slack values that are considered too large. This is done by selecting a percentage value of the remaining project duration that is to be considered the threshold value for too much slack. The default percentage value is preset at 25% of the remaining project duration. STAT will calculate what this value equates to, in terms of project work days, and then tabulate for the user how many and what percentage of tasks/milestones have slack values that are greater than the set threshold percentage. This information provides the user an additional means to quickly discern whether too many schedule tasks are missing interdependencies, or possibly have incorrect interdependencies identified in the schedule. The results of this tabulation are found in the "Additional Schedule Information" section of the Schedule Health Check report. If known, this step of the wizard also allows the user to select the appropriate descriptive indicators that apply to the schedule data being assessed. The indicator choices include the following: "Is the current schedule traceable to a Work Breakdown Structure?", and "Does the current schedule have a credible critical path?" If the information is not yet known for either of these questions, the user can continue by leaving the default selections (to be determined) in place and make the corrected choices at a later time.

To continue to Step 3 of the Health Check wizard, click next.

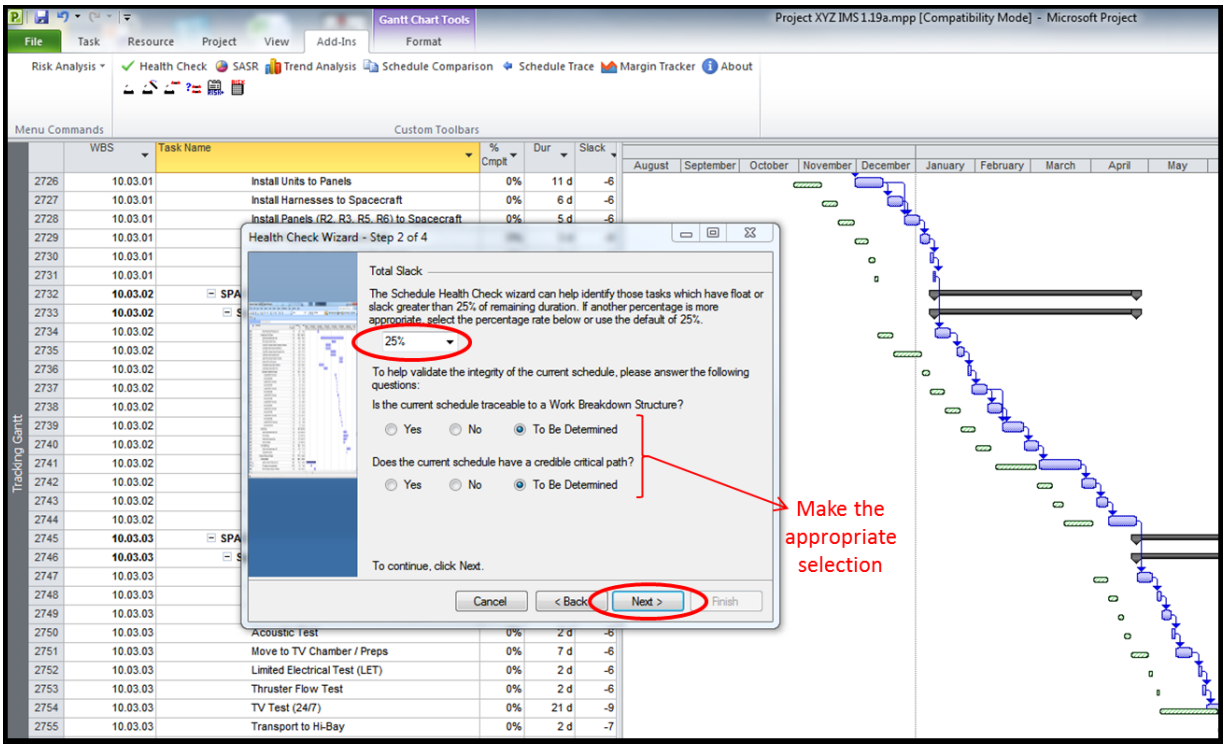


Figure 3-2: Health Check Wizard - Step 2

Step 3 of the Health Check Wizard produces a dialogue box (see figure 3-3) that provides the user the option of receiving Health Check results reflecting only the most recent run or a comparison of results for both, the most recent run and a previous Health Check run. *Note: if the comparison option is selected, the user must select the desired previous Health Check file, to be used in the comparison, and ensure that this file is **not** already open.*

The step 3 dialogue box also provides a browse function to allow the user to select the location where they wish the final output file to be stored.

After selecting the desired step 3 choices, click next.

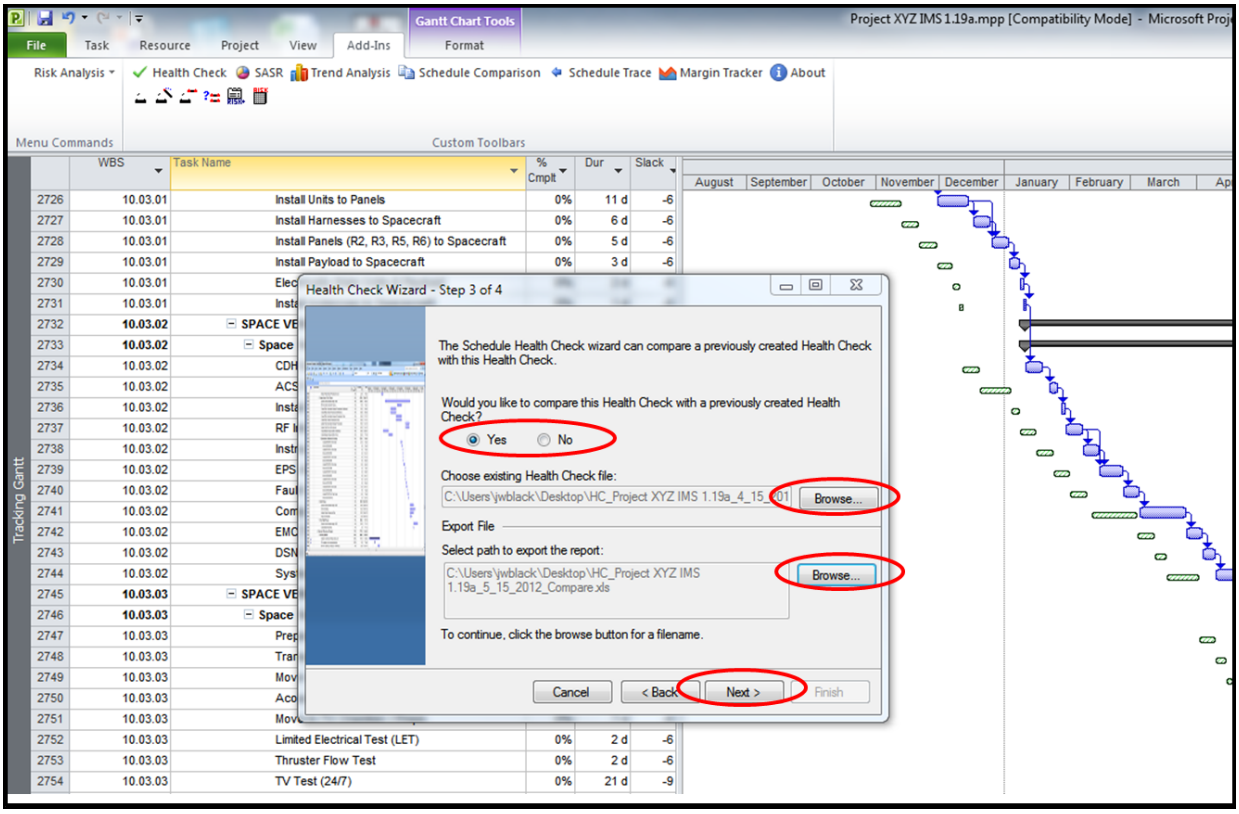


Figure 3-3: Health Check Wizard - Step 3

Step 4 of the Health Check Wizard produces a final dialogue box (see figure 3-4) that allows the user to complete the final step in initiating the Schedule Health Check. This dialogue box informs the user that Microsoft Excel 2000 or later must be installed. The user is also informed that the processing time for transferring the Health Check data results into the Excel template may take several minutes if the schedule file size is very large.

Click finish to complete the Schedule Health Check processing and compilation of assessment data.

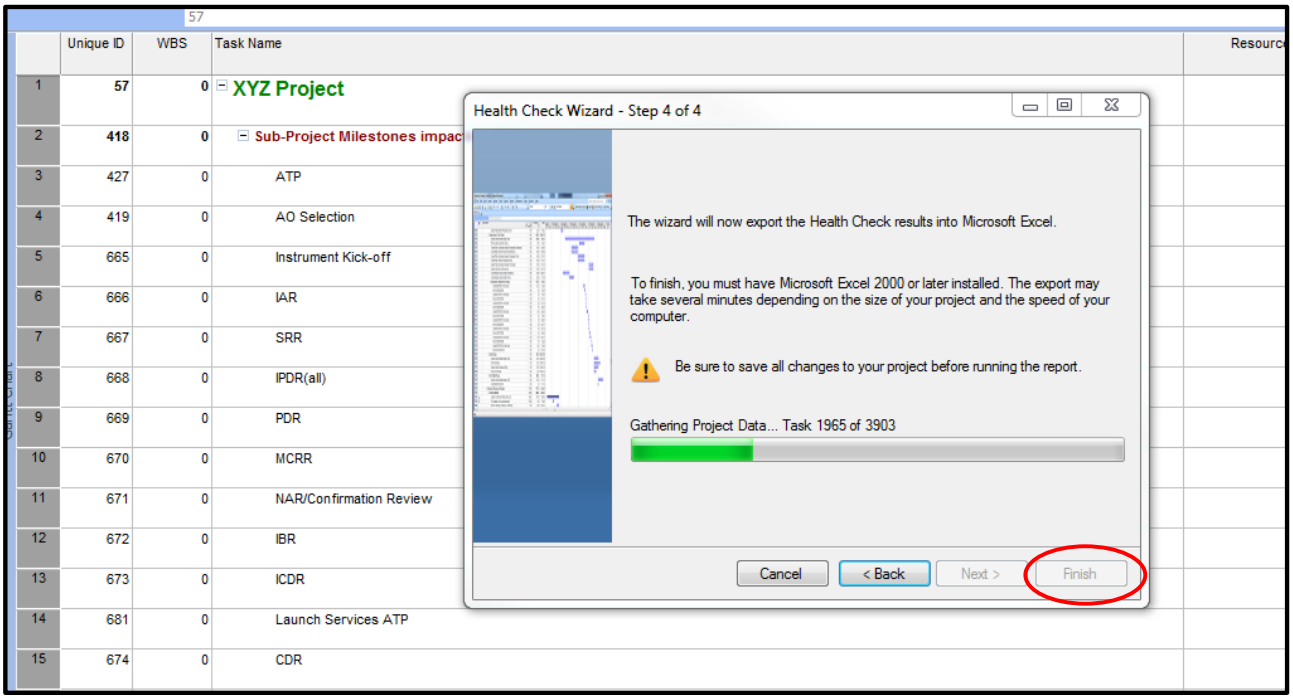


Figure 3-4: Health Check Wizard - Step 4

Understanding Schedule Health Check Results:

Credibility indicators, noted earlier in this section, should be identified and tabulated routinely using the Schedule Health Check on all detailed schedule tasks and milestones in the IMS that are not yet complete. Critical Path Method (CPM) scheduling guidelines call for logic networks to be structured so that all detailed tasks and milestones have accurate predecessor and successor relationships assigned. Additionally, it is important that minimal fixed task constraints be included within the IMS, with only those having a valid purpose being assigned and used in a logic network. It is also critical that an accurate reflection of current status (including new forecast dates for behind-schedule tasks) for all "to-go" tasks and milestones be reflected in the IMS. It is important that no task or milestone be left without progress prior to the current status date in the IMS. The higher the number of instances where these guidelines are not followed in the IMS , the more improbable it is to accurately identify the true critical path within a project schedule. It also indicates that the overall schedule lacks credibility in the data output that it produces. The Health Check assessment process additionally provides the basic statistics of the IMS content such as current number of total tasks, number of completed tasks, number of remaining tasks, current completion date, status date, and the number of remaining work days in the schedule. This information should be compared after each update to aid in understanding what changes have occurred since the last IMS update.

The figures below (Figures 3-5 and 3-6) illustrate schedule Health Check reports which apply a stoplight rating feature based on the number of "good/poor" indicators found in a project schedule's logic network dataset. Figure 3-5 reflects the Health Check results on a single schedule file, while Figure 3-6 illustrates the comparison of results from a current schedule file to a previous version of the same project schedule. The tabulation of these indicators is formatted in an Excel template that provides assessment results in a simple display that is easily understood by project schedulers. It is

generally recommended that Health Check assessment results be presented and explained to the project manager and other appropriate team members. This will help the project management team to gain a clear understanding regarding the quality and credibility of their project IMS. The assessment results should also assist in getting schedule weaknesses corrected so that the IMS can serve as a credible management tool.

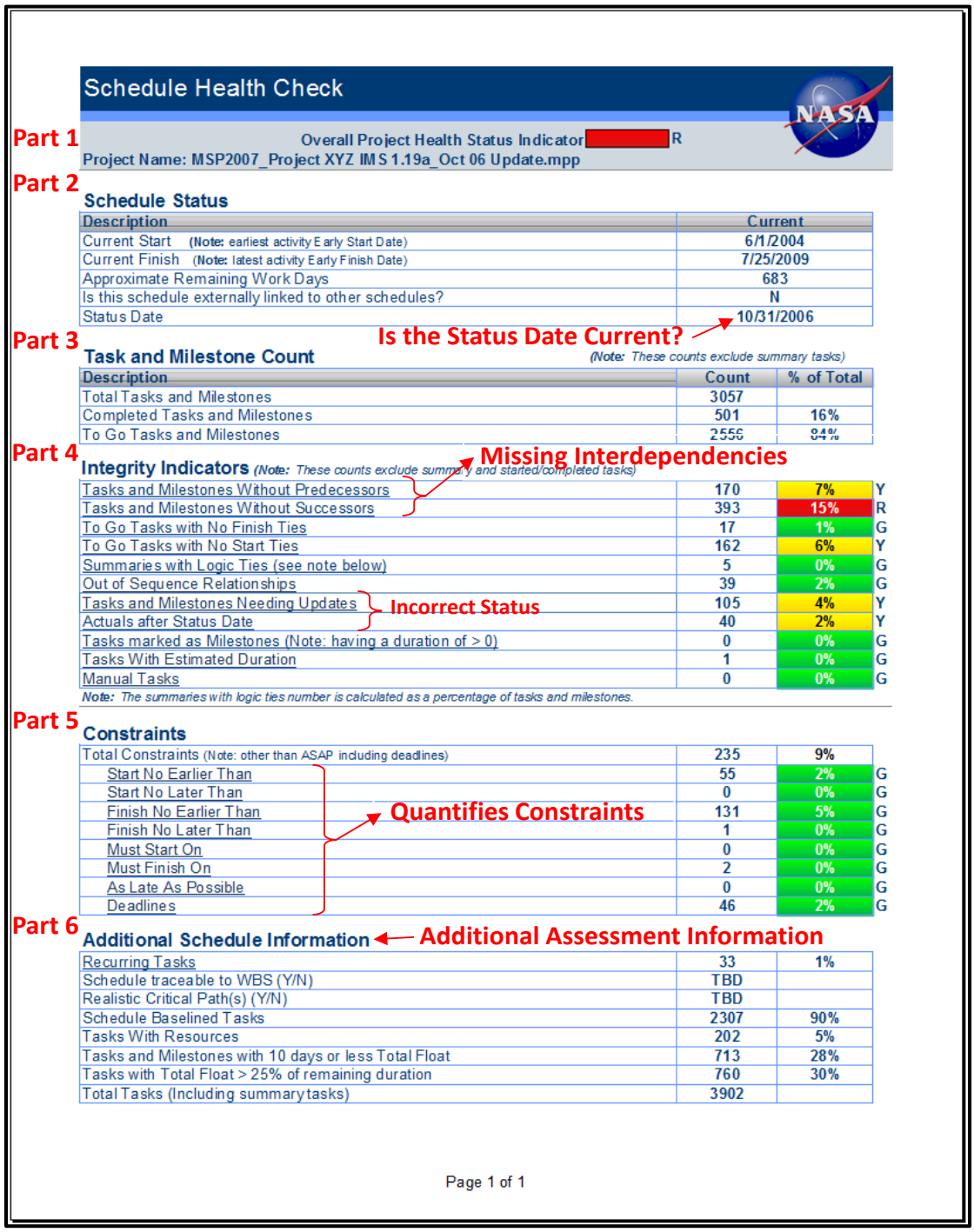
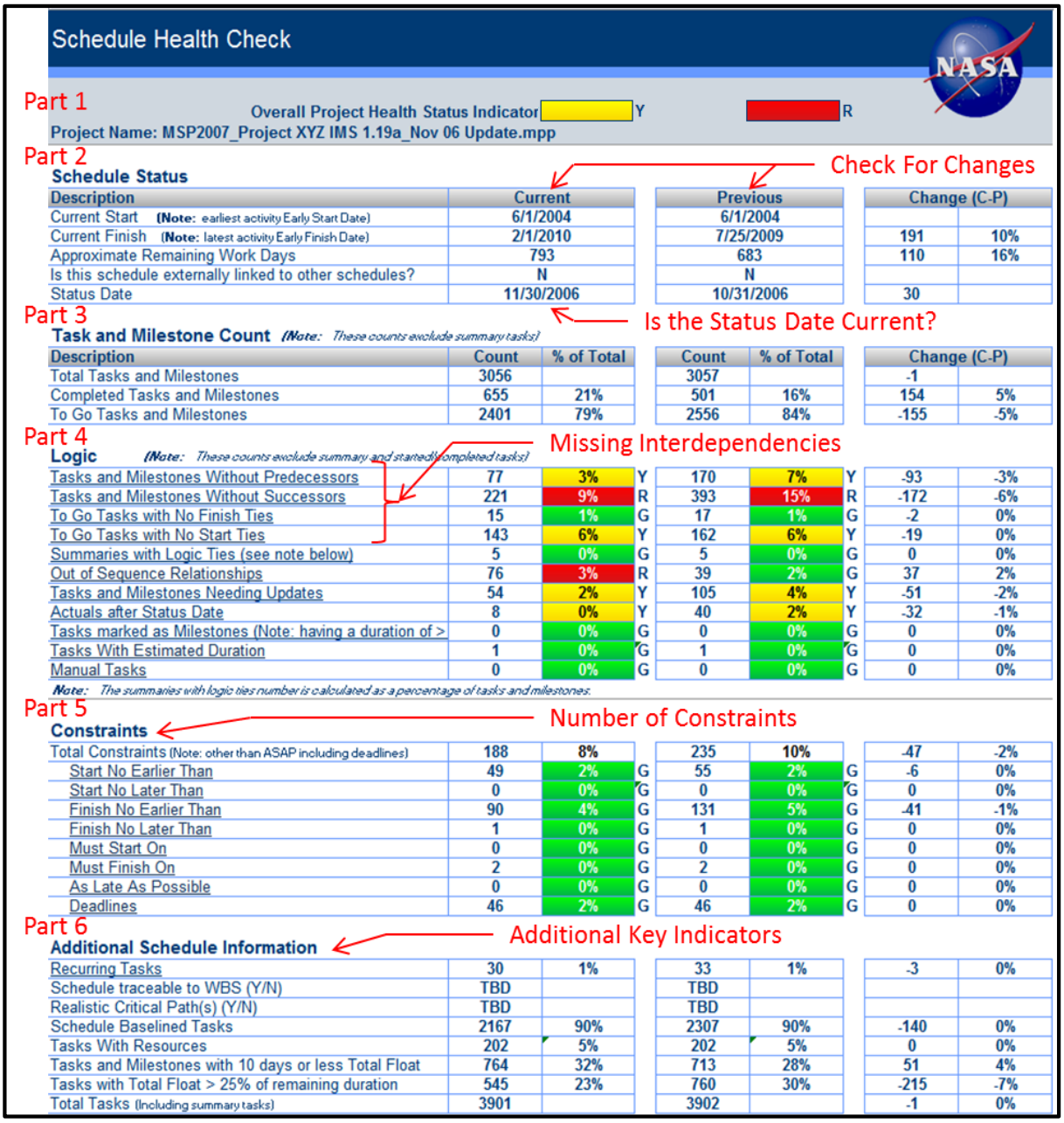


Figure 3-5: Health Check Assessment Results Output



Schedule Health Check

Part 1

Overall Project Health Status Indicator Y R

Project Name: MSP2007_Project XYZ IMS 1.19a_Nov 06 Update.mpp

Part 2

Check For Changes

Schedule Status

Description	Current	Previous	Change (C-P)	
Current Start (Note: earliest activity Early Start Date)	6/1/2004	6/1/2004		
Current Finish (Note: latest activity Early Finish Date)	2/1/2010	7/25/2009	191	10%
Approximate Remaining Work Days	793	683	110	16%
Is this schedule externally linked to other schedules?	N	N		
Status Date	11/30/2006	10/31/2006	30	

Part 3

Is the Status Date Current?

Task and Milestone Count *(Note: These counts exclude summary tasks)*

Description	Count	% of Total	Count	% of Total	Change (C-P)	
Total Tasks and Milestones	3056		3057		-1	
Completed Tasks and Milestones	655	21%	501	16%	154	5%
To Go Tasks and Milestones	2401	79%	2556	84%	-155	-5%

Part 4

Missing Interdependencies

Logic *(Note: These counts exclude summary and started/completed tasks)*

Tasks and Milestones Without Predecessors	77	3%	Y	170	7%	Y	-93	-3%
Tasks and Milestones Without Successors	221	9%	R	393	15%	R	-172	-6%
To Go Tasks with No Finish Ties	15	1%	G	17	1%	G	-2	0%
To Go Tasks with No Start Ties	143	6%	Y	162	6%	Y	-19	0%
Summaries with Logic Ties (see note below)	5	0%	G	5	0%	G	0	0%
Out of Sequence Relationships	76	3%	R	39	2%	G	37	2%
Tasks and Milestones Needing Updates	54	2%	Y	105	4%	Y	-51	-2%
Actuals after Status Date	8	0%	Y	40	2%	Y	-32	-1%
Tasks marked as Milestones (Note: having a duration of >	0	0%	G	0	0%	G	0	0%
Tasks With Estimated Duration	1	0%	G	1	0%	G	0	0%
Manual Tasks	0	0%	G	0	0%	G	0	0%

Note: The summaries with logic ties number is calculated as a percentage of tasks and milestones.

Part 5

Number of Constraints

Constraints

Total Constraints (Note: other than ASAP including deadlines)	188	8%		235	10%		-47	-2%
Start No Earlier Than	49	2%	G	55	2%	G	-6	0%
Start No Later Than	0	0%	G	0	0%	G	0	0%
Finish No Earlier Than	90	4%	G	131	5%	G	-41	-1%
Finish No Later Than	1	0%	G	1	0%	G	0	0%
Must Start On	0	0%	G	0	0%	G	0	0%
Must Finish On	2	0%	G	2	0%	G	0	0%
As Late As Possible	0	0%	G	0	0%	G	0	0%
Deadlines	46	2%	G	46	2%	G	0	0%

Part 6

Additional Key Indicators

Additional Schedule Information

Recurring Tasks	30	1%	33	1%	-3	0%
Schedule traceable to WBS (Y/N)	TBD		TBD			
Realistic Critical Path(s) (Y/N)	TBD		TBD			
Schedule Baselined Tasks	2167	90%	2307	90%	-140	0%
Tasks With Resources	202	5%	202	5%	0	0%
Tasks and Milestones with 10 days or less Total Float	764	32%	713	28%	51	4%
Tasks with Total Float > 25% of remaining duration	545	23%	760	30%	-215	-7%
Total Tasks (Including summary tasks)	3901		3902		-1	0%

Figure 3-6: Health Check Comparison Assessment to Previous Results

The stoplight rating criteria which is applied within the Health Check assessment function is shown below (Figure 3-7). This provides the user with an understanding of the criteria ranges that are associated with each stoplight rating. Item five in the figure below also provides the process by which an overall stoplight rating is applied to the total IMS being assessed. This "Overall Project Health Status Indicator" is contained in Part one of the Schedule Health Check output report, as shown in the previous figure.

Assessment Indicator Stoplight Criteria and Weighting

1. **For missing predecessors and successors: less than 3% is green, from 3% to 7% is yellow, and greater than 7% is red.** (Overall weighting is 20% each for missing predecessors and successors)
2. **For tasks with no finish or start ties: less than 3% is green, from 3% to 7% is yellow, and greater than 7% is red.** (Overall weighting is 20% each for missing start and finish ties)
3. **For summary tasks with logic ties: less than 2% is green, from 2% to 3% is yellow, and greater than 3% is red.** (Overall weighting 8%)
4. **For out-of-sequence relationships: less than 2% is green, from 2% to 3% is yellow, and greater than 3% is red.** (Overall weighting 3%)
5. **For tasks needing updates, actuals after the status date, tasks marked as milestones, and manual mode calculated tasks: 0% is green, greater than 0% up to 5% is yellow, and over 5% is red.** (Overall weighting is as follows: tasks needing updates is 17%, actuals after the status date is 7%, tasks marked as milestones is 2%, and tasks set for manual mode calculation is 3%)
6. **For tasks with estimated durations: less than 3% is green, from 3% to 7% is yellow, and greater than 7% is red.** (Overall weighting is 3%)
7. **For start no earlier than and finish no earlier than constraints: less than 10% is green, from 10% to 15% is yellow, and greater than 15% is red.** (Overall weighting is 8% for each type of constraint)
8. **For start no later than, finish no later than, must start on, must finish on, as late as possible, and deadlines constraints: less than 3% is green, from 3% to 7% is yellow, and greater than 7% is red.** (Overall weighting is as follows: 12% each for start no later than, finish no later than, and deadline constraints, 15% each for must start on, must finish on, and as late as possible constraints)
9. **The "Overall Project Health Status Indicator" is determined by summing the quantity percentage of each indicator category and then multiplied by its weighting factor. This percentage value is then used to determine the overall rating based on the following: less than 3% is green, from 3% to 7% is yellow, and greater than 7% is red.** Note: If missing predecessors and successors are both red, then the overall Project Health Status Indicator will be Red.

Figure 3-7: Schedule Health Check Stoplight Criteria and Weighting

The Health Check output provides the capability for viewing current assessment results only, or for comparing current results to those of any previous Health Check assessment. This will provide the user with the capability of tracking and presenting improvement details for schedule quality and credibility. The output format structures the data results into six parts. **Part one** provides an overall schedule health rating in red, yellow, and green stoplight fashion. This overall health rating is based on a weighted average of all health indicators contained in Parts four and five. **Part two** provides general schedule status information relative to project start and forecast finish dates, how many work days are remaining in the project, whether there are external schedule interdependencies, and the project status date. It should be noted that, regardless if there are external interdependencies included in the schedule logic, the Health Check will still perform the assessment in the same manner as if there were only one project schedule file. Additionally, it is important for users to check the status date and ensure that the correct date is identified from which key portions of the assessment will be based. Keep in mind that a project schedule that reflects and incorrect or old status date is considered suspect for any further schedule analysis.

Part Three provides information on the size of the project schedule relative to how many total tasks and milestones are included, how many are already completed, and how many tasks/milestones remain to be worked. Please remember that the numbers tabulated in this section

only include detailed tasks and milestones. No summary tasks are counted in these totals because the details are of primary importance when assessing schedule status and credibility. Summary tasks are always driven and determined by the detailed tasks and milestones.

Part Four is the primary assessment portion of the Schedule Health Check. Crucial schedule logic credibility indicators are identified and tabulated for the user's assessment. Specific assessment criteria has been established and built into the STAT software for determining the stoplight ratings. Weighting factors have also been incorporated that apply to each indicator contained in Part Four and are also used in determining the overall schedule health rating as explained earlier in Part One. The following detailed explanations are provided for Part Four indicators:

- ***"Tasks and Milestones without Predecessors"*** – This indicator is very straight forward and provides a detailed count of all tasks/milestones that have no predecessor assignments in the IMS. Keep in mind that when a task or milestone does not have a predecessor assigned then, unless there is a valid constraint preventing its start, it should be scheduled to start immediately. If this is truly the case then this situation is fine, however, this is not typically the case. To accurately model a planned project implementation, the correct sequence must be identified for each task and milestone contained in the schedule. This will allow the automated scheduling tool to accurately calculate slack (float) for each task/milestone in the IMS which is required in order to correctly identify the project critical path. The Health Check correctly identifies all tasks/milestones that have no predecessor assignments so that they can be evaluated, and if necessary corrected.

- ***"Tasks and Milestones without Successors"*** – This explanation is nearly the same as the above indicator, except that when there is no successor assignment for a specific task or milestone, then that item may slip indefinitely with no impact to project completion. This situation also hinders correct slack calculation and critical path identification.

- "***To Go Tasks with No Finish Ties***" – This indicator identifies all tasks in the IMS that, even though they have successors assigned, have no finish successors. The tasks identified have only successors that are either *start-to-start* or *start-to-finish* type interdependencies. The impact of this type of interdependency is that the finish of the task involved may slip continuously with no resulting impact on the project completion. In other words, it has nearly the same impact as a task that has no successor assignments. See Figure 3-7 for example of this type of situation.

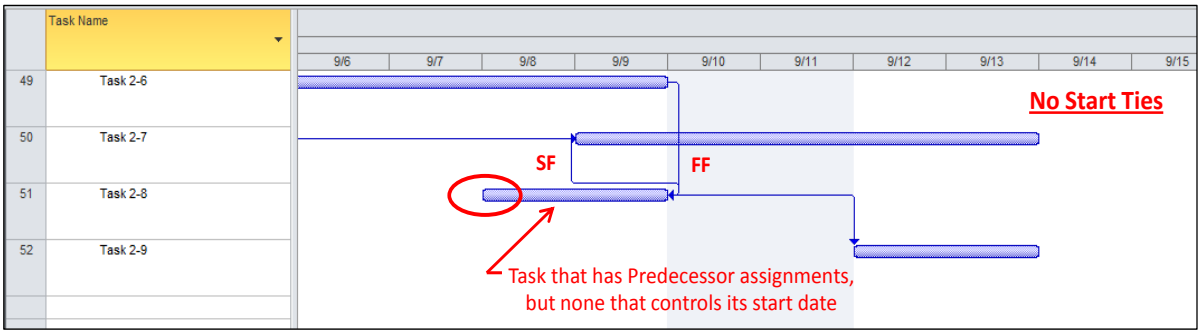


Figure 3-7 Tasks with No Start Ties

- "***To Go Tasks with No Start Ties***" – This indicator identifies all tasks in the IMS that, even though they have predecessors assigned, have no start predecessor. The tasks identified have only predecessors that are either *finish-to-finish* or *start-to-finish* type interdependencies. The impact of this type of interdependency is similar to the impact as a task that has no predecessor assignments. See Figure 3-7 for example of this type of situation.

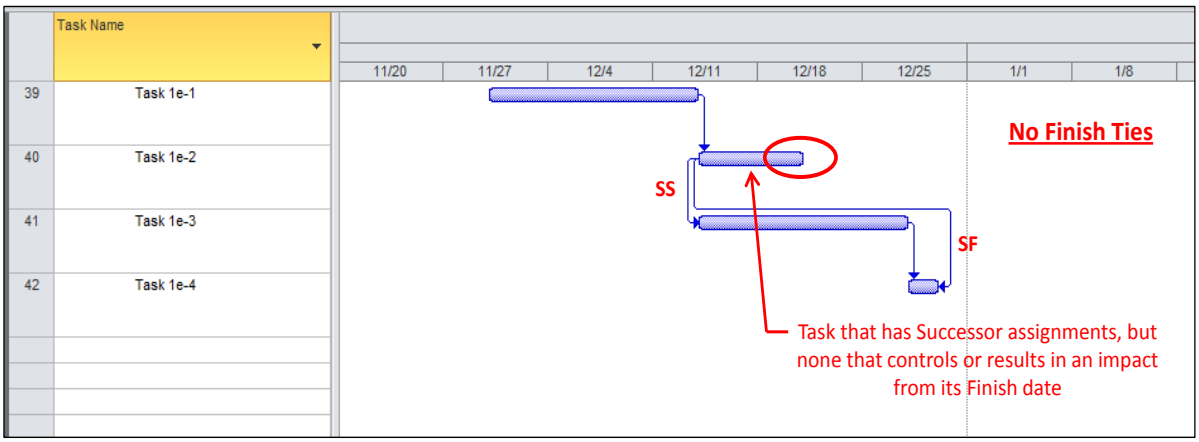


Figure 3-8 Tasks with No Finish Ties

- ***"Summaries with Logic Ties"*** – Summary tasks should never be assigned sequence interdependencies. When this occurs, the summary task relationships will override the sequence relationships that exist on the detailed tasks and milestones that are contained under the summary task. Remember that detail task logic sequence should always drive the summary task dates and not the other way around. The impact is potentially incorrect schedule dates and incorrect slack calculation.

- "***Out of Sequence Relationships***" – Out of sequence relationships occur when predecessor/successor assignments contained in the IMS become invalid due to actual start or finish dates being input that conflict with the existing logic relationships. This means that an actual date that has been input on a task indicates that the task is in progress before the logic tie reflects that it could be. These situations should be reviewed and corrected with valid logic relationships, if needed, or possibly an actual date has been entered in error and requires a correction. The impact of this situation is that the total slack calculations on

the involved tasks are incorrect and could potentially affect the accuracy of critical path identification.

- ***"Tasks and Milestones Needing Updates"*** – This credibility indicator identifies and counts all tasks and milestones that are reflecting a behind schedule status of greater than seven days from the assigned status date. The purpose of this indicator is to locate tasks and milestones that need correct progress applied or new forecast start and/or finish dates. The impact of leaving tasks/milestones without correct progress is incorrect slack calculations and incorrect schedule dates.

- ***"Actuals after Status Date"*** – This indicator identifies all tasks and milestones that have been improperly progressed with a date that is later than the assigned project status date. The impact of this type of error is that schedule dates and calculated slack values associated with tasks/milestones in the downstream logic will also be incorrect.

- ***"Tasks marked as Milestones (Note: having a duration of >0)"*** – This indicator identifies all schedule tasks that have a duration assignment that is greater than zero, but also has been marked within Microsoft Project to be shown as a milestone. Microsoft Project will use the duration to calculate the path through this activity but it will show as finish milestone. While this technique does not impact schedule slack calculations, it does prevent the schedule user from seeing the true task progress and seeing why there is a gap between the predecessor task and the milestone. The impact to the user is that a schedule task may be significantly behind schedule, but the user potentially won't be aware of the situation because it will be hidden and only reflected as a finish milestone.

- "***Tasks With Estimated Duration***" – This indicator finds all tasks that have been added to the IMS without a specified duration assignment, or a duration assignment that is flagged as estimated and needs verifying. This type of occurrence is usually caused by the scheduler forgetting to add a duration value or not knowing what the correct duration assignment should be. Remember that incorrect task durations lead to incorrect schedule dates and also incorrect schedule slack calculations.

- "***Manual Tasks***" - Microsoft Project introduced this feature in the 2010 release to allow activities to be maintained and controlled manually by the user. The manual schedule mode provides a means for inputting duration and date values in free form or in general terms for situations where schedule information may be limited and/or confidence is low. In manual schedule mode task relationships are not considered, and therefore have no bearing on calculated task start/finish dates. Manual scheduling is a method best served by occasional schedulers and results in a format much like an excel listing of tasks to be worked. This feature may have a purpose and a time for use, but for typical project scheduling that requires Critical Path Method (CPM) functionality, the manual schedule mode should not be used. The impact of having manually scheduled tasks becmixed within a normal CPM functioning project schedule is that critical path identification may be hindered or even prevented due to manual task relationships not being considered in calculating accurate total slack values.

Part Five provides a breakdown of the type and quantity of constraints that are assigned within the schedule. A constraint is a fixed date that has been assigned to a task or milestone in order to control when it starts or finishes. Caution should be exercised when using constraints because they are a significant factor in how slack (float) is calculated throughout the project schedule. All constraint types have some bearing on slack values, but certain types, such as: As Late As Possible, Finish No Later Than, Must Start On, Must Finish On, and Deadlines act as completion points in the IMS from which the total slack values are calculated. While it is true that sometimes certain schedule situations arise that necessitate the valid use of a constraint, many times constraints are over used and severely hinder the scheduler's ability to identify the project's critical path. Ideally, minimal use of constraints, other than "As Soon As Possible", is strongly encouraged. This Health Check indicator identifies and counts all constraints except for those with "As Soon As Possible", so that they can be evaluated for the extent of their impact to the project schedule. *Note: Deadline assignments are also included in the constraint count due to their impact and results being the same as a Finish No Later Than constraint.*

After running the STAT Health Check, the user can find the detailed listings of tasks and milestones that are identified and counted for each indicator metric contained in Parts Four and Five that are explained above. As shown in the figure below (Figure 3-8), the worksheet tabs located at the bottom of the Health Check screen can be selected to provide the specific indicator details for printing, reviewing, and as-needed corrections. *Note: the underlined indicator titles may also be selected to provide the detailed listing of tasks and milestones that make up that particular metric count for the current schedule's assessment indicators.*

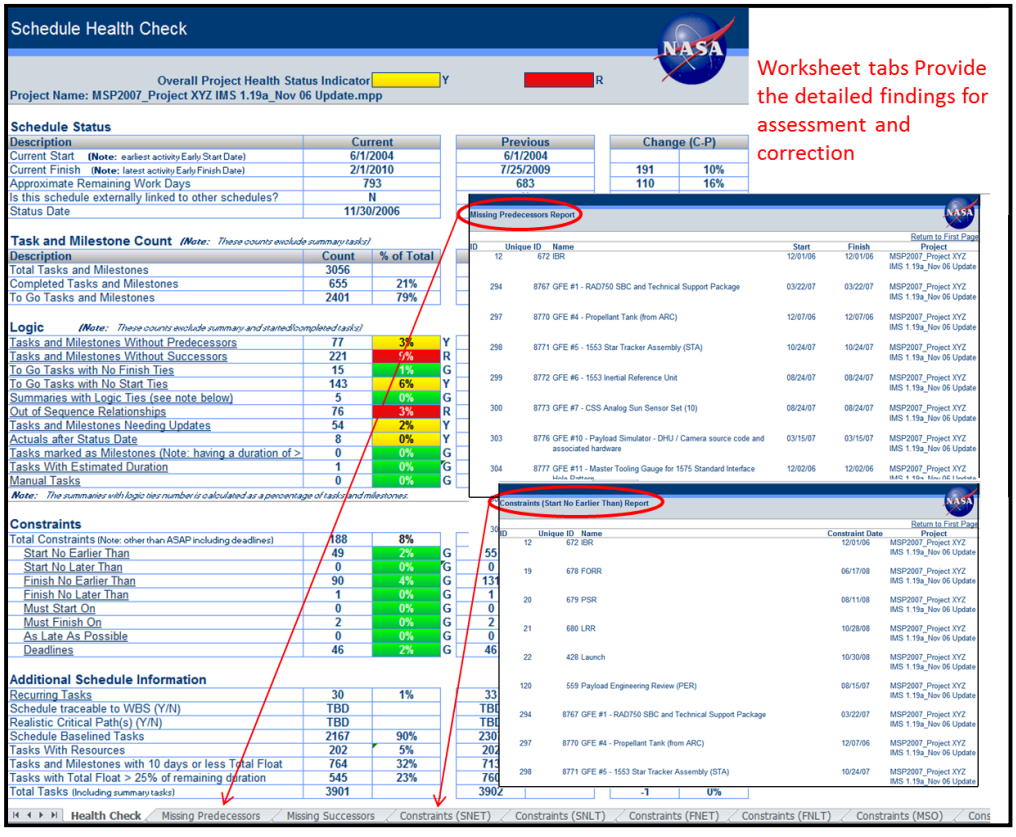


Figure 3-8: Health Check Detailed Indicator Listings

Part Six provides miscellaneous additional indicators that can assist the user in determining the integrity and credibility of the IMS. Some of these indicators are derived automatically as a function of the Health Check assessment and other indicators are included as manual entries determined from observations and user judgment. The following detailed explanations are provided for Part Five indicators:

- ***"Recurring Tasks"*** - This indicator identifies tasks and milestones that are normally repetitious in nature, and that typically should not impact the project critical path. Examples of this type of task include: weekly meetings, routine report issuances, routine reviews, etc. While these tasks are necessary when resource loading is required, it can be a real concern if the IMS is predominantly made up with these kinds of tasks instead of the real project work scope.

- ***"Schedule Traceable to WBS (Y/N)"*** – This Health Check indicator is a manual entry by the Health Check user because Microsoft Project auto-fills the WBS field with system generated values that are typically not the correct project WBS element identifiers. Prior to making this entry the user should take a quick look at the schedule to determine how much of the IMS has the correct WBS elements identified. Keep in mind that a project WBS serves as the approved framework for all technical, financial, and schedule planning. It is also a NASA requirement for the project WBS to be consistent with the integrated project baseline for all technical, budgetary, and schedule content. Having the WBS fully integrated into the IMS is a key approach to ensuring the required consistency exists.

- ***"Realistic Critical Path(s) (Y/N)"*** – This indicator is a manual entry by the Health Check user. It is strictly a subjective judgment call, but should be, in a large measure, based on the results indicated in the Part 4 and 5 stoplight assessment portion of the Health Check. If the stoplight indicators are predominantly red for IMS logic then it is reasonable to assume that any critical path identification or information would be very suspect at best, and typically not trustworthy for management decision making.

- ***"Schedule Baselined Tasks"*** – This indicator quantifies, for the Health Check user, how much of the to-go IMS has been baselined. It should be understood that project management "best practices" dictate that at some point the total remaining project schedule should be baselined in order to provide for meaningful performance measurement.

- ***"Tasks With Resources"*** – This indicator quantifies the number of tasks that have resources assigned. Since it is clearly true that project schedules cannot be successfully met unless adequate resources are available, it becomes important to the analyst to know if resources have been reasonably considered when developing the project IMS. This indicator provides additional insight into schedule credibility.

- ***"Tasks and Milestones with 10 days or less Total Float"*** – This indicator provides the Health Check user with additional insight into the reasonableness and credibility of IMS data. There is no stoplight criteria applied to this metric. There are however, 30% and 5% recommended threshold percentages for analysis purposes. This means that if this indicator reflects a percentage of 50% or greater portion of the schedule has 10 days or less slack,

then the IMS would generally be considered too optimistic. And conversely if a 5% or less percentage is reflected, then the IMS is mostly likely missing necessary interdependency assignments. *Note: if a project is in its final five to six months of implementation then instead of using 10 days as the filtering criteria the user should use a value equal to 10% of the remaining duration* Keep in mind that there are always exceptions and that the percentage threshold for this indicator should be a user determined value based on the nature of the scope of work contained in the project.

- ***"Tasks with Total Float > 25% of remaining duration"*** – This Health Check indicator also provides the user with additional insight into schedule credibility. The purpose of this indicator is to determine what percentage of the IMS has excessively large slack values. This is determined by identifying all detailed tasks/milestones whose total slack value is greater than 25% of the remaining project duration. Like the previous indicator, there isn't a stoplight criteria, or built-in threshold that is applied to this metric, but a 30% threshold is recommended for analysis purposes. This means that if this indicator reflects a percentage of 30% or greater portion of the schedule that has slack values that are greater than 25% of the remaining project duration then there are most likely many necessary interdependencies that are missing.

- ***"Total Tasks (Including summary tasks)"*** – This final item provides the total number of tasks including the summary tasks. This item is intended for information only.

Section 4: The Schedule Assessment Summary Report (SASR)

Initiating the Schedule Assessment Summary Report (SASR)

The purpose of SASR is to provide the user with a tool for obtaining both quick assessment data reflecting schedule integrity and also schedule performance data indicating how well the schedule is being followed and met. This tool incorporates a combination of the primary credibility indicators from the Health Check along with other indicators of sound planning and performance achieved. The SASR output report provides multiple types of schedule integrity and performance data in graphical formats to assist the user in making correct assessment judgments and arriving at accurate performance analysis.

To initiate this analysis function, select the SASR icon from the MS Project toolbar. *Note: If using Microsoft Project 2010, the SASR icon will be listed under the "Add-Ins" tab on the toolbar*. This icon initiates the automated SASR wizard to lead the user through five simple steps to produce a Schedule Assessment Summary output report.

Step 1 produces a wizard dialogue box that allows the user to set the schedule "Status Date" on which the resulting assessment and analyses data will be based. Generally the status date will already be set within the project schedule file, but if not, STAT will alert the user to set the correct date within this wizard. This dialogue box also allows the user to select the correct baseline version to be used in calculating the various assessment metrics addressed within the SASR module. If no specific baseline is selected, the default version will be set on "Baseline".

After selecting the desired Status Date and correct baseline version, then click "Next".

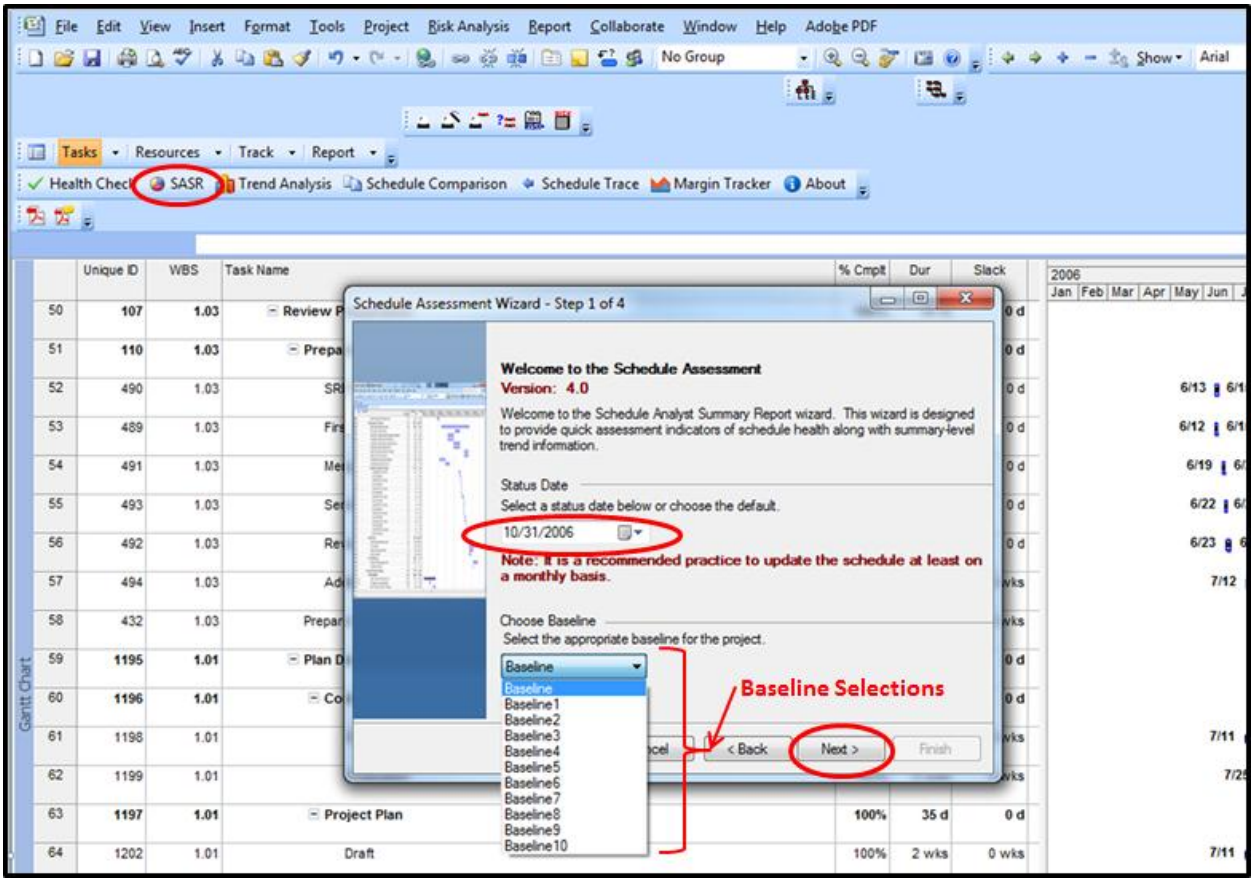


Figure 4-1: Schedule Assessment Summary Report Wizard – Step 1

Step 2 produces a wizard dialogue box (see Figure 4-2) that allows the user to set the percentage threshold for slack values that are considered too large (same as for the Schedule Health Check). This is done by selecting a percentage value of the remaining project duration that is to be considered the threshold value for too much slack. The default percentage value is preset at 25% of the remaining project duration. STAT will calculate what this value equates to, in terms of project work days, and then tabulate for the user how many and what percentage of tasks/milestones have slack values that are greater than the set threshold percentage. This dialogue box also allows the user to indicate whether or not to calculate the monthly "Hit or Miss" value. This calculation reflects a performance index of how many tasks and milestones that were baselined to complete during the current month actually were completed. If the "Hit or Miss" option is selected then the value will be plotted along with the Baseline Execution Index (BEI) on the SASR output report. If it is not selected then the output report will only show the BEI metric.

After completing the desired step 2 choices, click next.

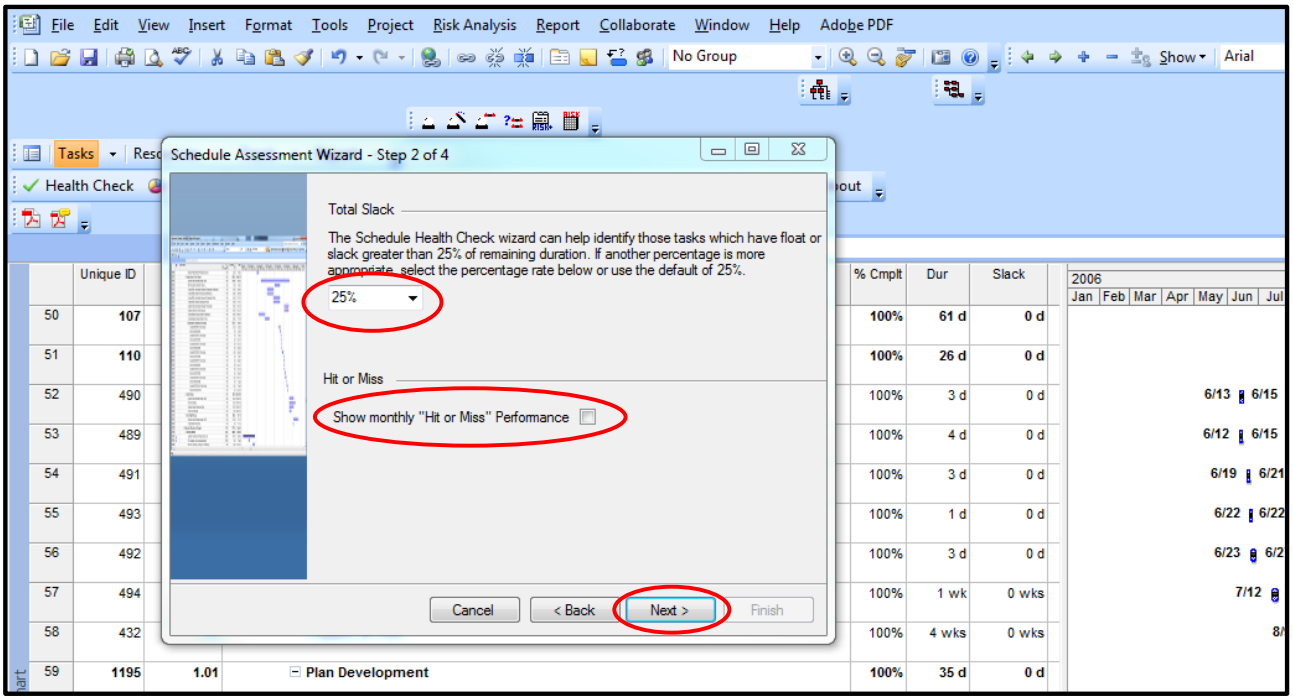


Figure 4-2: Schedule Assessment Summary Report Wizard – Step 2

Step 3 produces a wizard dialogue box (see figure 4-3) that allows the user to select key milestones to monitor variances from the approved baseline dates. The SASR output report provides a comparison graphic that highlights the amount of variance from baseline dates for only those milestones that are selected in this dialogue box. Within this dialogue box a listing of all milestones (zero duration) contained in the project schedule are provided for user to select from. There no limit on the number of major milestones that may be selected for any single SASR run. To select multiple milestones from the listing, the user must hold down the control key while making the desired milestone selections.

The step 3 dialogue box also provides a browse function to allow the user to select the location where he wishes the final SASR output file to be stored.

After completing the desired step 3 choices, click next.

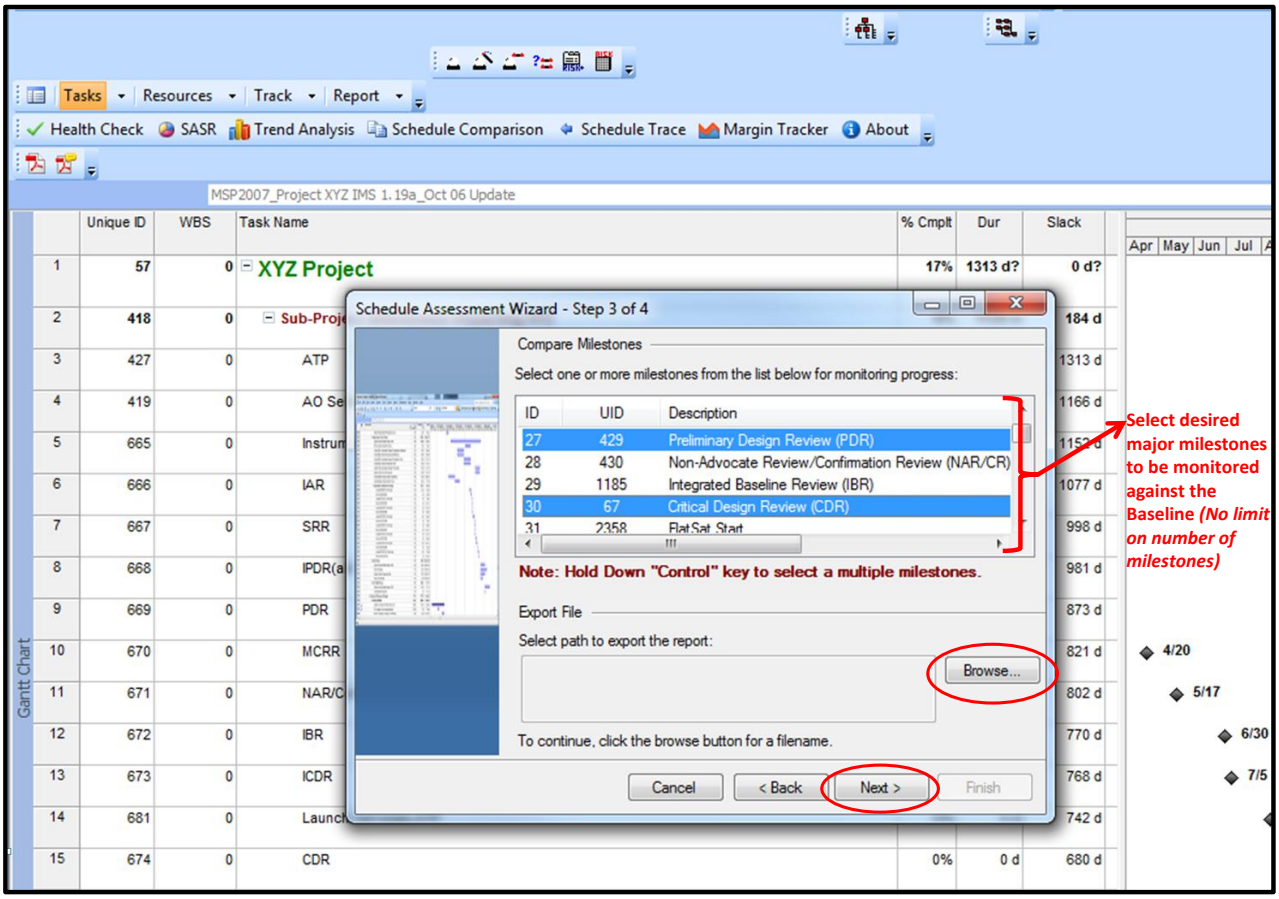


Figure 4-3: Schedule Assessment Summary Report Wizard – Step 3

Step 4 of the Wizard produces a final dialogue box (see Figure 4-4) that allows the user to complete the final step in initiating the SASR analysis report. This dialogue box informs the user that Microsoft Excel 2000 or later must be installed. The user is also informed that the processing time for creating and transferring the SASR data results into the Excel template may take several minutes if the schedule file size is very large. A processing status bar is also provided to keep the user informed on the status of the tool during its gathering and formatting of data from the schedule and also the calculations being performed.

Click finish to complete the Schedule Assessment Summary Report processing and compilation of assessment and performance data.

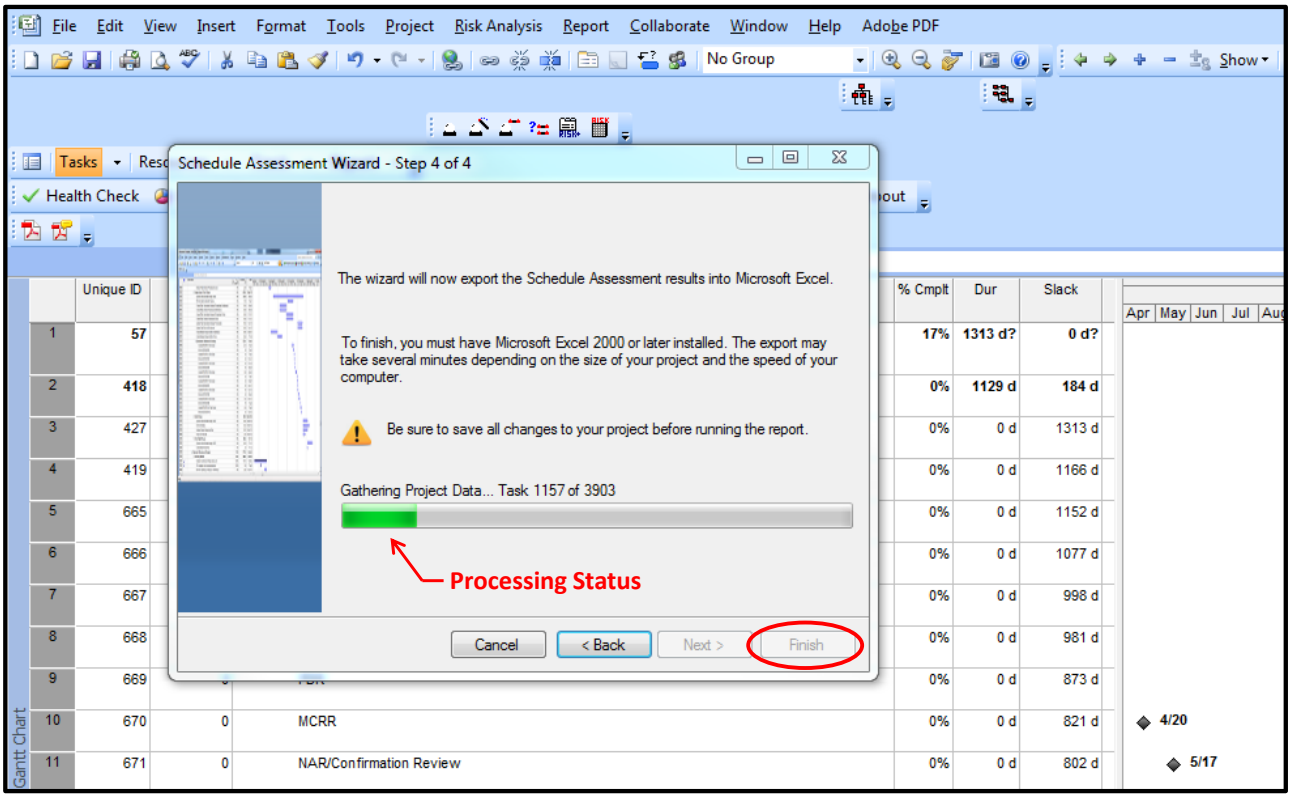


Figure 4-4: Schedule Assessment Summary Report Wizard – Step 4

Understanding Schedule Assessment Summary Report Results:

The SASR output is formatted as a multi-page report containing nine different analysis graphics along with an available input space for the planner/scheduler or analyst to input relevant notes or analysis comments derived from the output metrics. As noted earlier, the SASR includes the primary credibility indicators from the Schedule Health Check along with various other integrity and performance data. Nearly all of the SASR metrics are reflected in user-friendly stoplight fashion. The stoplight ratings contained in this report are based on calculations per the designated criteria and threshold factors designed for each analysis metric. The following paragraphs provide explanations and insights for each part of the SASR report that may be helpful to the user in arriving the most accurate analysis of the schedule.

Schedule Analyst Summary Comments: This space (see Figure 4-5) is provided for the user to document and explain his summary findings and/or list the relevant questions/concerns that arise after assessing and analyzing the SASR output data.

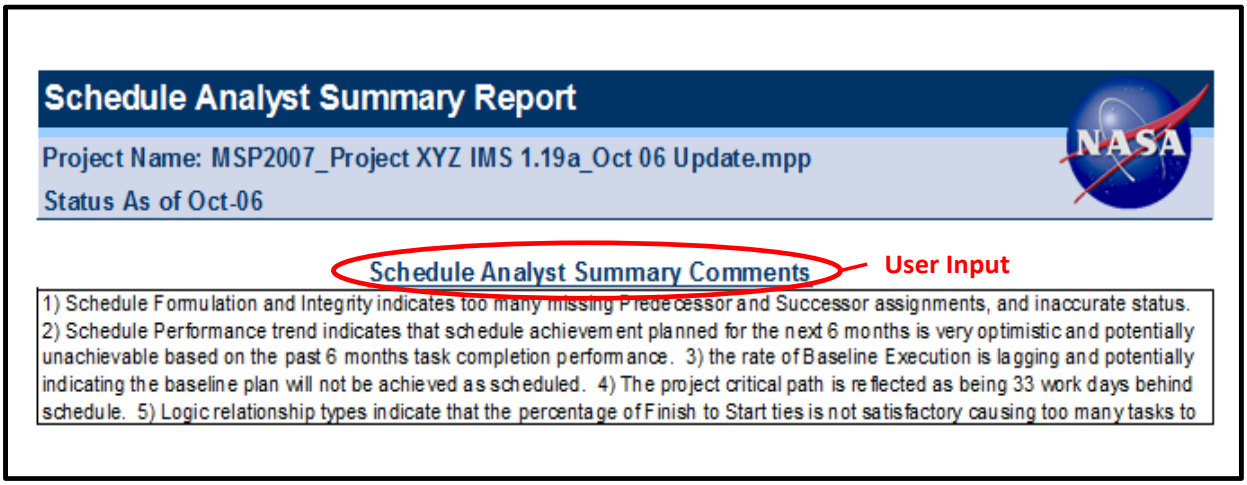


Figure 4-5: Schedule Assessment Summary Report (SASR) – Analyst Comments

Schedule Formulation and Integrity: This graphic provides key selected Schedule Health Check credibility indicator results in a histogram format (see Figure 4-6). Primary credibility indicators include: how many tasks/milestones have no predecessors, how many tasks/milestones have no successors, how many tasks/milestones have fixed date constraints assigned, and how many tasks/ milestones need correct status (progress) updates. As indicated earlier in the Schedule Health Check section of this guide, Critical Path Method (CPM) scheduling guidelines call for logic networks to be structured so that all detailed tasks and milestones have accurate predecessor and successor relationships assigned *(Note: this excludes minimal valid exceptions such as, Project Start, Project Complete, external project deliveries, etc.)*. Additionally, it is crucial for only valid task date constraints *(ie; facility availability, component deliveries from external sources, etc.)* to be used in a logic network, as well as an accurate reflection of current status (including new forecast dates for behind-schedule tasks) for all "to-go" tasks and milestones in the IMS. It is important that no task or milestone be left without progress prior to the current status date in the IMS. The higher the number of instances where these guidelines are not followed within a project schedule, the more improbable it is for accurate task dates to be calculated and also for a clear identification of the true critical path for the project.

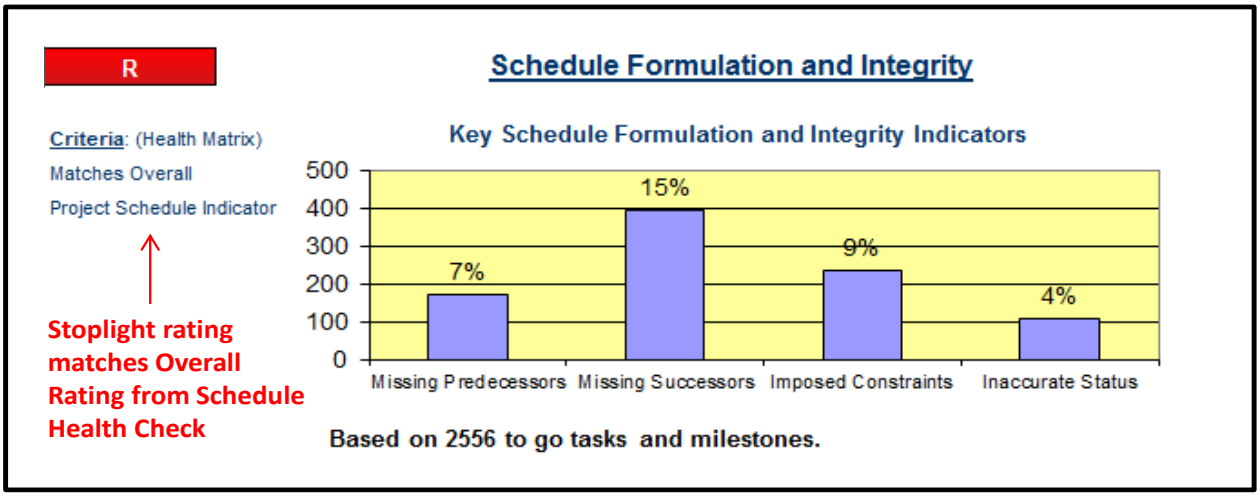


Figure 4-6: SASR -Schedule Formulation and Integrity

Schedule Performance Trend: This graphic provides analysis insight based on performance trends relating to actual and projected task and milestone completions. This metric focuses on the six month period prior to the current status date and also looks ahead to the six month period following the current status date. STAT sums the number of actual task/milestone completions per month for each of the previous six months and compares to the monthly baseline number of items that were supposed to be accomplished during the same period. A monthly average of actual completions for the six month period is also calculated. STAT then, in similar fashion, tallies the number of forecasted finishes for each of month included in the upcoming six month period and compares to the baseline number of expected finishes for each month during that same period. A monthly average of forecasted completions is also calculated to reflect what must occur to stay on schedule. The average performance of the past six months can then be compared to the average projected for the next six month period to see if the required monthly completion rate is optimistic, pessimistic, or reasonable.

Figure 4-7 below, provides an example of how the Schedule Performance Trend metric can be used for analysis and what other information can be gleaned and understood. The following illustration reflects a trend situation where the average monthly task completion rate during the past six months was 61 tasks/milestones per month. Based on this past performance trend, is it reasonable to expect the project to complete 182 tasks/milestones per month for the next six month period, as the figure indicates must be done to stay on schedule? The initial answer would typically be "*no"*. However, at this point the planner/scheduler should look within the IMS to identify those specific tasks that are scheduled to complete during the next six months and determine if the type of work is such that tasks can be completed at a rate nearly triple what has previously been accomplished.

Other helpful information displayed on the Schedule Performance Trend are tasks and milestones that have been scheduled to be worked, but are not progressed as time passes. The result of this practice is that incomplete schedule tasks are continuing to be reflected to the left of time-now, or in past history. It should be noted that this practice is not satisfactory for sound schedule management. In order to maintain schedule accuracy and critical path credibility, it is crucial that all tasks/milestones that were previously scheduled to have been started or completed prior to time-now, be assigned with new forecast start/completion dates in the future if previous scheduled dates were not achieved. Tasks with inaccurate status, as described above, will impact accurate total slack calculations on involved tasks and also hinder meaningful and effective schedule analysis.

The Schedule Performance Trend stoplight rating is based upon the specified criteria range as reflected in the output report. The stoplight is Red when the average required completion rate for the next six months is more than 20% higher than the past six months monthly average, and Yellow when the required average is from 11% to 20% higher, and Green when the future required average completion is less or equal to 10% higher than the past six months.

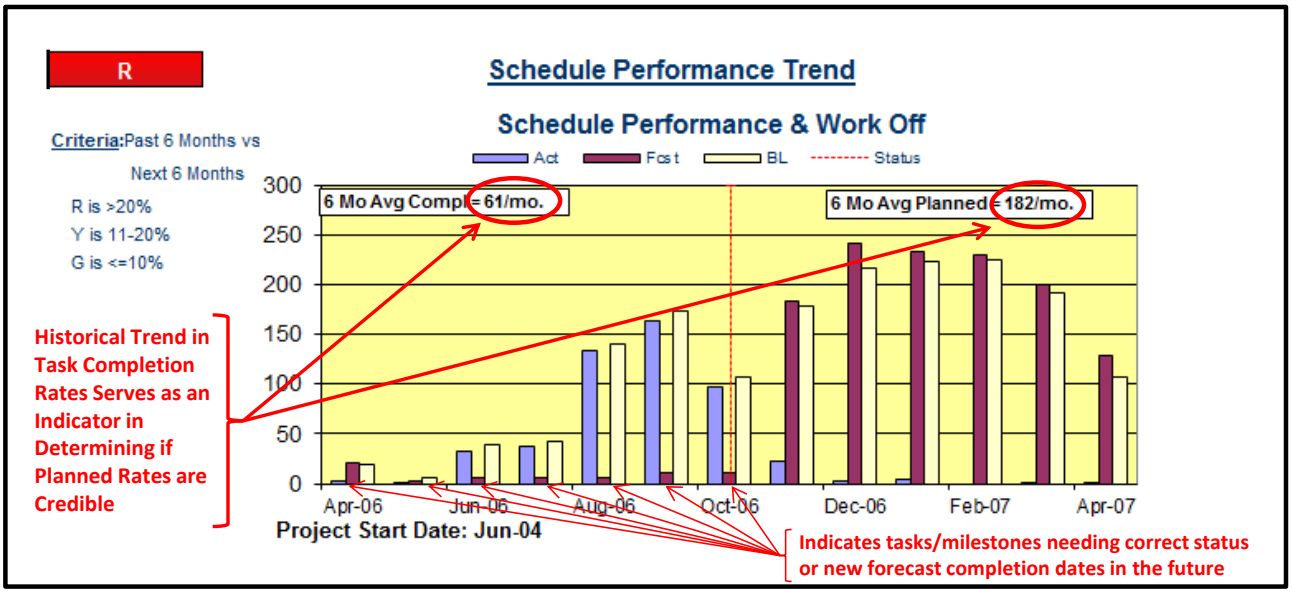


Figure 4-7: SASR – Schedule Performance Trend

Baseline vs. Actual Finishes Analysis: This analysis graphic reflects actual schedule performance against the baseline plan. As shown below in Figure 4-8, this metric reflects the basic monthly cumulative total of tasks/milestones that have actually been completed to-date versus the cumulative total of schedule items that should be completed to-date per the baseline plan. This metric is not concerned about whether tasks are completed during the correct baseline month or not, but rather a basic comparison of the total cum actuals to-date versus the total cum baseline plan to-date.

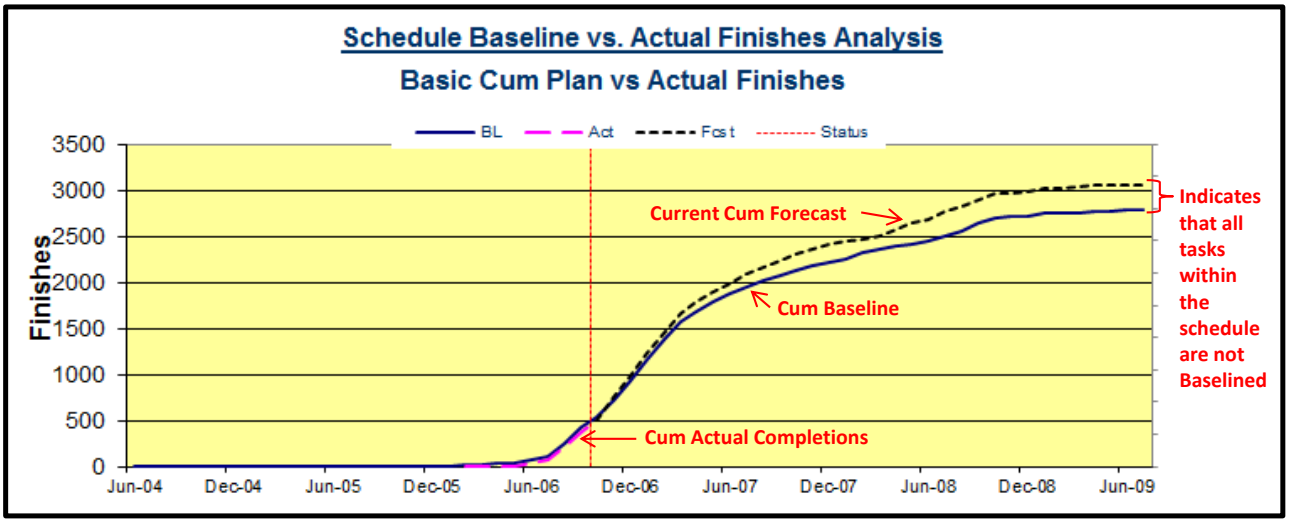


Figure 4-8: SASR – Schedule Baseline vs Actual Finishes Trend

While this metric may not indicate whether the baseline plan is being completed per the correct time phasing, it does reflect whether or not that general progress is being made against the baseline plan. Additional assessment of the specific completion data is required to determine if the right baseline

tasks are being worked during the correct months. The next metric will provide the additional assessment data required for determining if the right tasks are being worked and completed.

The Baseline vs. Actual Finishes graphic also reflects whether or not the baseline is being maintained properly. As shown in Figure 4-8, if a gap exists between the cum forecast curve and the cum baseline curve, then this is an indication that new tasks are being added to the schedule, but not being incorporated into the baseline plan. The baseline plan must be maintained by assigning baseline dates to new tasks as the necessary management approvals are received.

Baseline Execution Index (BEI): This metric (see Figure 4-9) provides two different performance perspectives on how well a project is performing in completing the baseline plan. The primary metric provided in this graphic calculates a BEI value which indicates to the user how well the project is following the baseline plan and completing baseline tasks as they are scheduled to be completed . The BEI is calculated using the following formula:

BEI = cum # of baseline tasks completed / cum # of baseline tasks scheduled for completion.

The stoplight will indicate a Green rating if the BEI value is .95 or greater, and Yellow if the BEI value is between .85 and .94, and Red if the index is less than or equal to .84. As the BEI value gets lower, the less likely that the project will be completed on time per the baseline plan. If the BEI value is greater than "1", this is an indicator that the project is doing well and performing ahead of the baseline plan.

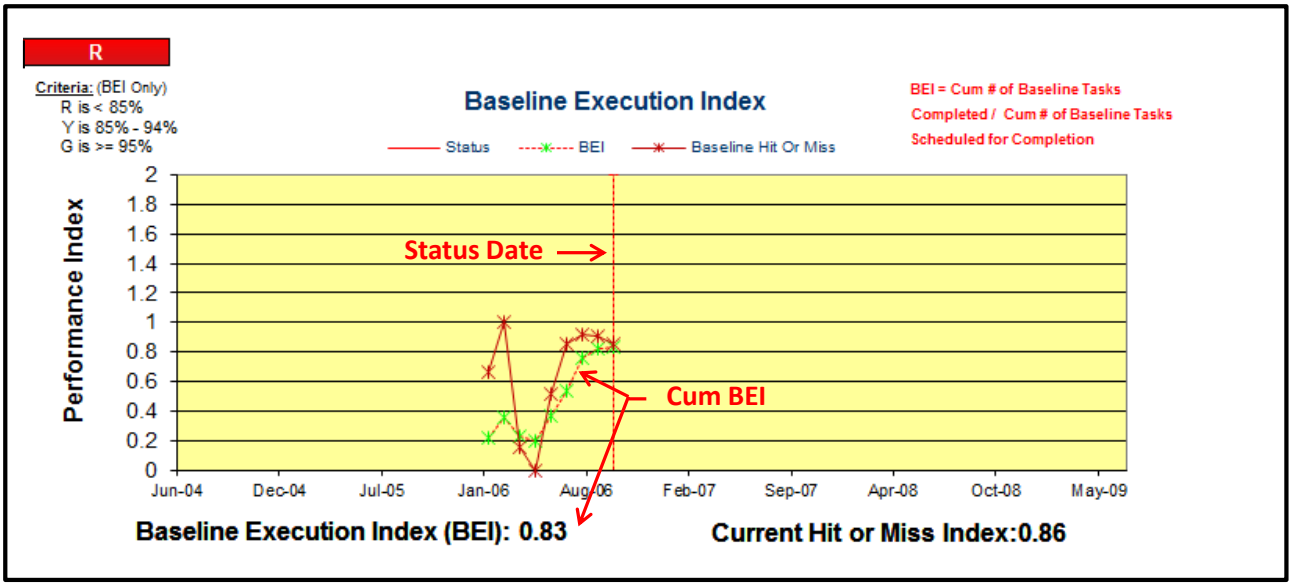


Figure 4-9: SASR – Baseline Execution Index (BEI)

A secondary performance metric option is also available within this graphic, if selected by the user. This optional metric is similar to the BEI, but instead is a completion index value for *only* a specified month's task completion performance. It applies to those specific tasks/milestones whose baseline schedule calls for them to be completed during the specified month. This measurement is referred to as the "Hit or Miss" (HOM) metric because it focuses solely on the specific

tasks/milestones that are baselined to occur in the month and reflects that they are either accomplished or not. The HOM index is calculated using the following formula:

Hit or Miss (HOM) Index = total baseline tasks completed during the specified month / total of baseline tasks scheduled for completion during the specified month.

Performance analysis using the HOM index (see Figure 4-10) indicates that during the specified month the baseline tasks/milestones are either finished during the month or they were not. If all tasks/milestones are completed during a specified month that are scheduled to finish per the baseline plan then the HOM will equal "1" on the scale. On the other hand, if only six out of ten baseline schedule items are finished during the correct month, then the HOM will equal "0.6".

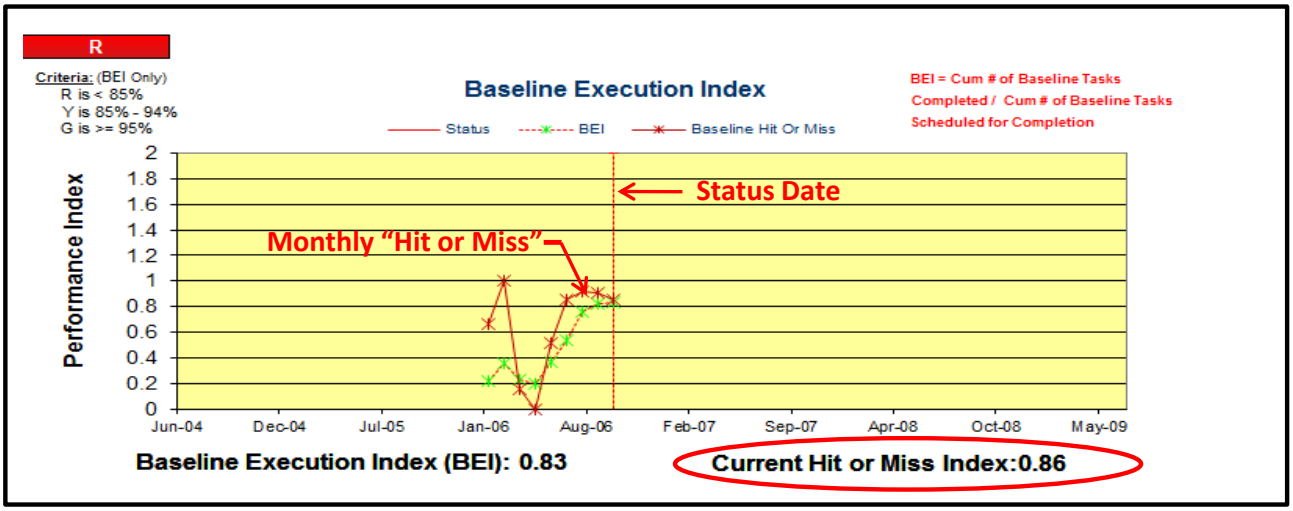


Figure 4-10: SASR – Baseline "Hit or Miss" Index (HOM)

Analysis questions that can be easily answered by the data contained in this graphic include the following:

a) Is the baseline plan being worked?
b) Is the rate of baseline accomplishment sufficient to achieve project success?

To illustrate the analysis insight that can be gained from the performance data reflected in figures 4-8, 4-9, and 4-10, first notice that the HOM index has fluctuated quite drastically over the previous six months with very poor accomplishment in some months. The cumulative results of this poor monthly performance can be seen in the BEI metric which indicates that the baseline plan is not being adequately accomplished at a sufficient rate to achieve "on-time" project completion. Unfortunately, this typically means that additional resources (ie; added personnel, overtime, etc.) will have to be implemented to catch up from the behind-schedule situation. Next, notice in Figure 4-8, that the "cum actual completions" graph is tracking nearly the same as the baseline plan. This indicates that there is a problem in that the wrong tasks are being worked, possibly tasks not yet scheduled to be worked per the baseline plan. If this situation continues over a span of several reporting periods then it is probably an indication that the baseline plan was not a viable plan to start with. Finally, in Figure 4-8, also notice that the current and baseline "cum" curves show a divergence indicating that numerous new tasks/milestones contained in the current IMS have not

been incorporated into the baseline plan. The baseline schedule plan should be continually maintained and updated through the baseline change process to reflect the most current approved baseline plan. This analysis information should be reported to the project management team to determine resolve the issues identified.

Top Five Critical Paths: This graphic (see Figure 4-11) displays total slack (float) information for the five lowest slack paths contained in the project IMS. The lowest slack path is considered the primary critical path followed by the next four secondary paths. All five paths should be monitored closely on a continuing basis to ensure schedule validity. The management team should be aware of the specific tasks and milestones on each path and ensure that each assigned task duration and interdependency accurately reflects the planned implementation model. Caution should be used before making any analysis assumptions using the top five critical path data. It is very important to validate the credibility of each of the five paths contained in this metric. If the schedule Health Check indicates poor ratings for IMS formulation and integrity then this metric will be of lesser analysis value.

The stoplight rating for this metric is set so that Red will be reflected anytime the lowest path indicates that negative total slack exists. A Yellow rating will occur when the lowest path reflects total slack values that are between "0" days and "20" days. And a Green rating will occur if the lowest path shows "20" or more days of total slack.

The analysis information gleaned from this graphic is typically found in the slack values of each path and also the number of tasks contained in each path. Below are examples of analytical data that can be gained from this graphic along with the potential analysis conclusions that can be reached.

1) If, after validating the credibility of the five lowest paths, the primary critical path, as well as any of the secondary paths, have negative or significantly low total slack (float) values, then the project schedule may not reflect a feasible or realistic plan for success.

2) Many times the number of tasks making up the critical path is a good indicator of credibility. Assuming that the level of task detail across all WBS elements contained in the IMS should be consistent, then it is generally expected that the primary critical path will contain more tasks than the secondary paths. This is expected because, by definition, the primary critical path represents the longest duration path from the current status date through the IMS network to project completion. If this is not the case, then it potentially indicates either inconsistency in task detail or an invalid use of fixed task constraints.

As noted in the figure below, caution should be used when interpreting the data within this graphic because the credibility of slack calculations is totally dependent upon the formulation integrity and logical structure of the IMS. If the Schedule Health Check reflects a red stoplight rating then this metric will not provide much effective insight for management to use.

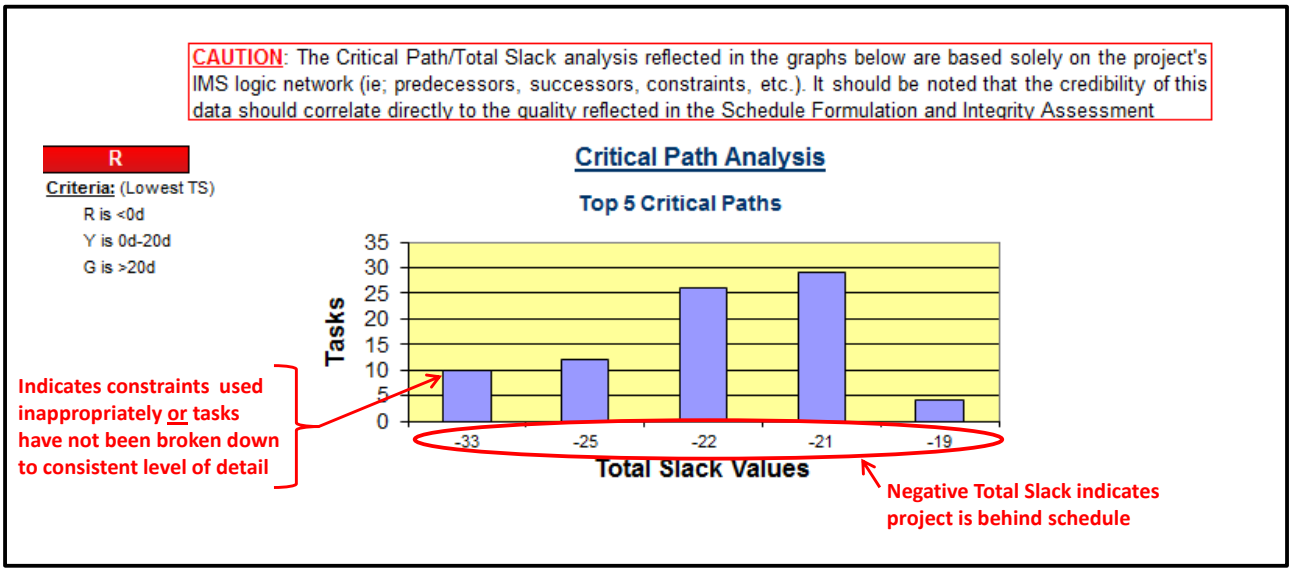


Figure 4-11: SASR – Top 5 Critical Paths

Total Slack Categories: This graphic displays an overall snapshot of how the project IMS can be broken down into three categories of total slack (float) values for analysis and general information purposes (see Figure 4-12). The categories of slack are described below:

1) The first category indicates the total percentage of detailed schedule tasks contained in the IMS that have ten days or less of total slack. A general rule of thumb pertaining to this category indicates that less than 30% of the schedule should fall into this category. If 30% or greater of the scheduled tasks within an IMS have ten days or less of slack then it is highly probable that the project schedule is too optimistic and most likely unachievable. Schedule review and re-planning by the project team is recommended.

2) A second category indicates the total percentage of detailed schedule tasks within the IMS that have total slack values that are greater than 25% of the remaining project duration. In other words, this is a measure of how much of the project schedule has excessively high slack values. The analysis insight that comes from this category for situations where the resulting percentage is 30% or greater is that the schedule has not been sequenced properly. Interdependency relationships between tasks either have not been assigned at all or they have been assigned incorrectly. Encountering this situation should also result in a review of the IMS by the project management team.

3) The third category total slack values in this metric indicates the total percentage that makes up the balance of IMS tasks that are not falling into either of the above categories. The analysis insight that can be gained from this category is that the resulting percentage of tasks that do not have too little or too much total slack should generally always be higher than either of the two categories described above. Any time this category is lower than either of the first two categories it becomes another indicator of poor or missing task interdependency relationships, or an overly optimistic schedule.

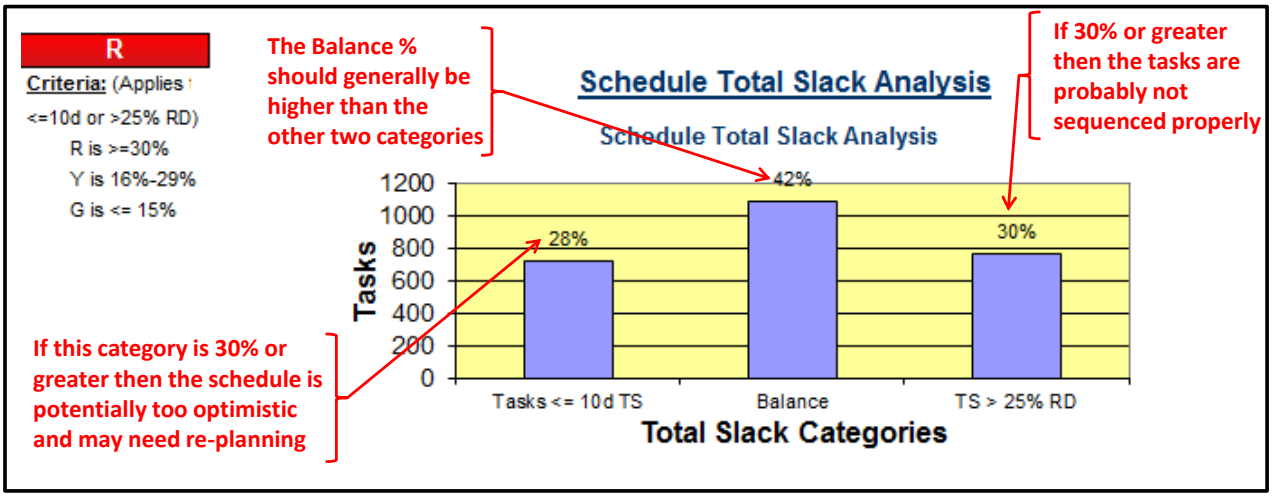


Figure 4-12: SASR – Schedule Total Slack Analysis

The stoplight rating for this metric is set so that Red will be reflected anytime *either* of the low or high total slack categories result in values of 30% or greater. A Yellow rating will occur when *either* of the low or high total slack categories result in values that are 16% to 29%. And a Green rating will occur when *both* the low and high total slack categories result in values of 15% or less.

Logic Relationship Types: This graphic provides a breakdown of the types of task relationships and reflects the percentage of use within the IMS for each of the relationship type. As noted in the figure below (Figure 4-13), the percentages shown in this metric are based on the ***to-go*** number of detail task and milestone relationships remaining in the IMS. CPM scheduling techniques utilize four different logic relationship types when establishing the sequence of tasks in the network. The four relationship types include: finish-to-start, start-to-start, finish-to-finish, and start-to-finish. It is important to note here, that it is an industry recognized goal to break down task detail to a level where finish-to-start relationships are used at least 90% of the time. It is also a NASA recommended goal that start-to-start and finish-to-finish relationships not be used any more than 5% of the time. True start-to-finish relationships between tasks are rare occurrences in sequencing work tasks, therefore it is not recommended that this relationship type be used in more than 1% of the assigned task dependencies within an IMS.

Each type of task relationship serves a specific purpose in reflecting how the project work will be sequenced. Using appropriate relationship types allows the planner/scheduler to create an accurate model of how the work is expected to be accomplished. This model can then be used for effective management of work and resources. The model can also be used for determining the project critical path (longest contiguous path to completion), along with identifying other secondary schedule drivers. If the schedule model lacks credibility then most data will be suspect and ineffective for management use.

As the scheduler assesses the IMS for credibility, the percentage criteria noted above enables the scheduler to make a determination as to the validity with which the schedule logic has been constructed. If the relationship percentages indicate that the logic network is not appropriately constructed using recommended relationship types, then schedule credibility will be lacking and data will potentially be inaccurate for management use.

This graphic also provides other metrics that can be used for schedule assessment purposes. One such metric relates to the number of task relationships that include negative lag values (lead values). Task/milestone relationships containing negative lag values means that a successor task can actually occur prior to the predecessor task. In reality, this type of work sequence happens very rarely in a project and usually will only apply to a very specific or special situation. Therefore, as the illustration below shows, the number of relationships that include negative lags should be very small (the stoplight rating indicates a goal is no negative lags). Another important metric STAT provides is the quantity/percentage of Finish to Start (FS) relationships that also include the use of positive lag values. The use of a FS relationship between tasks, along with a positive lag value results in a gap between the involved tasks that typically cannot be explained with any valid rationale. Past experiences and assessments have typically indicated that the gaps created by this type of relationship in a schedule should really have been represented by the inclusion of an additional duration-based task that can be monitored and progressed to more accurately model and manage sequence and time phasing of scheduled work. The stoplight rating for this situation is set to reflect Red if there are greater than 10% of the to-go FS relationships that have positive lags. A Yellow stoplight will occur if the percentage is between 6% and 10%. A Green stoplight will be indicated if the percentage is less or equal to 5%. Quantities for other non-stoplight task relationship uses are also provided to help assist the user in his overall schedule analysis. It should be noted that accurate total slack calculations and critical path identification can only be accomplished when proper logic relationships are applied.

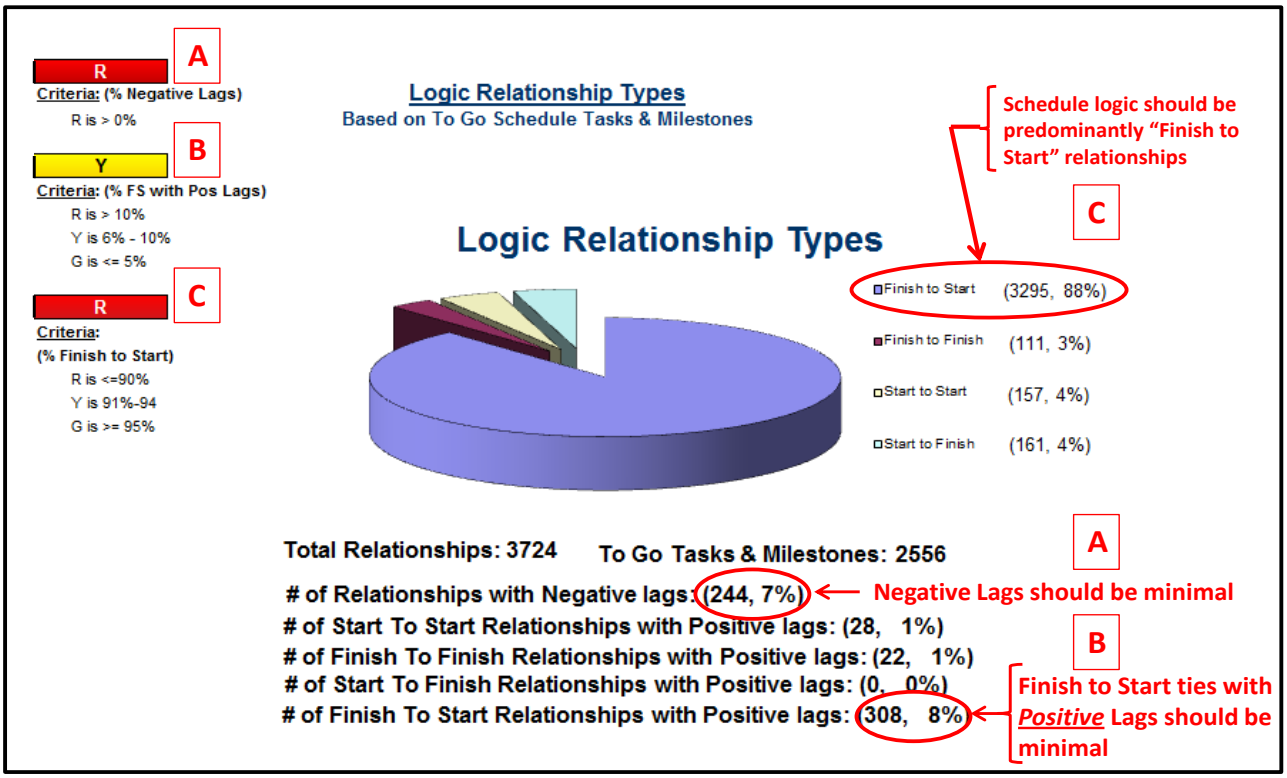


Figure 4-13: SASR – Logic Relationship Types

Remaining Duration Profile: The assessment graphic below (Figure 4-14) provides a histogram which displays a profile of all remaining task/milestone durations. The importance of this

information is to gain an understanding of the level of task detail contained in the IMS and make an assessment as to whether it is adequate or not. Generally, when task durations are long it is much more difficult to identify the specific interface points needed to allow for meaningful finish-to-start task relationships. The level of task detail within the IMS typically correlates to the development phase that the project is currently in. NASA projects in pre-phase A and also during portions of phase A generally reflect less detail in task definition resulting in much longer durations. As a project proceeds into phase B and also later phases, the project definition becomes much clearer and task durations should become shorter and more discrete allowing effective task interdependencies and meaningful progress/performance measurement. Within phase B it is preferred that task durations for work during the upcoming 9-12 month period be kept at a level not exceeding 1-3 months. During phase C it is preferred that the majority of task durations for the upcoming 9-12 months should not exceed one to two months in duration. It is understood that keeping with these goals is not always possible and that tasks should not be arbitrarily split when there are not logical and meaningful break points. It is important to understand that the more meaningful and discrete the level of task detail is, the more effective and accurate the IMS will be for determining critical schedule drivers, measuring project progress/performance, allocating resources, and forecasting future accomplishment. In simple terms it is recommended that the predominant number of tasks within an IMS should not exceed three months in duration preferably less than two months.

Another industry best practice for the IMS is that it be structured in a task-oriented format. Milestones should be used for significant and meaningful project events. Using a task-oriented format enables the project team and their customers to have better insight into progress leading to task completions. If milestones are predominantly used in developing the IMS then correct logic development and accurate progress insight are many times more difficult to incorporate. Some organizations across industry have a goal of keeping the number of milestones within the IMS to less than 20% of the total number of detail items in the schedule.

The stoplight rating for task duration assessment has been set so that Red will be reflected if the percentage of tasks with durations greater than or equal to three months in length account for more than 20% of the remaining activities/milestones. A Yellow will occur when the percentage of tasks with durations of three months or greater accounts for 11% to 20% of the remaining schedule. And Green will occur when this percentage is less than or equal to 10%.

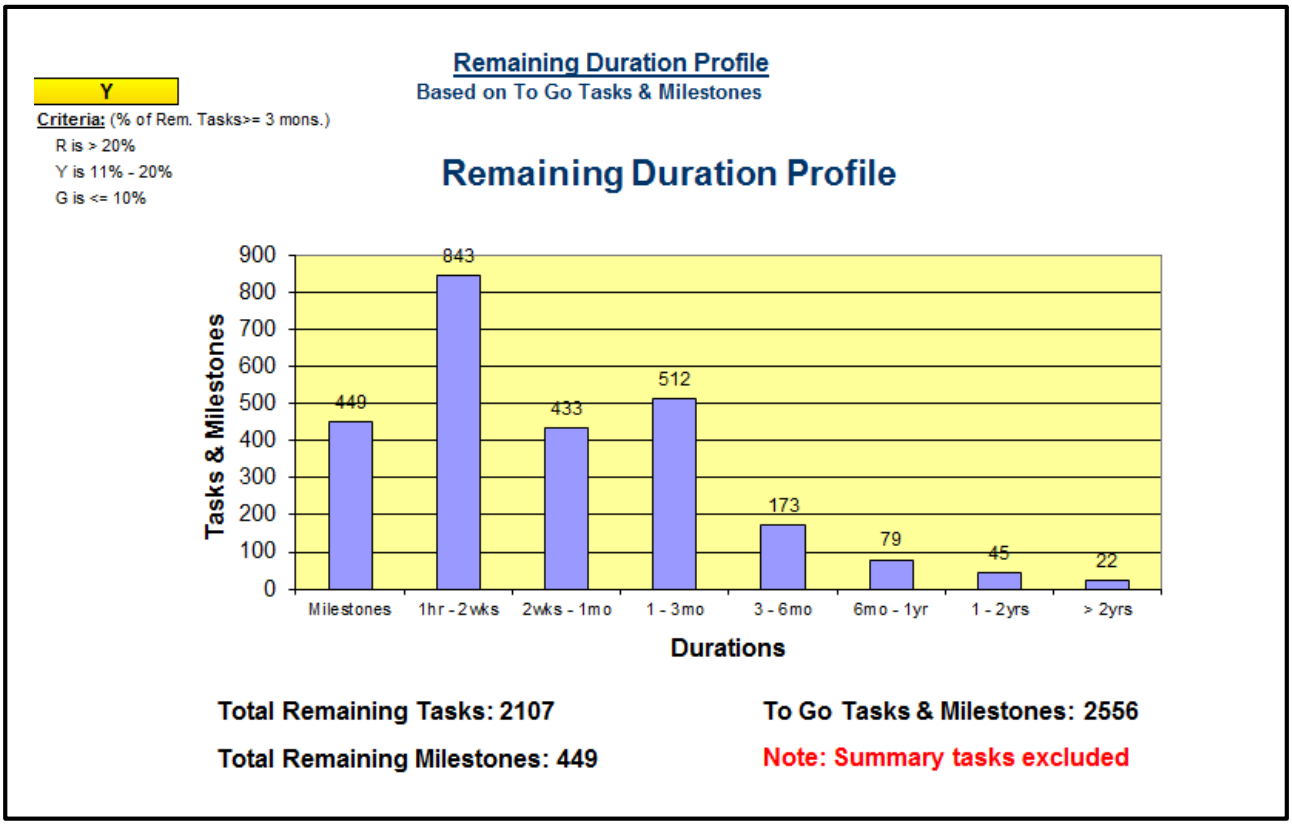
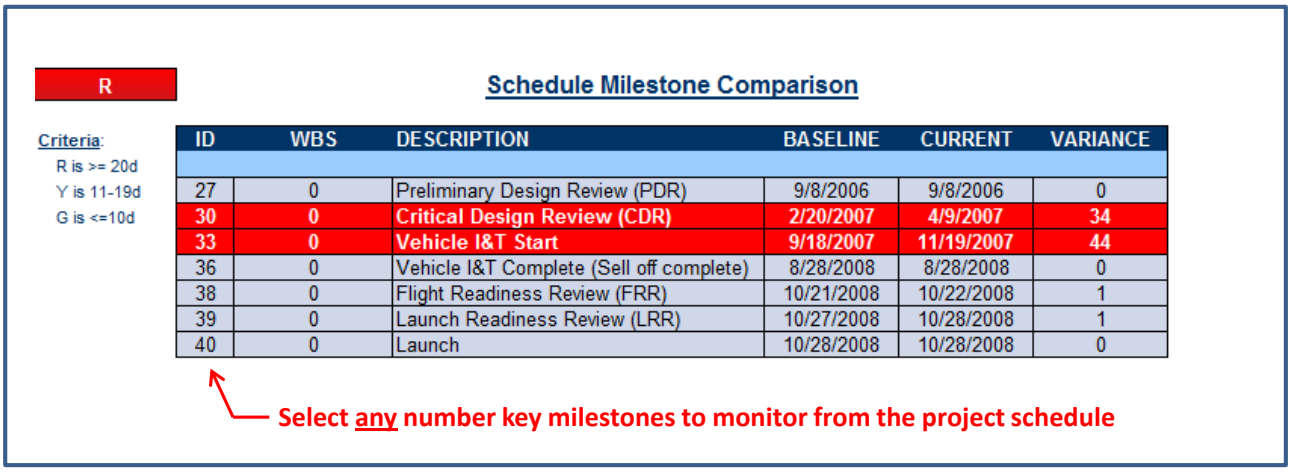


Figure 4-14: SASR – Remaining Duration Profile

Schedule Milestone Comparison: This graphic (see Figure 4-15) provides a basic status comparison metric for all selected milestone dates from the project schedule. The comparison reflects the baseline dates versus the current dates for the selected project milestones. The amount of schedule variance is also shown where the baseline and current schedules diverge. Red and yellow highlighting is added to flag those milestones where the schedule variance has significantly exceeded the established sufficiency criteria.

The stoplight rating that has set for this metric is as follows for the selected project milestones within the schedule. A Red will be reflected when *any* of the selected milestones have slipped 20 or more workdays from the baseline dates. A Yellow will occur when any milestone slips from 11 to 19 workdays from the baseline dates. And a Green occurs when the milestone slip is less than or equal to 10 workdays.



ID	WBS	DESCRIPTION	BASELINE	CURRENT	VARIANCE
27	0	Preliminary Design Review (PDR)	9/8/2006	9/8/2006	0
30	0	Critical Design Review (CDR)	2/20/2007	4/9/2007	34
33	0	Vehicle I&T Start	9/18/2007	11/19/2007	44
36	0	Vehicle I&T Complete (Sell off complete)	8/28/2008	8/28/2008	0
38	0	Flight Readiness Review (FRR)	10/21/2008	10/22/2008	1
39	0	Launch Readiness Review (LRR)	10/27/2008	10/28/2008	1
40	0	Launch	10/28/2008	10/28/2008	0

Figure 4-15: SASR - Schedule Milestone Comparison

SASR Management Overview Report (2 pages): This two-page management report (see Figures 4-16, and 17) provides both thumbnail graphics of the above metrics along with narrative assessment explanations provided by the schedule analyst. This report allows the scheduler to explain in understandable terms the meaning of each metric along with the appropriate analysis conclusions as they relate to the project.

Management Overview Report (page 1)

Provides a format for brief analysis explanation for management reporting

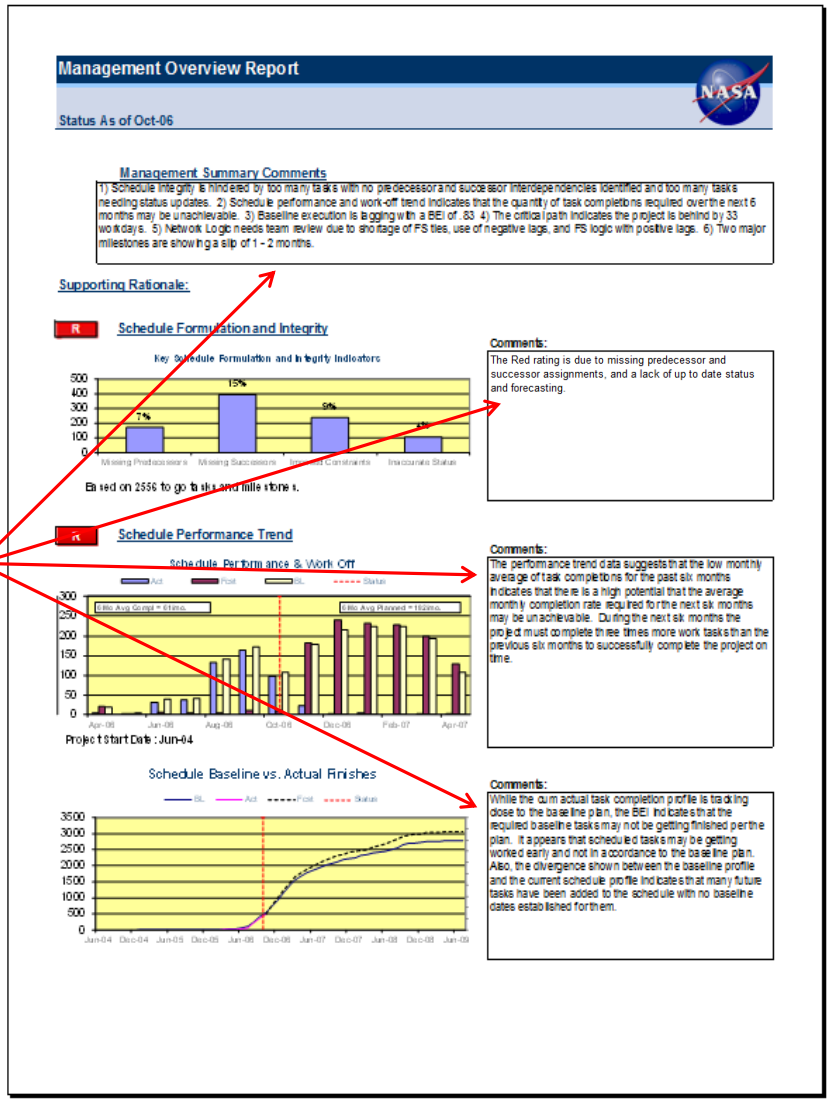


Figure 4-16: SASR – Management Overview Report (Page One)

Management Overview Report (page 2)

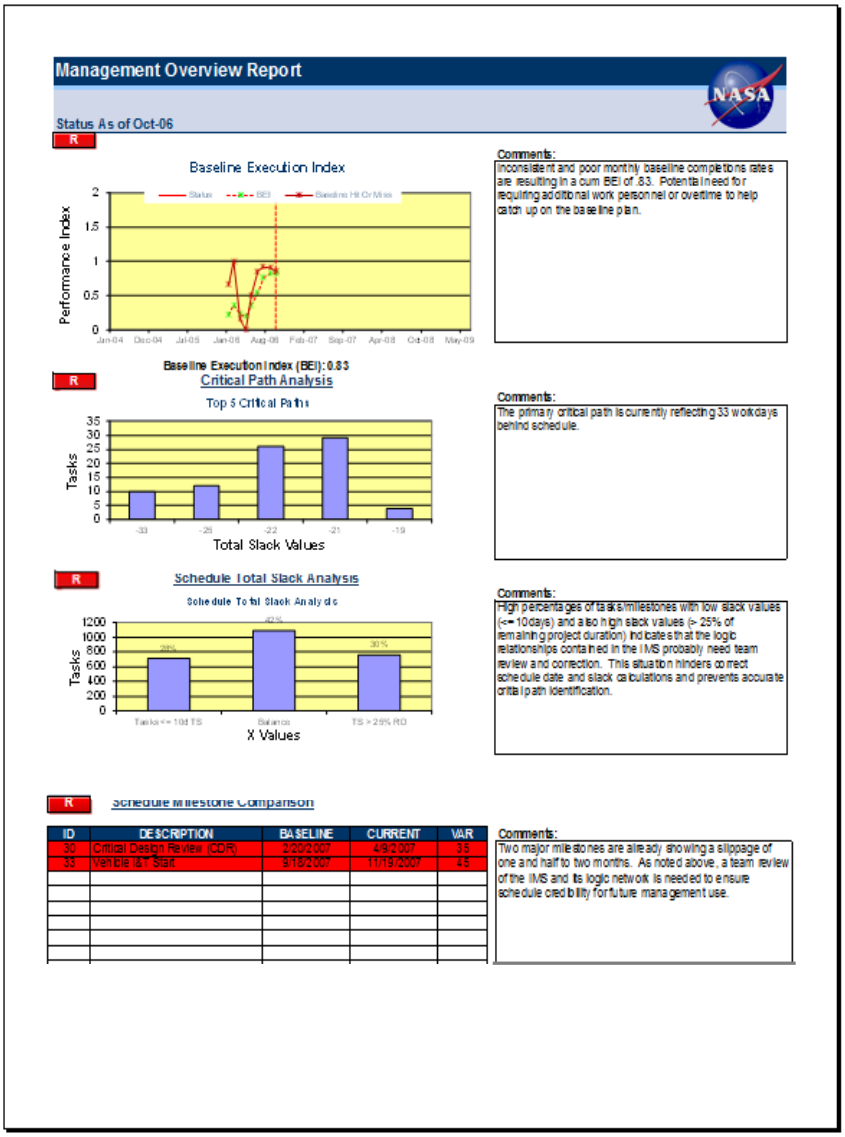


Figure 4-17: SASR – Management Overview Report (Page Two)

Section 5: The Schedule Performance and Work-Off Trend

Initiating the Schedule Performance and Work-Off Trend

The purpose of the Schedule Performance and Work-Off Trend is to provide the user with very quick visibility into how tasks and milestones stack up on a monthly basis within the project IMS. It reflects not only the baseline plan, but also actual accomplishment too date, and the schedule profile of how all remaining project tasks are scheduled to be worked in the future. This trend analysis report provides objective schedule data to assist in the assessment of IMS credibility.

To initiate this assessment function, select the Trend Analysis icon from the MS Project toolbar (see Figure 5-1). The icon initiates the Trend Analysis Wizard.

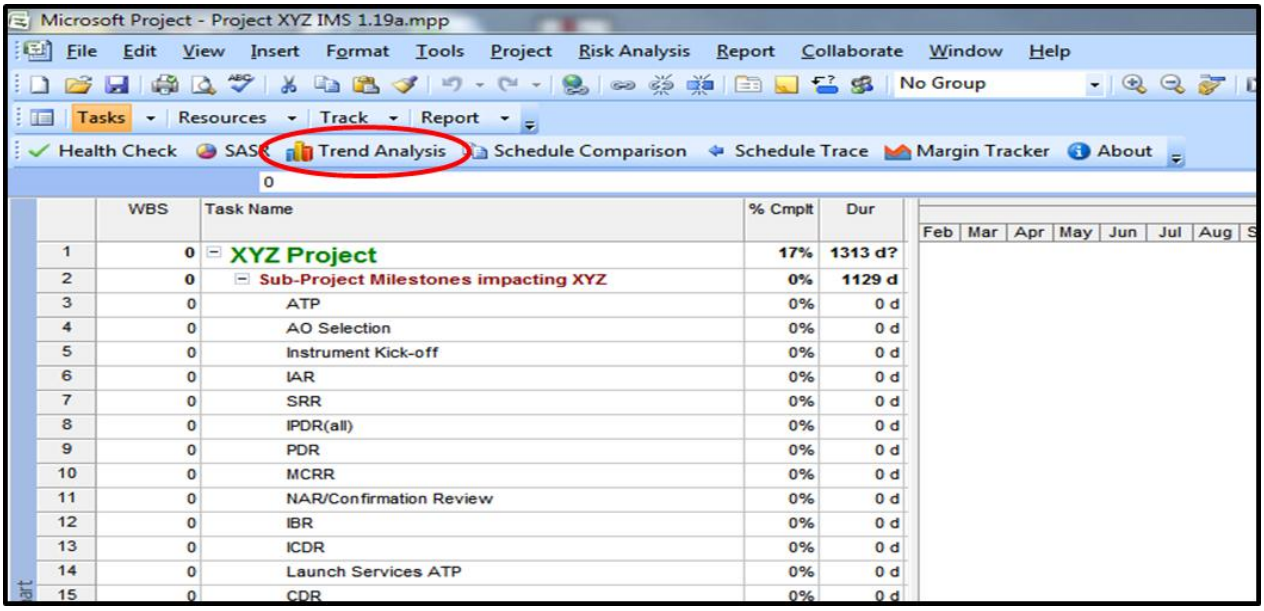


Figure 5-1: Performance and Work-Off Trend Tool Bar Selection

Step 1 of the Trend Analysis wizard dialogue box allows the user to set the schedule "Status Date" on which the resulting performance and work-off trend data will be based. *Note: The schedule should reflect a Status Date that represents the most current date for which the schedule has been progressed through.* If the date is missing or obviously incorrect it should be added or changed. Also on this step of the wizard the user can select the baseline to use in plotting the Scheduled Baseline Tasks. The Baseline is the default but Baseline 1-10 can also be selected. See Figure 5-2.

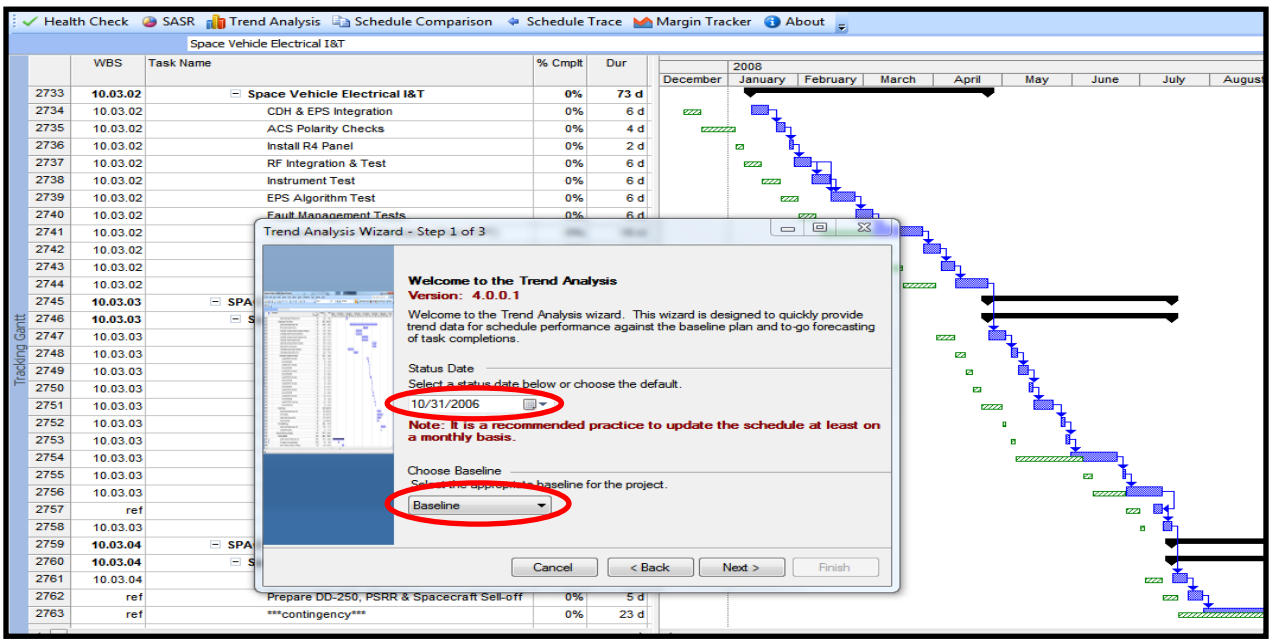


Figure 5-2: Performance and Work-Off Trend Wizard Step 1

Step 2 of the wizard dialogue box provides a browse function to allow the user to select the location where they wish the performance and work-off output file to be stored. See Figure 5-3.

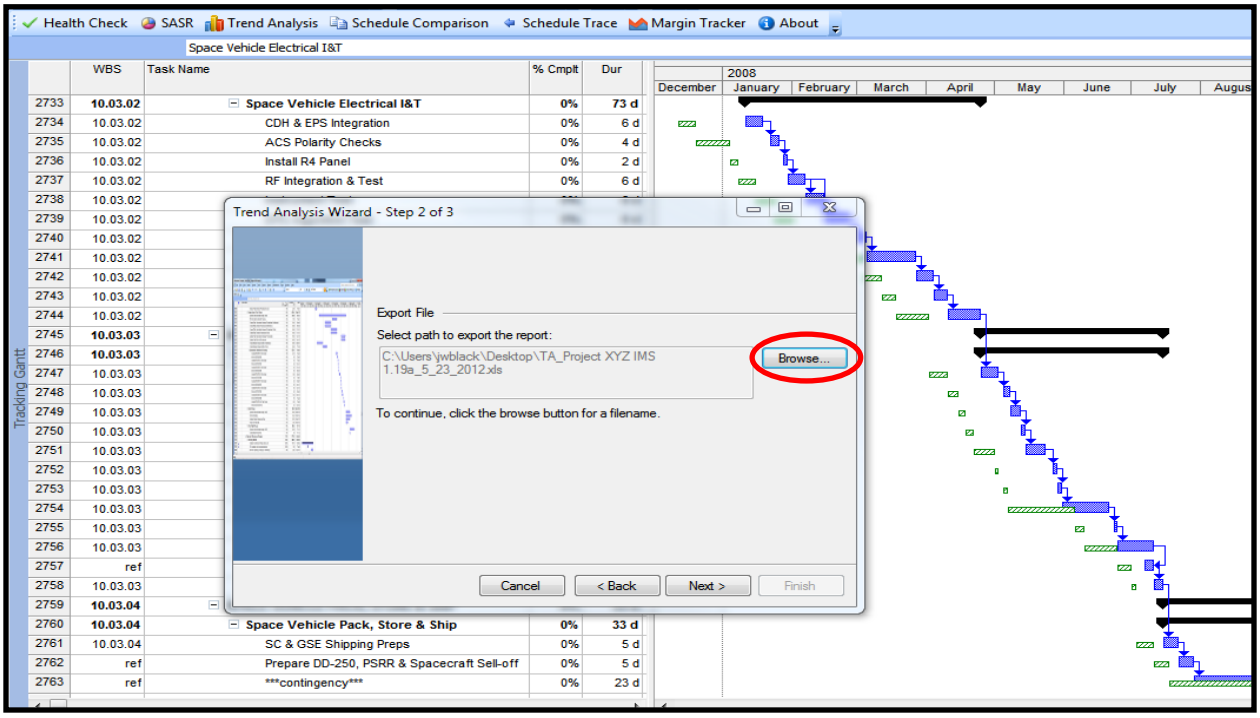


Figure 5-3: Performance and Work-Off Trend Wizard Wizard Step 2

Step 3 of the Health Check Wizard produces a final dialogue box that allows the user to complete the final step in initiating the Performance and Work-Off Trend Analysis. This dialogue box informs the user that Microsoft Excel 2000 or later must be installed. The user is also informed that the processing time for transferring the data results into the Excel template may take several minutes if the schedule file size is very large.

Click finish to complete the Performance and Work-Off Trend processing and compilation of the assessment data. The STAT tool will then process the schedule data to produce a histogram profile within excels that shows how the scheduled tasks and milestones stack up by month for the duration of the project. See Figure 5-4.

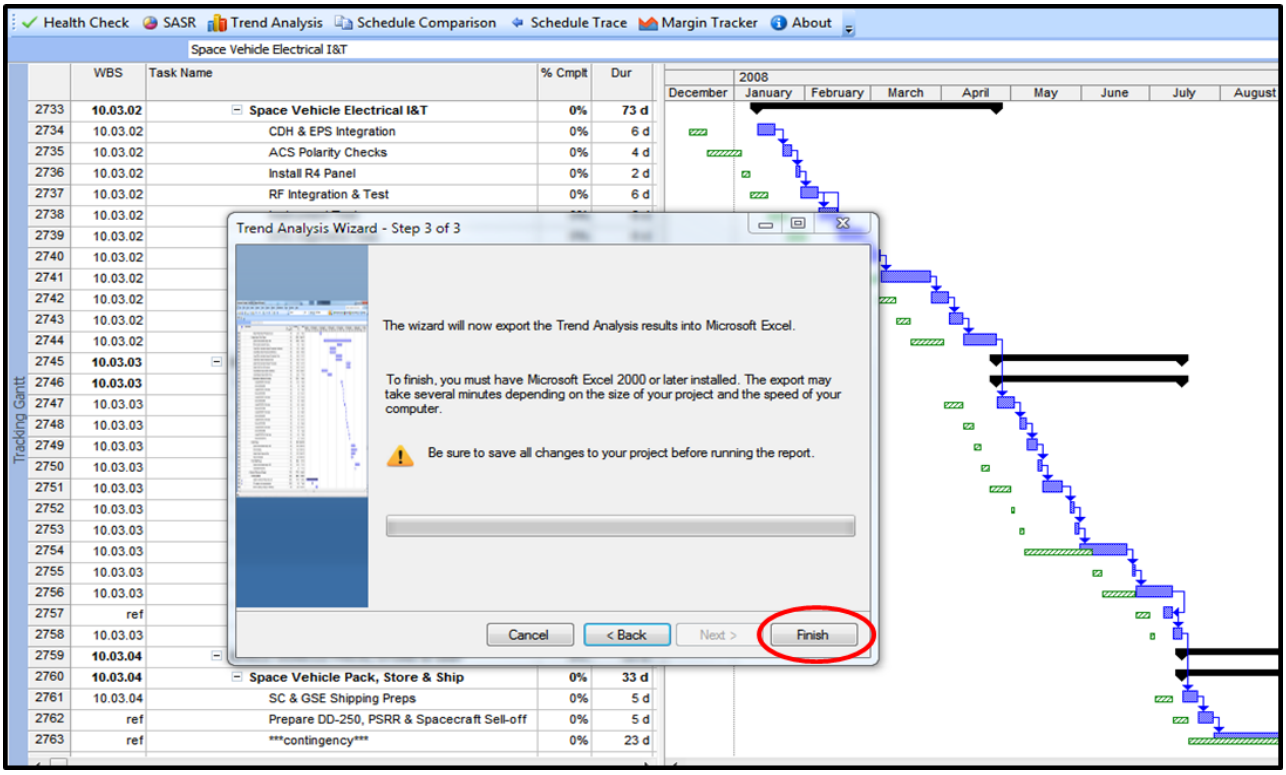


Figure 5-4: Performance and Work-Off Trend Wizard Step 3

Understanding Schedule Performance and Work-Off Trend Results

The performance and work-off trend data provides the user with objective information relative to past schedule achievements and to-go schedule forecasts while at the same time comparing to the IMS baseline plan. The illustration below (Figure 5-5) provides visibility for the overall duration of the project to assist the scheduler and project team in determining if the planned schedule execution profile looks reasonable and achievable. Assessing the peaks and valleys of the profile can sometimes be helpful when comparing to a project's labor profile to determine if there is a correlation or consistency in time phasing that exists between the number of tasks scheduled to complete each month and the amount of labor required to complete those tasks. This metric can also identify and highlight where unrealistic bow-waves of scheduled work exists. Where bow-

waves do exist, it is recommended that appropriate project team members review and revise the schedule as-needed to ensure data credibility for management decision making. Actual completion performance is also visible in this graphic to help in establishing performance trends that assist in evaluating chances for future schedule success.

Other helpful information displayed on the performance and work-off trend are tasks and milestones that have been scheduled to be worked, but are not progressed as time passes. The result of this practice is that incomplete schedule tasks are continued to be reflected to the left of time-now, or in past history. It should be noted that this practice is not satisfactory for sound schedule management. In order to maintain schedule accuracy and critical path credibility, it is crucial that all tasks/milestones that were previously scheduled to have been started or completed prior to time-now, be assigned with new forecast start/completion dates in the future if previous scheduled dates were not achieved. Tasks with inaccurate status, as described above, will hinder meaningful and effective schedule analysis.

The Schedule Performance & Work-Off Trend report also provides a zoom function (see Figure 5-6). This feature allows the user to select a more specific span of time to be reflected in the graphic which provides improved clarity in the data being reported. The function is activated by selecting the start date and end date of the span you are interested in and then click the zoom button.

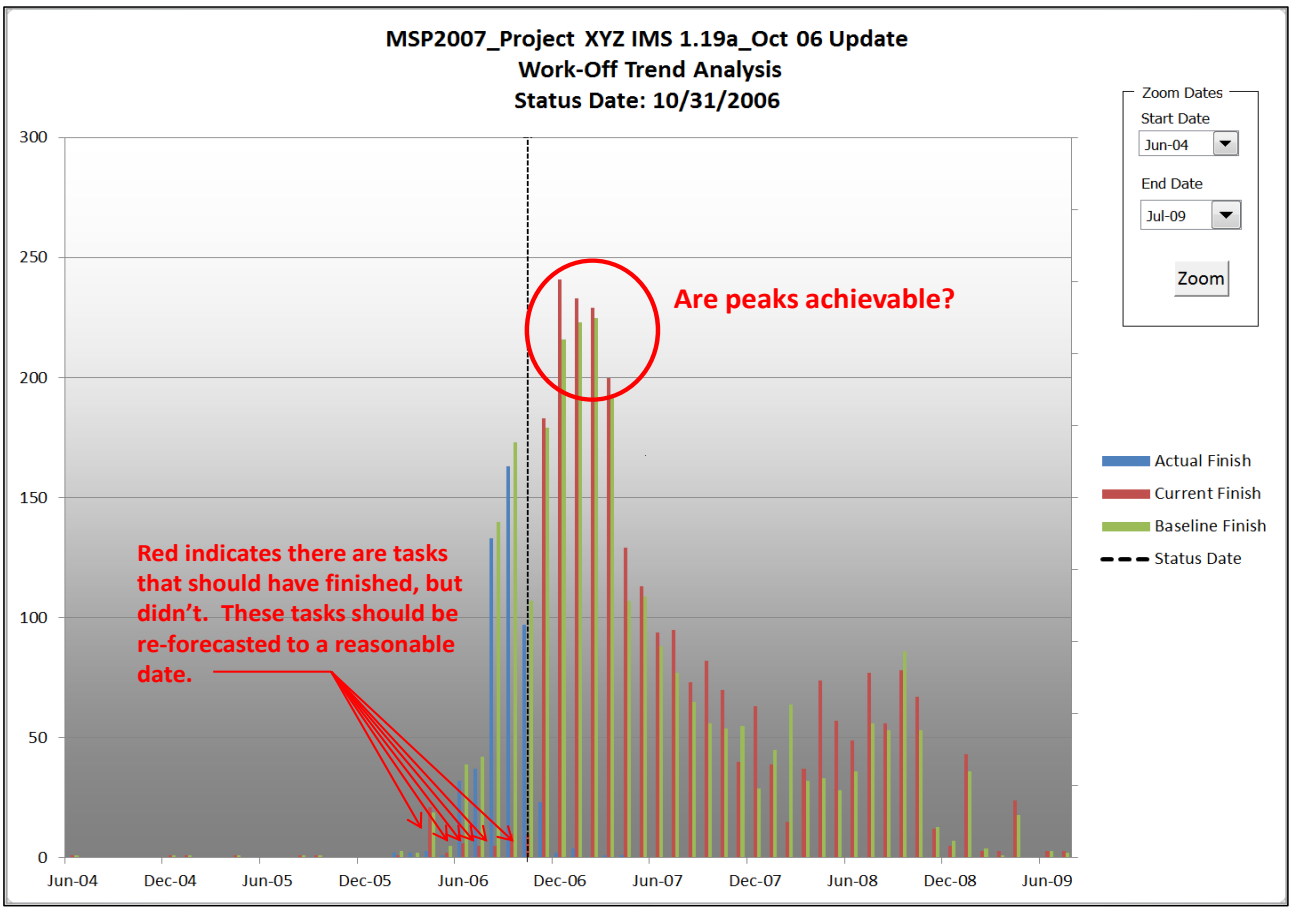


Figure 5-5: Schedule Performance & Work-Off Trend Illustration

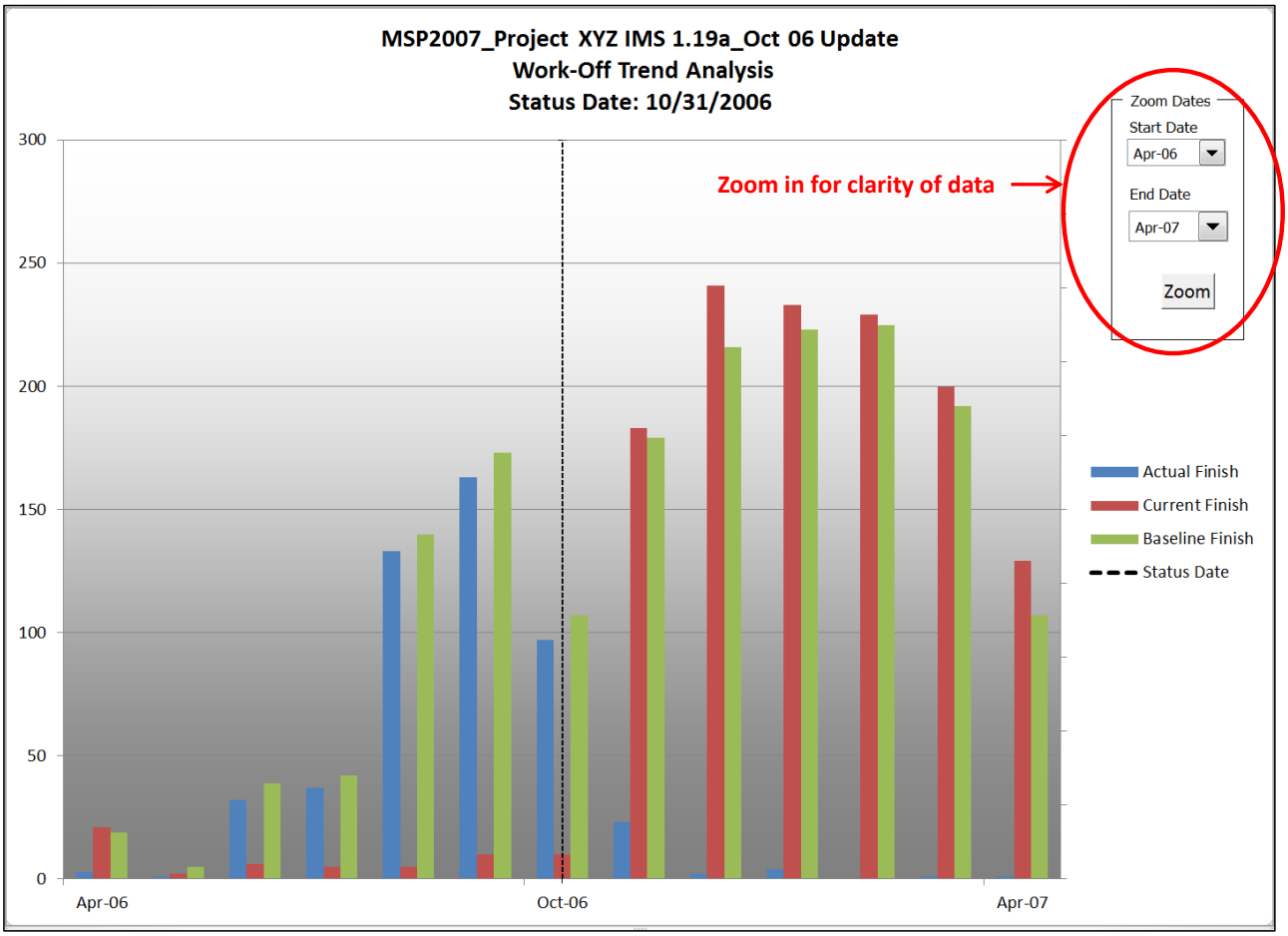


Figure 5-6: Performance & Work-Off Trend Zoom Illustration

Section 6: Schedule Comparison

Initiating Schedule Comparison :

The purpose of the Schedule Compare function is to provide the user with a very quick assessment of important changes that may have occurred between two versions of a schedule. Many times the amount of data content contained within a schedule is so robust that it is impossible to know what all has changed from one update to the next. This module is designed to identify the key changes that have been made and to provide a listing of those details for the planner/scheduler to use in analyzing the impacts that result from those changes.

The Schedule Comparison module compares two schedule files and identifies changes that have been made to the following key schedule details:

1. New Tasks
2. Deleted Tasks
3. Duration Changes
4. Constraint Changes
5. Constraint Date Changes
6. Task Name Changes
7. Resource Name Changes
8. Predecessor Changes
9. Successor Changes
10. Baseline Start Changes
11. Baseline Finish Changes

To initiate this assessment function, select the Schedule Comparison icon from the MS Project toolbar (see Figure 6-1). This icon initiates a three step wizard that allows the user to make the needed parameter selections which leads to the output report to be used for schedule analysis. The wizard steps are illustrated and explained below.

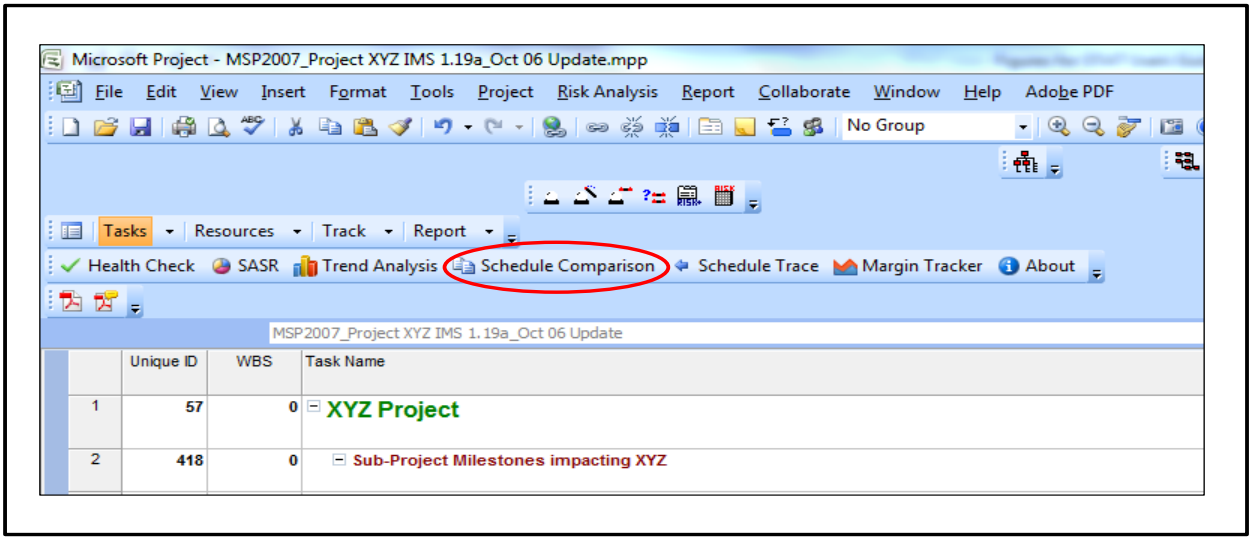


Figure 6-1: Schedule Comparison Icon Illustration

Step 1 produces a wizard dialogue box that allows the user to set the schedule "Status Date" on which the schedule comparison data will be based. After selecting the desired status date click "Next" (see Figure 6-2). *Note: The schedule should have a Status Date that represents the "as-of" date which the schedule was updated through*. If that date is missing or obviously incorrect it should be added/changed. Also, the user can select the desired baseline version to use in comparing the correct schedule baseline information. The version denoted as "Baseline" is the default, if no other version is selected, but Baseline versions 1-10 can also be selected. *Always make sure that the same baseline version is selected in the two schedule files being compared*. This will ensure consistent baseline data is being compared and prevent erroneous differences being reflected in the output report

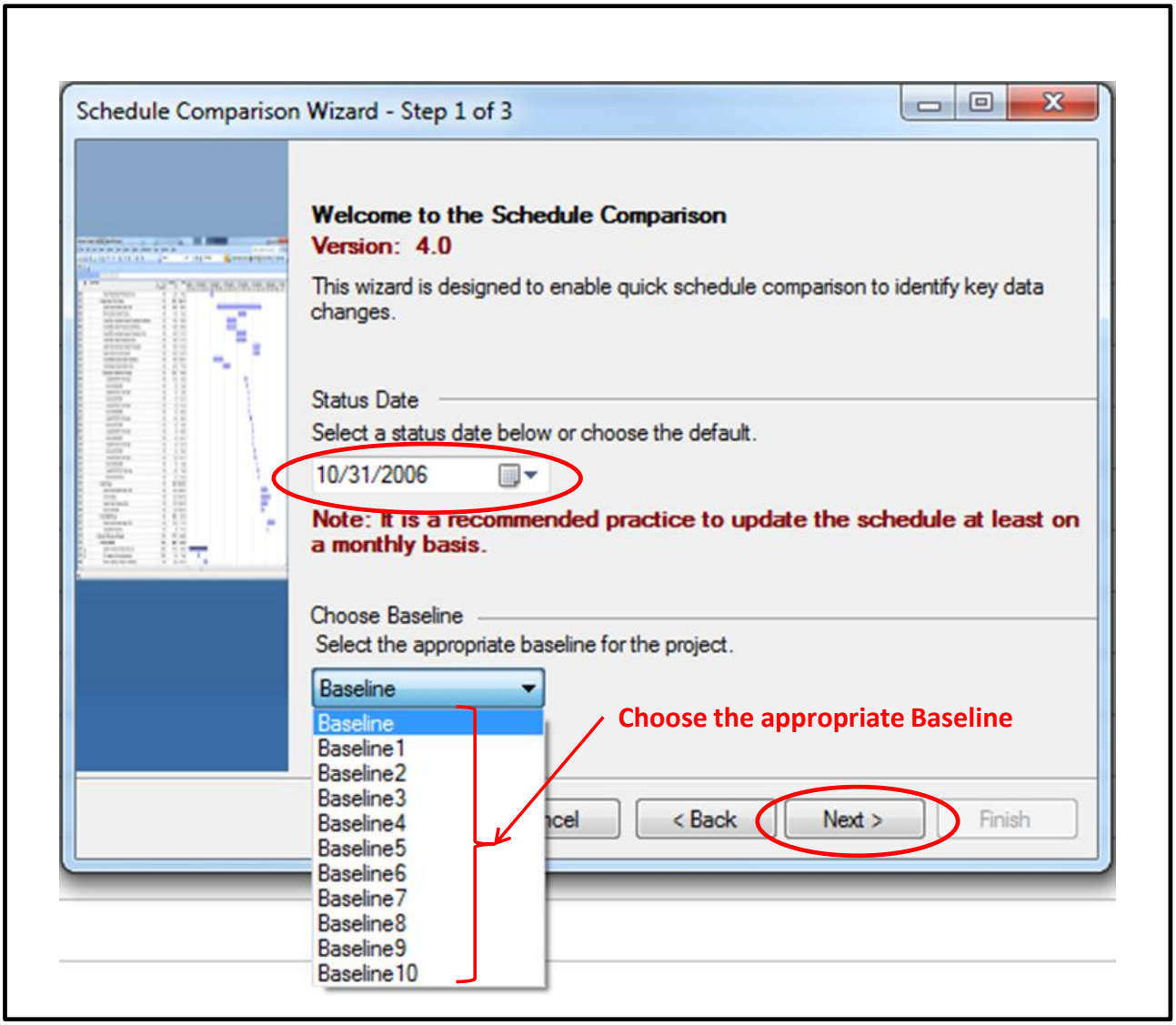


Figure 6-2: Schedule Comparison Wizard Step 1

Step 2 of the Schedule Comparison Wizard produces a dialogue box (see figure 6-3) that provides the user with selections needed for creating and storing an initial template report for a prior

schedule that will be used for schedule comparisons to a later iteration or update of the schedule file. When the comparison option is selected, the user must then browse and select the previously stored template comparison report, to be used in comparing to data contained in the current schedule file. *Note: when selecting the previous schedule comparison template report, make sure that this file is **not** already open.*

The step 2 dialogue box also provides a browse function to allow the user to select the location where they wish to store the final resulting comparison output report.

After selecting the desired step 2 choices, click next.

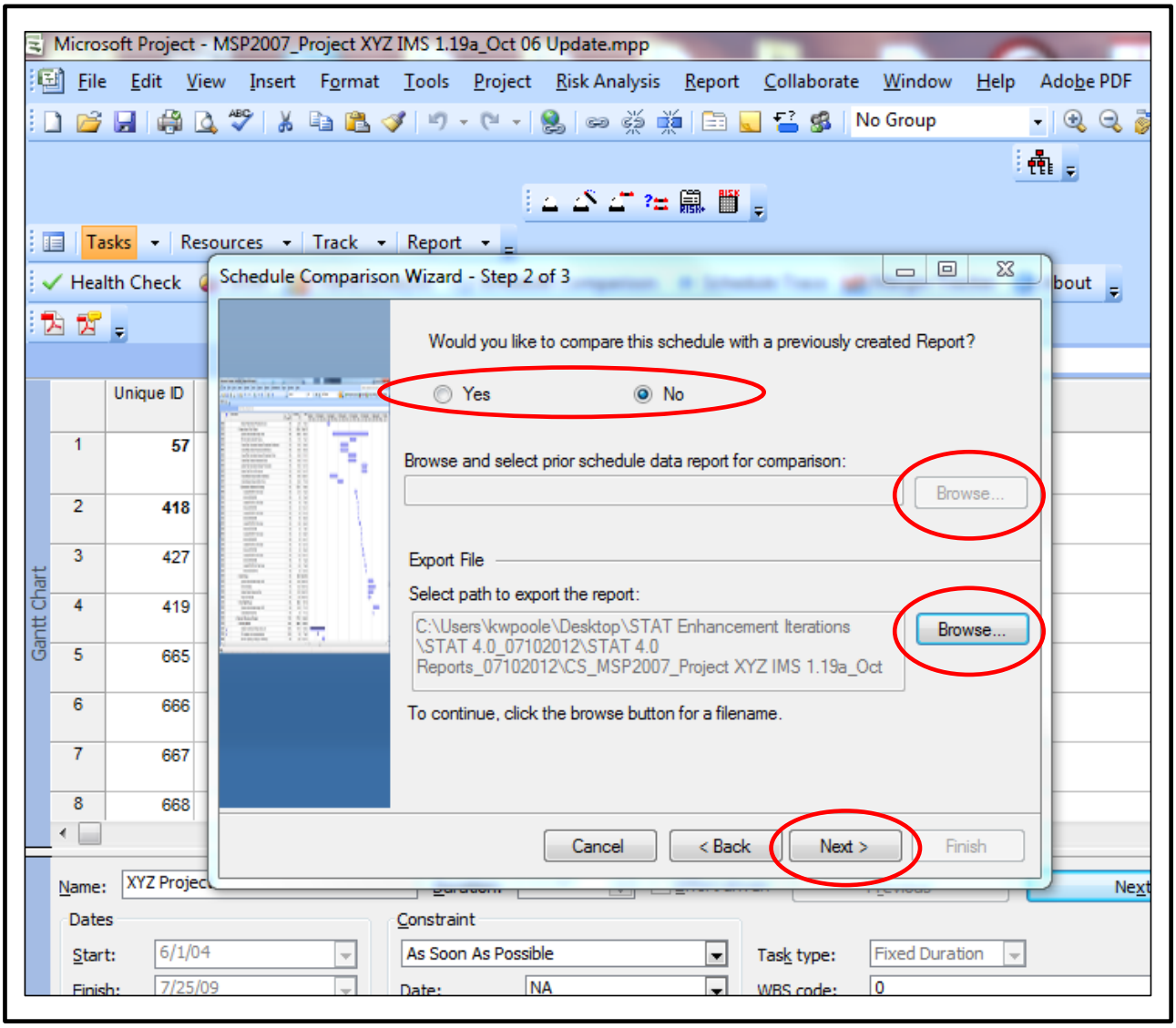


Figure 6-3: Schedule Comparison Wizard Step 2

Step 3 of the Schedule Comparison Wizard produces a final dialogue box (See Figure 6-4) that allows the user to complete the final step in initiating the desired comparison output report. This dialogue box informs the user that Microsoft Excel 2000 or later must be installed. The user is also

informed that the processing time for transferring the data results into the Excel template may take several minutes if the schedule file size is very large.

Click finish to complete the Schedule Comparison processing and compilation of the assessment data. The STAT tool will then process the schedule data to produce the comparison results within excel that shows the specific key schedule details that have changed from a previous schedule iteration and the current update.

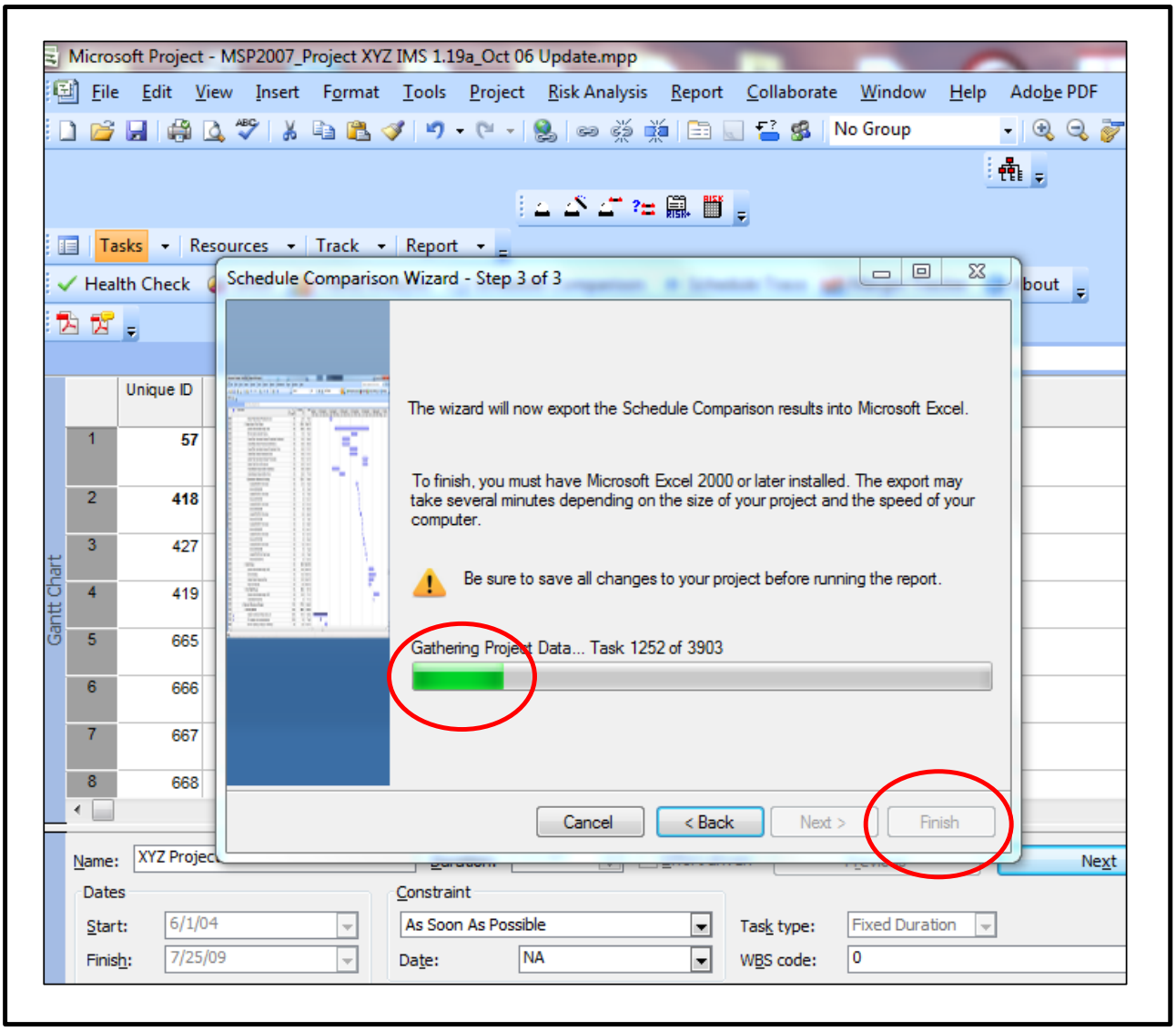


Figure 6-4: Schedule Comparison Wizard Step 3

Understanding Schedule Comparison Results

In the normal routine rhythm of project schedule updates and maintenance, there are potentially many changes made by many different people that can significantly impact the validity of the resulting data reflected in the project schedule. During this process, there is also a high potential for

inadvertent errors and/or incorrect changes that get incorporated that may also impact the schedule's validity. Due to these dynamics of schedule management, the schedule owner must always have a clear understanding of what has changed in his/her project schedule and why so that proper and accurate analysis can be done to ensure the credibility of schedule data produced and provided to the project management team.

A Schedule Comparison output report is shown below (see Figure 6-5) which identifies the two schedules being compared, and also the quantities of changes found for the eleven key types of schedules changes noted above. Additionally, the report provides a listing of all the specific task/milestone details that have been changed so that the user can more easily find the cause of unexpected schedule results or issues that must be addressed and corrected.

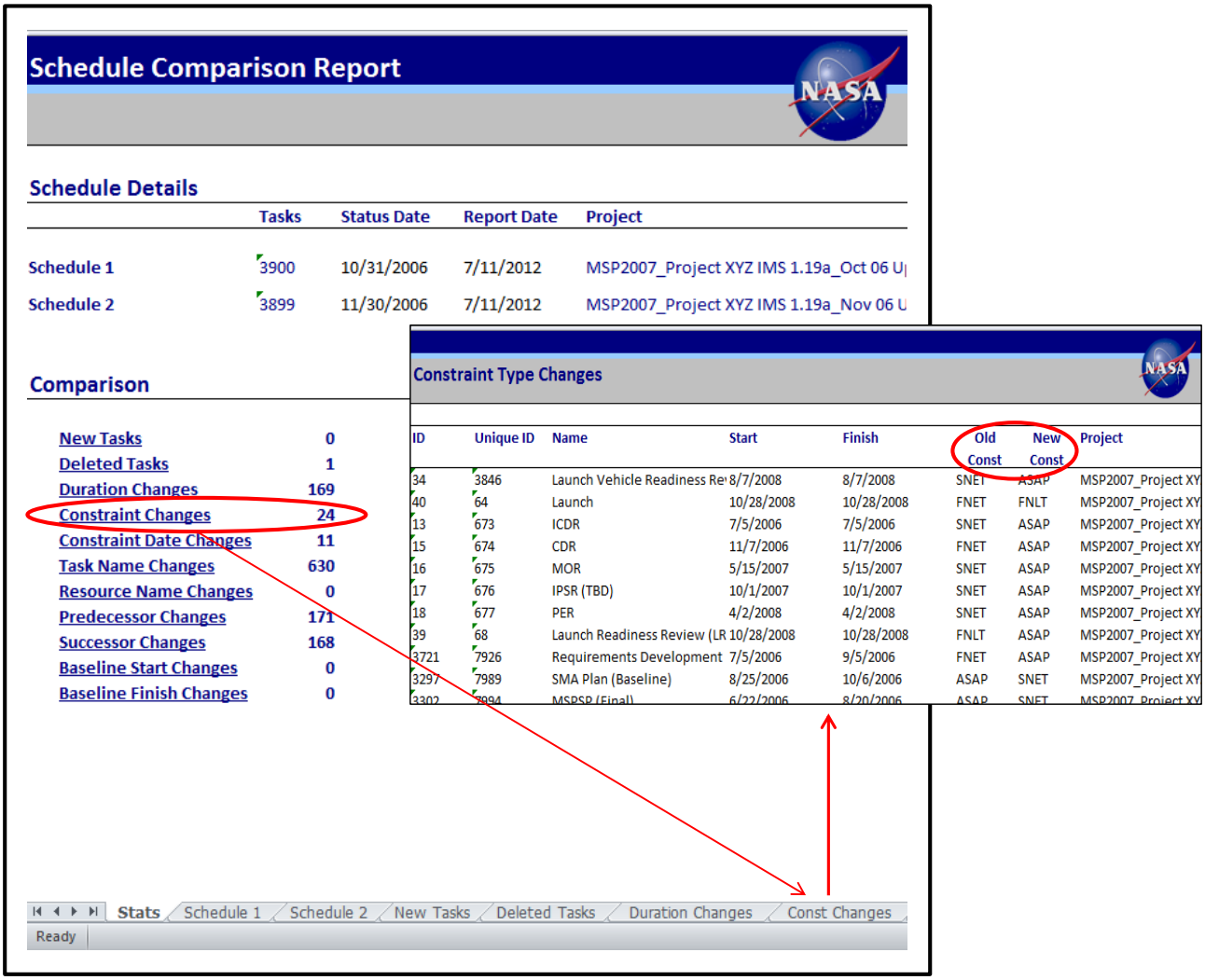


Figure 6-5: Schedule Comparison Output Report Illustration

Section 7: Schedule Trace

Initiating Schedule Trace

The purpose of the Schedule Trace Program is to provide the user with a quick look into which activities are required to complete a selected task, based on the network logic. When all the tasks required to complete the end points are determined any remaining tasks are identified that are not linked to any of the selected tasks. A summary page is produced in excel and a tab with the list of tasks for each end point is provided. Also a tab with the tasks that are not linked to any selected end point is included. This data can also be used to determine if the schedule logic is sound enough to perform a Schedule Risk Assessment or Joint Confidence Level analysis.

To initiate this assessment function, select the Schedule Trace icon from the MS Project toolbar (see Figure 7-1). The icon initiates the Schedule Trace Wizard.

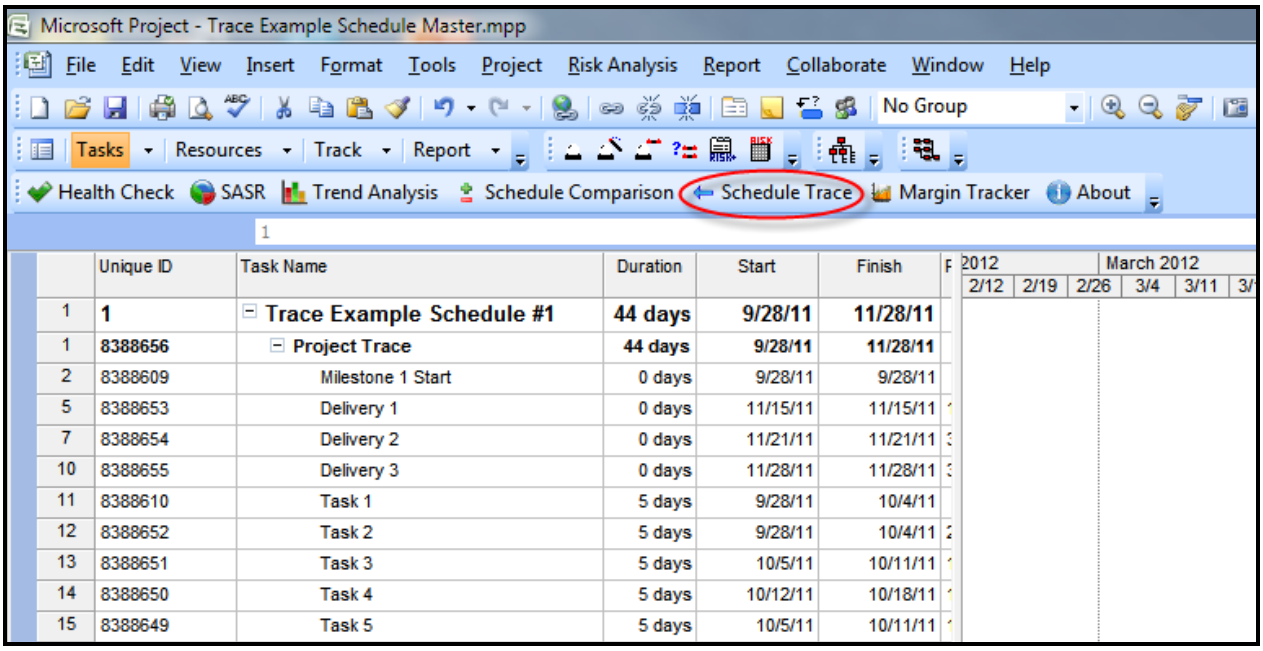


Figure 7-1: Schedule Trace Tool Bar Selection

Step 1 of the Schedule Trace wizard dialogue box (Figure 7-2) allows the user to set the schedule "Status Date" on which the resulting schedule trace data will be based. *Note: The schedule should reflect a Status Date that represents the most current date for which the schedule has been progressed through.* If the date is missing or obviously incorrect it should be added or changed. Click the next box to proceed.

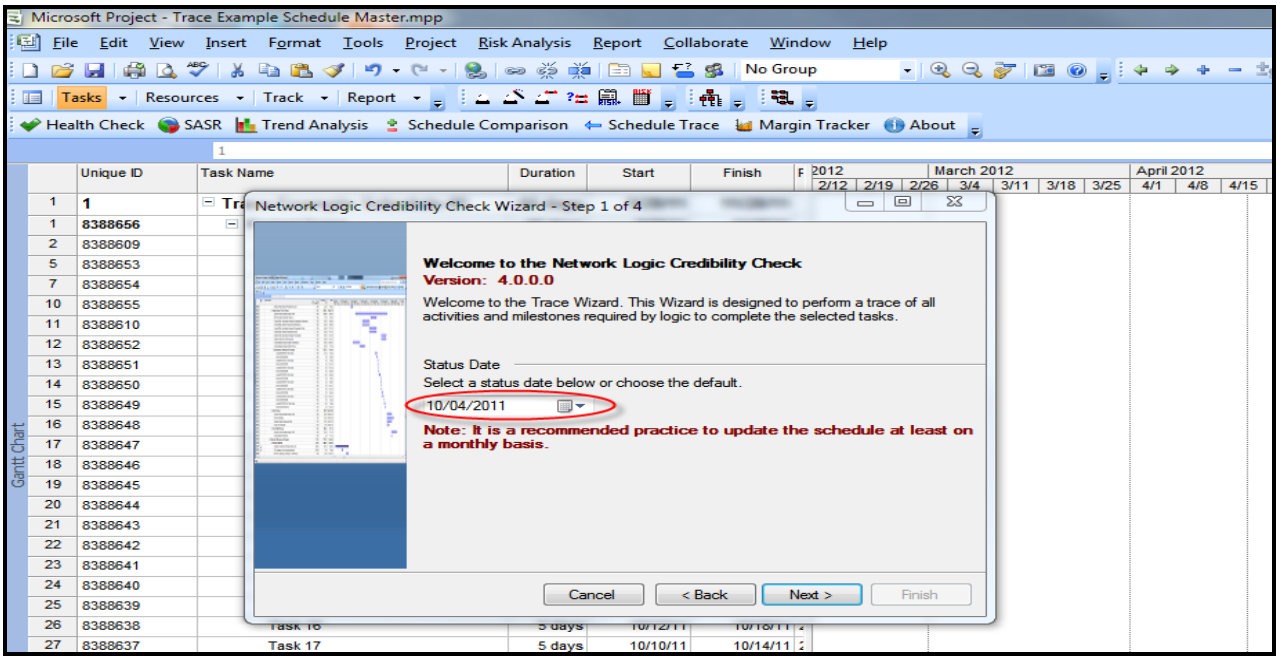


Figure 7-2: Schedule Trace Wizard Step 1

Step 2 of the Schedule Trace wizard dialogue box (Figure 7-3) allows the user to select the end points to be traced back from. Up to 10 activities can be selected by ID or Unique ID by clicking on the radial buttons Unique ID or ID. If the ID is used with a Master/Subproject schedule you may get multiple activates added to the list. If this occurs select the unwanted activities and click the Remove box. The box for "Exclude tasks from earlier listed traces in trace output" is checked by default but can be changed if you would like to see all the tasks that are included in previous traces listed on the trace tabs. Click the next box to proceed.

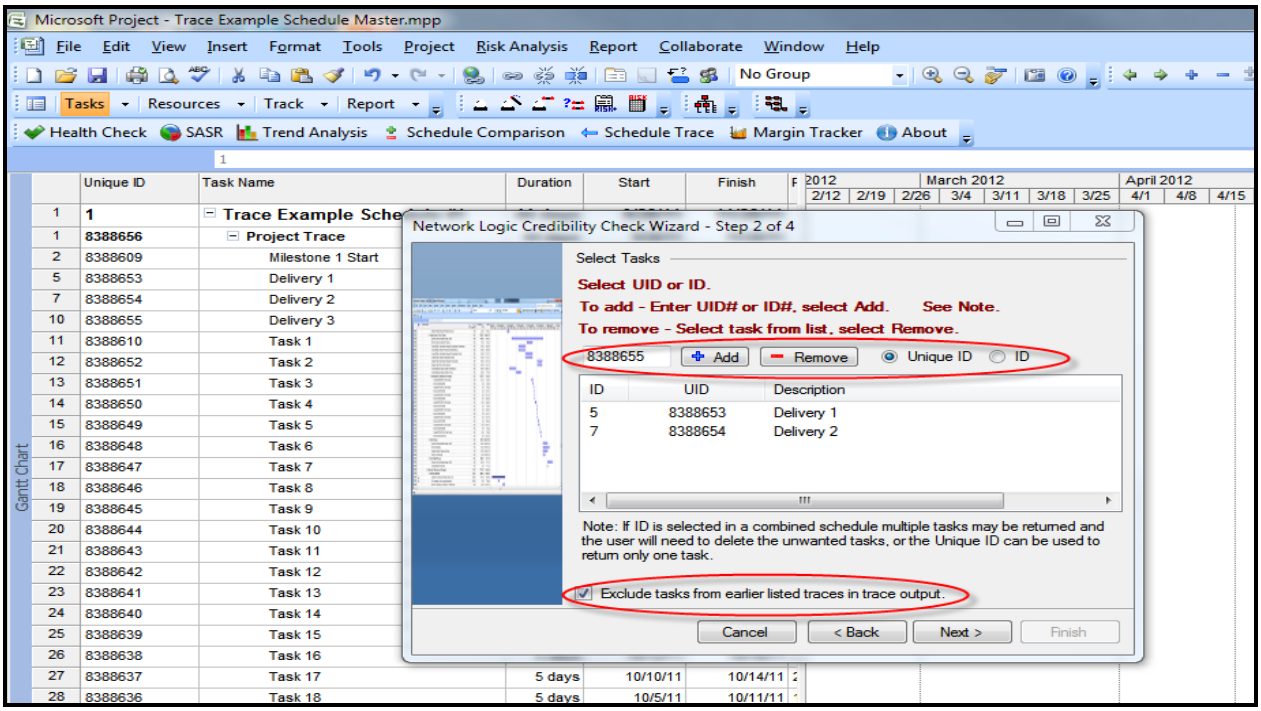


Figure 7-3: Schedule Trace Wizard Step 2

Step 3 of the wizard dialogue box (Figure 7-4) provides a browse function to allow the user to select the location where they wish the Schedule Trace output file to be stored. Click the next box to proceed.

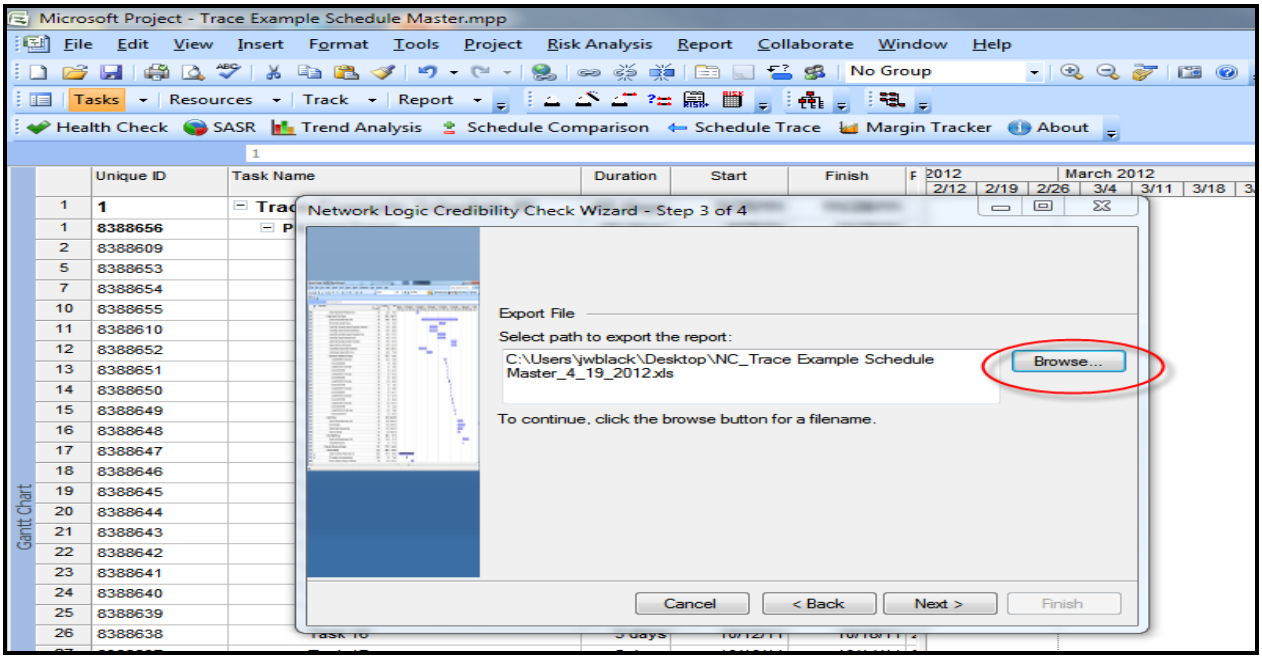


Figure 7-4: Schedule Trace Wizard Step 3

Step 4 of the Schedule Trace wizard dialogue box (Figure 7-5) provides the option to back up and make changes or click the finish box to process the schedule data to produce the output in an excel file.

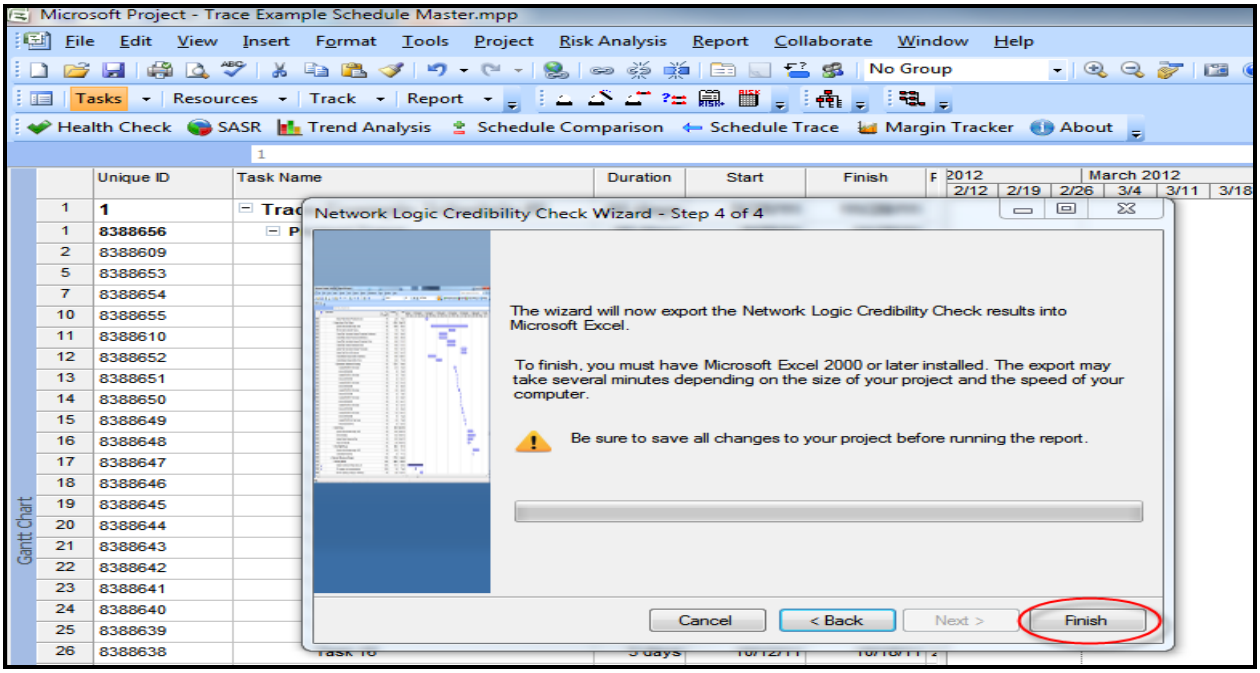
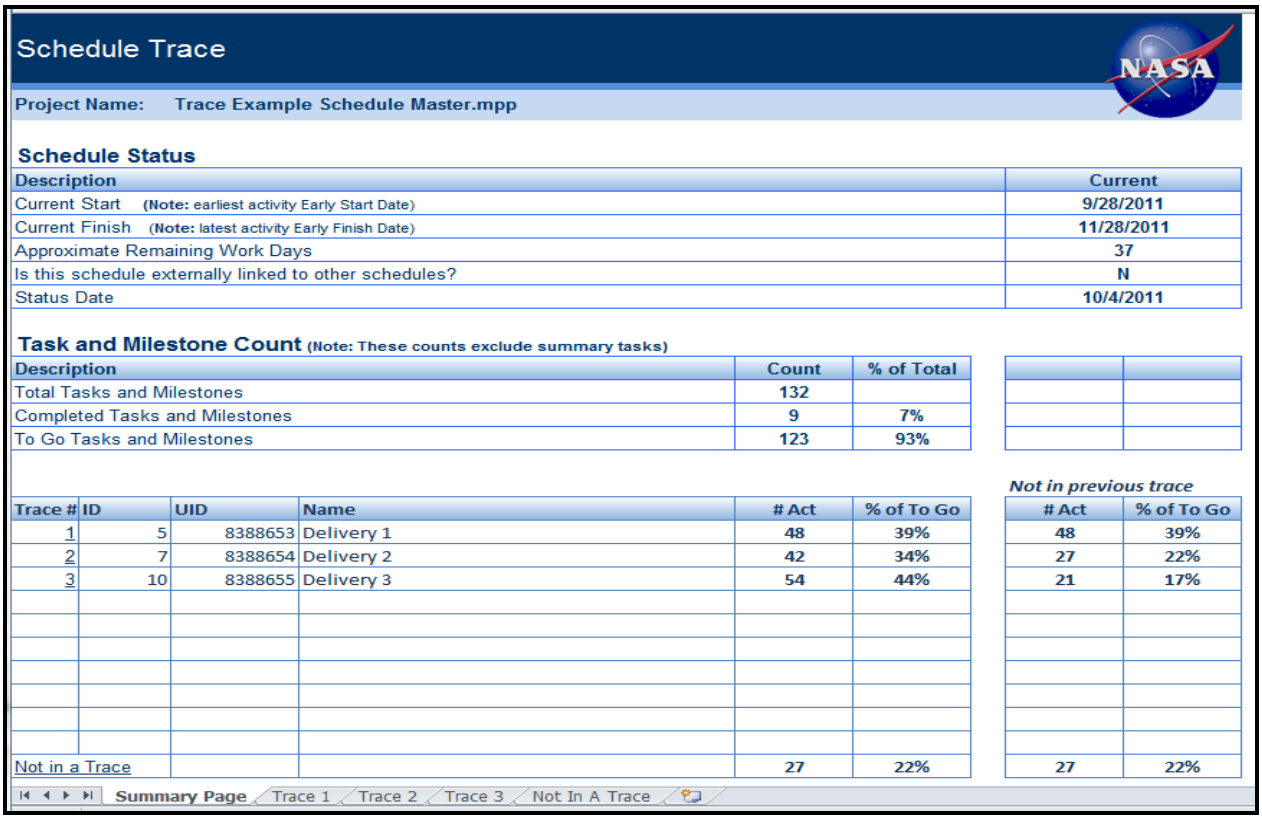


Figure 7-5: Schedule Trace Wizard Step 4

Understanding Schedule Trace Results

The schedule trace data provides the user with information on which activities are logically linked to the selected end activities, and which are not. This information can be useful in judging the credibility of the logic network. For example, if a subsystem that is required for assembly in the final delivered product is not logically linked to the final delivery then there is probably a problem with the logic. Also, in situations where the IMS contains multiple deliveries of common hardware, there should typically be a larger percentage of tasks needed (expected) for the first delivery due to the design effort only being required one time. This type of analysis of schedule network logic is especially helpful before a Schedule Risk Assessment or Joint Confidence Level analysis is performed. The following is an example of the schedule trace output.



Schedule Trace

Project Name: Trace Example Schedule Master.mpp

Schedule Status

Description	Current
Current Start (Note: earliest activity Early Start Date)	9/28/2011
Current Finish (Note: latest activity Early Finish Date)	11/28/2011
Approximate Remaining Work Days	37
Is this schedule externally linked to other schedules?	N
Status Date	10/4/2011

Task and Milestone Count (Note: These counts exclude summary tasks)

Description	Count	% of Total
Total Tasks and Milestones	132	
Completed Tasks and Milestones	9	7%
To Go Tasks and Milestones	123	93%

Trace #	ID	UID	Name	# Act	% of To Go	*Not in previous trace* # Act	*Not in previous trace* % of To Go
1	5	8388653	Delivery 1	48	39%	48	39%
2	7	8388654	Delivery 2	42	34%	27	22%
3	10	8388655	Delivery 3	54	44%	21	17%
Not in a Trace				27	22%	27	22%

Summary Page | Trace 1 | Trace 2 | Trace 3 | Not In A Trace

Figure 7-6: Schedule Trace Summary Page Output Example

The first two sections Schedule Status and Task and Milestone Count are the same as it the Health Check output and gives basic information about the schedule (See Figure 7-6). The To-Go Tasks and Milestones count is used to calculate the percentages in the trace results. The bottom section gives the data for the traces performed in this run. After entering the ID or UID for each endpoint to be traced, the STAT tool will provide a trace identifying number and the task name for the endpoints selected. The next columns show the total quantity of to-go tasks and milestones that are linked to each end activity selected and also what percentage of the to-go tasks that equates to. The last line of the report shows the count of the tasks and milestones that are not in one of the listed traces. The last two columns of data gives the count of tasks that are in the trace and are not in a previous trace along with what percent that is of the to go tasks and milestones. Along the bottom of the report there will be tabs that contain a listing of the tasks that make up the counts in each trace and the ones that are not in any trace. Figure 7-7 is an example of the trace tab output.

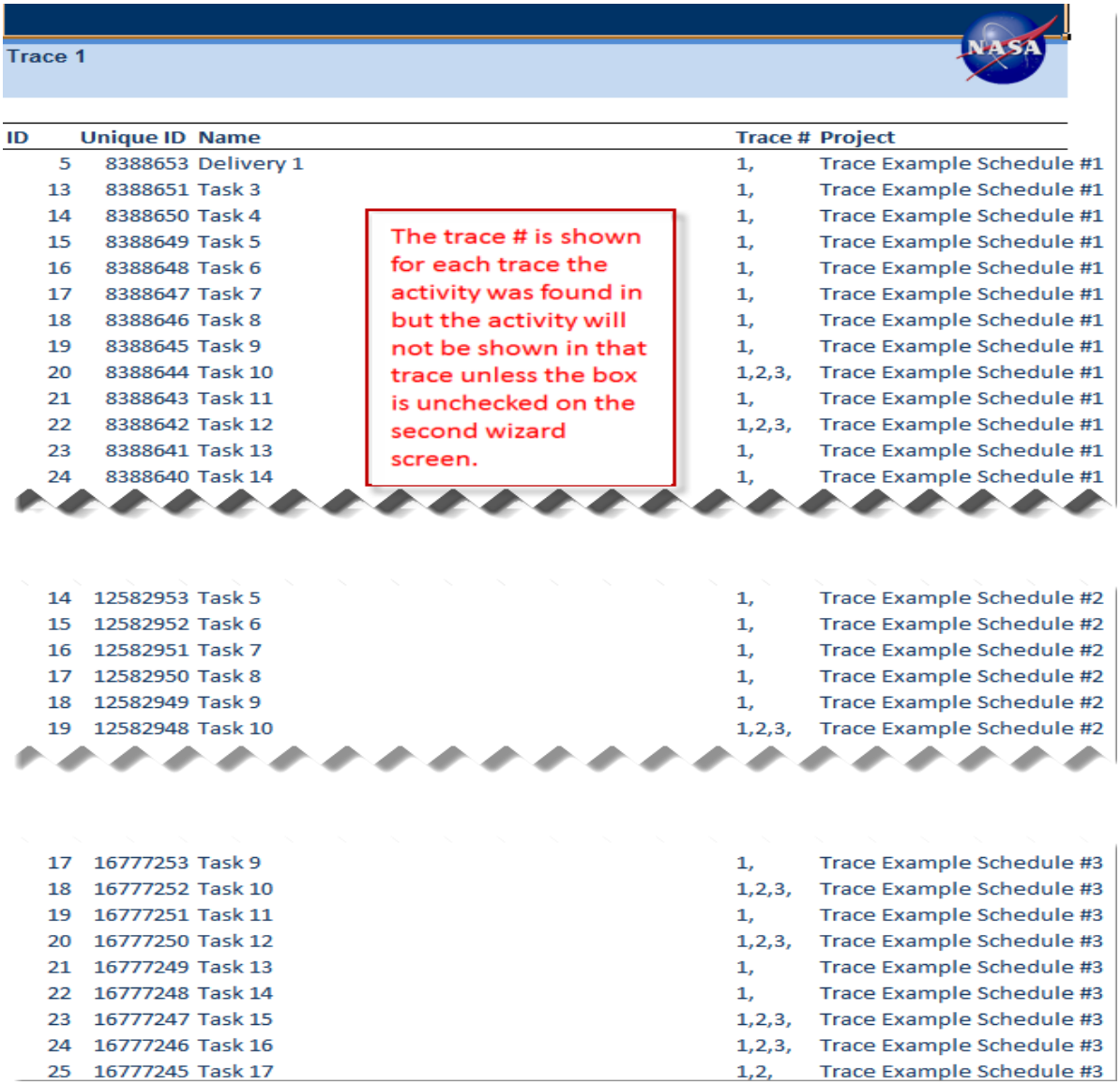


Figure 7-7: Schedule Trace Output Trace Tab Example

Section 8: Margin Tracker

Initiating Margin Tracker:

The purpose of the Margin Tracker module is to provide the user a very quick assessment of how much schedule margin exists within the project IMS. It is a recommended practice that schedule margin, based on risks, duration uncertainty, and historical norms, be clearly identifiable when included within the IMS. Schedule margin may also be referred to as "schedule reserve" or "schedule contingency." Schedule margin is typically owned and controlled by the Program/Project Manager. For clarification, it should be understood that schedule float (slack), which is a calculated value based on network logic, should not be considered as schedule margin. Schedule margin is a separately planned quantity of time above the planned duration estimate and reflected in the IMS. Schedule margin is used to cover uncertainty for situations that are difficult to predict, and is intended to reduce the impact of missing the overall planned schedule timeframe. The Margin Tracker will use the monthly margin task ID/UID inputs by the user and calculate a sum total of those durations to reflect a tally of the remaining schedule margin that exists within the project IMS. If additional days of schedule margin should also be included that are not represented by specific margin tasks then those values may also be added into the overall remaining total.

To initiate this assessment function, select the Margin Tracker icon from the MS Project toolbar (see Figure 8-1). This icon will initiate the Margin Tracker Wizard.

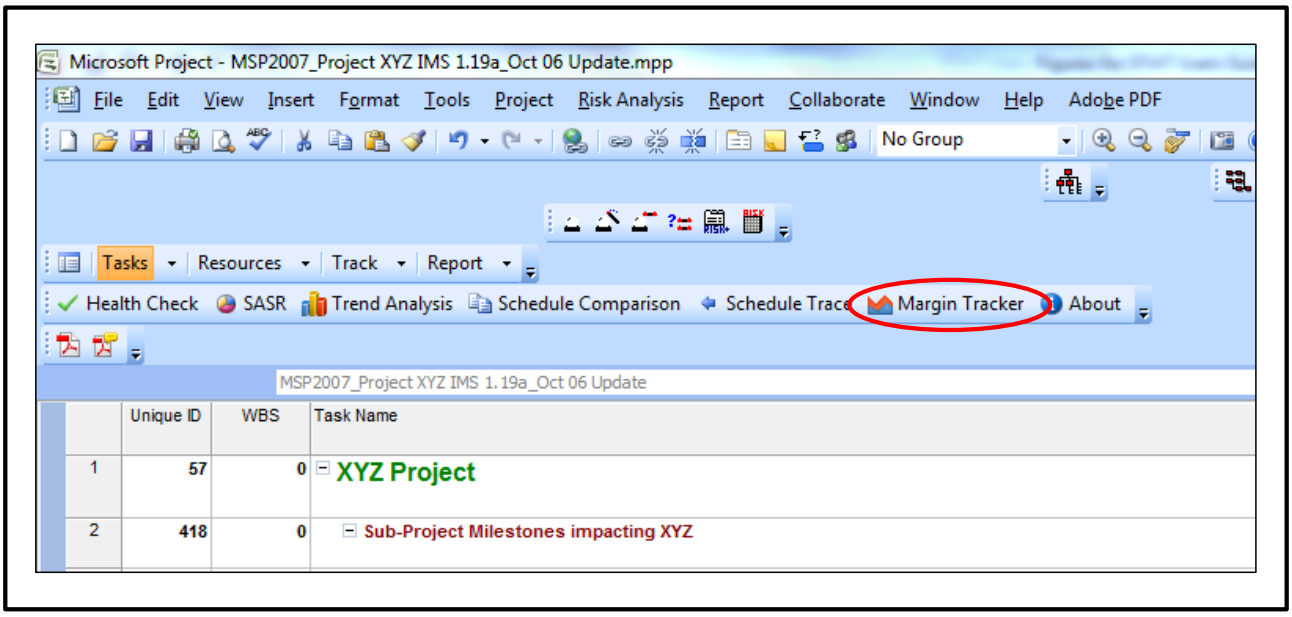


Figure 8-1: Margin Tracker Icon Toolbar Selection

Step 1 produces a wizard dialogue box (see Figure 8-2) that allows the user to set the schedule "Status Date" on which the resulting Margin Tracker results will be based. After selecting the desired status date click "Next" (see Figure 8-2). *Note: The schedule should have a Status Date that represents the "as-of" date which the schedule was updated through*. If the date is missing or

obviously incorrect it should be added/changed. Also the user can select the desired baseline version to use in determining the correct schedule baseline information. The version denoted as "Baseline" is the default, if no other version is selected, however Baseline versions 1-10 can also be selected.

Select "Next" to proceed to step two of the wizard.

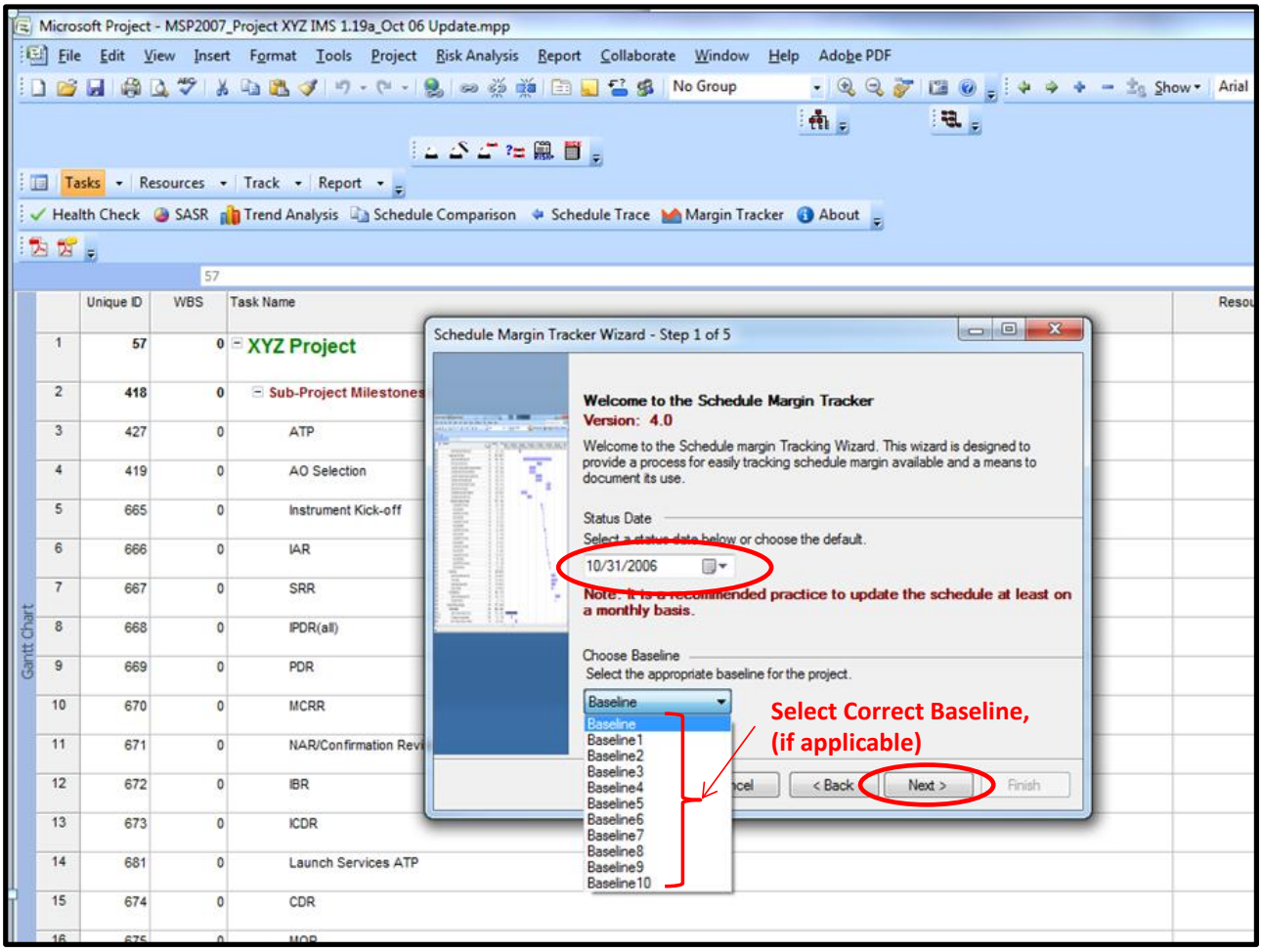


Figure 8-2: Margin Tracker Wizard Step 1

Step 2 produces a wizard dialogue box (see Figure 8-3) that is *only* needed if the user wants to enter manually known schedule margin contained in the current or a prior version of the project IMS, but was not reflected in a clearly identifiable schedule margin task. Simply select the appropriate month or months the known schedule margin existed and also enter the number of margin (reserve) days that are known to have existed during that month and then select "Add". The month and margin days will then be listed in the open pane below. Multiple months can be addressed, but must be selected one month at a time. If a mistake is made during the entry or a change is desired before proceeding to the next step then highlight in the listing the data to be changed and select "Remove". The correct information can then entered.

If all schedule margin is contained in clearly identifiable tasks within the IMS, then no manual margin entries are needed, and this step will not require any user input. *Note: There must be at least one identifiable margin task for which the ID/UID is selected in order for any manual margin entries to be accepted and shown in the output report.*

Select next and proceed to the next wizard step.

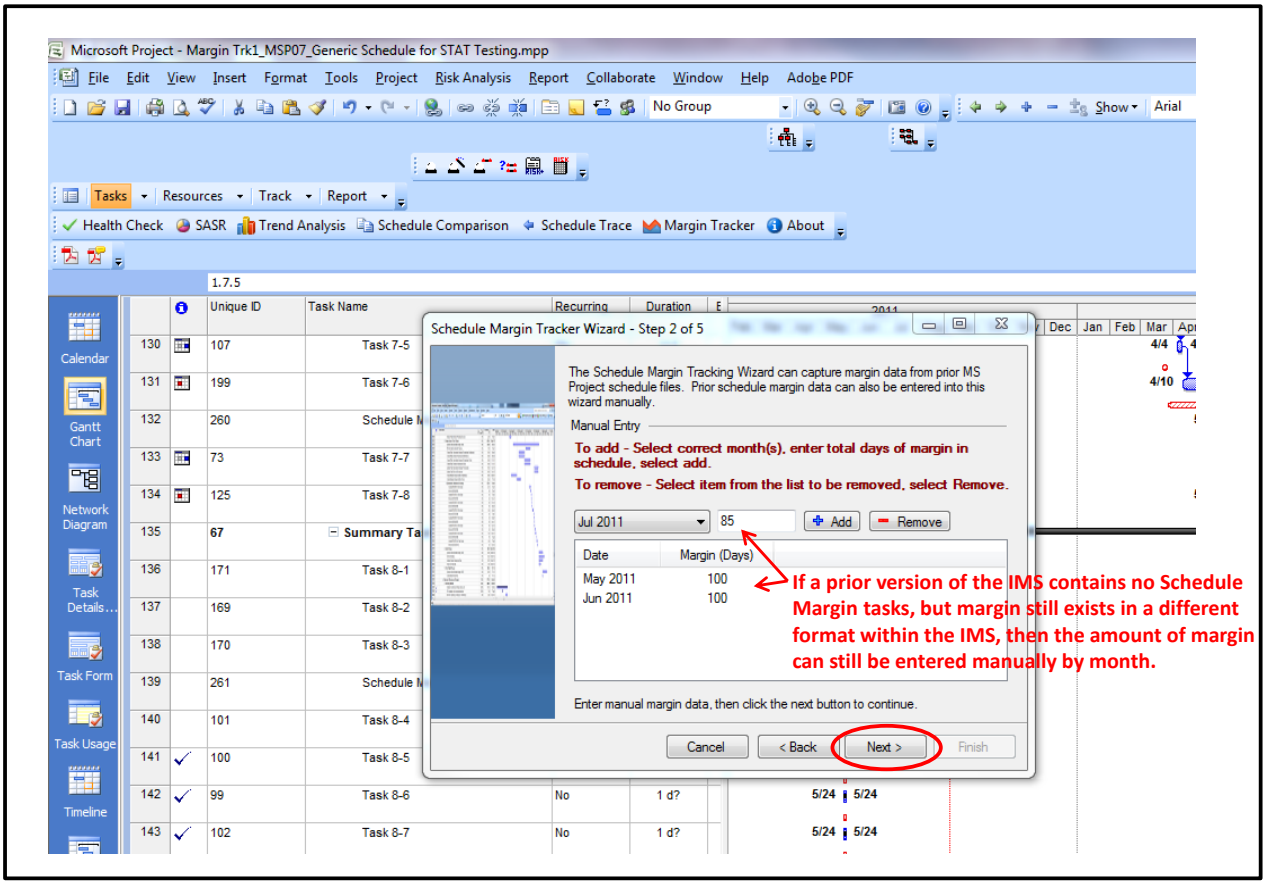


Figure 8-3: Margin Tracker Wizard Step 2

Step 3 produces a wizard dialogue box (see Figure 8-4) that allows the user to input the ID or UID numbers for clearly identifiable schedule margin tasks that are contained in the current version of the project IMS that is being assessed. First select ID or UID which is, of course, dependent upon the set of task identifiers the user will be entering. The user will then enter the specific task identifier and select "Add" after each entry. The ID# or UID# along with each task description will be listed in the open pane below. If a mistake is made during the entry or a change is desired before proceeding to the next step then highlight in the listing the data to be changed and select "Remove" The correct information can then be entered.

After all schedule margin (reserve) tasks are entered then select next and proceed to the next wizard step.

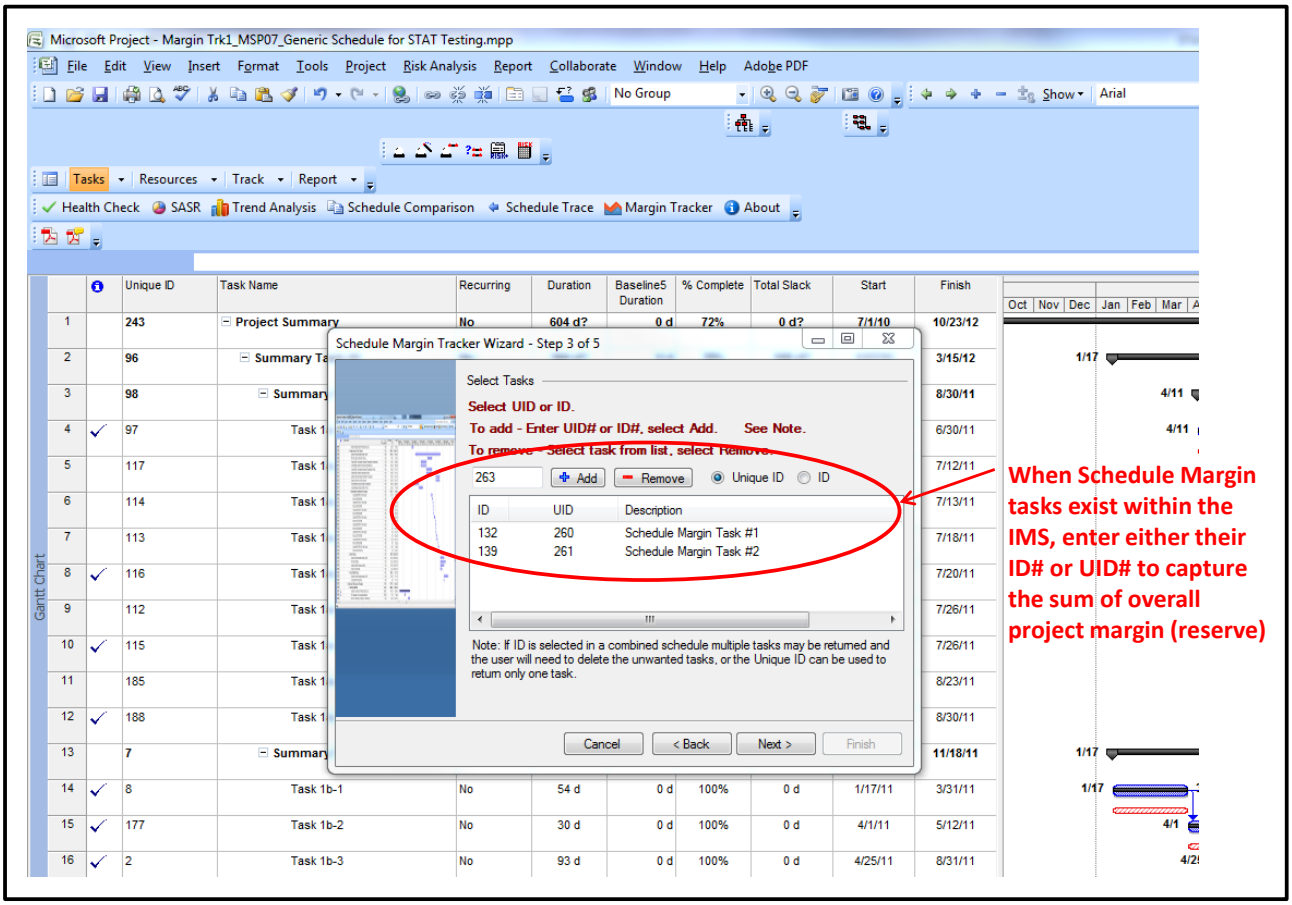


Figure 8-4: Margin Tracker Wizard Step 3

Step 4 of the Margin Tracker wizard produces a dialogue box that provides the user with selections needed for creating and storing the initial margin report, or updating a previous report that already exists. When creating the first Margin Tracker report for an IMS assessment, or no prior report exists to be updated, select "No" as the response to the first wizard question (see figure 8-5). When a previous margin report does exist, and the user wishes to update that report with the new month's remaining schedule margin data, then select "Yes" and browse to locate and choose the correct report file to be updated (see figure 8-6). *Note: when selecting a previous schedule margin report, make sure that this file is **not** already open.*

The step 4 dialogue box also provides a browse function to allow the user to select the desired location where resulting Schedule Margin Tracking output report will be stored.

After selecting the desired step 4 choices, click next.

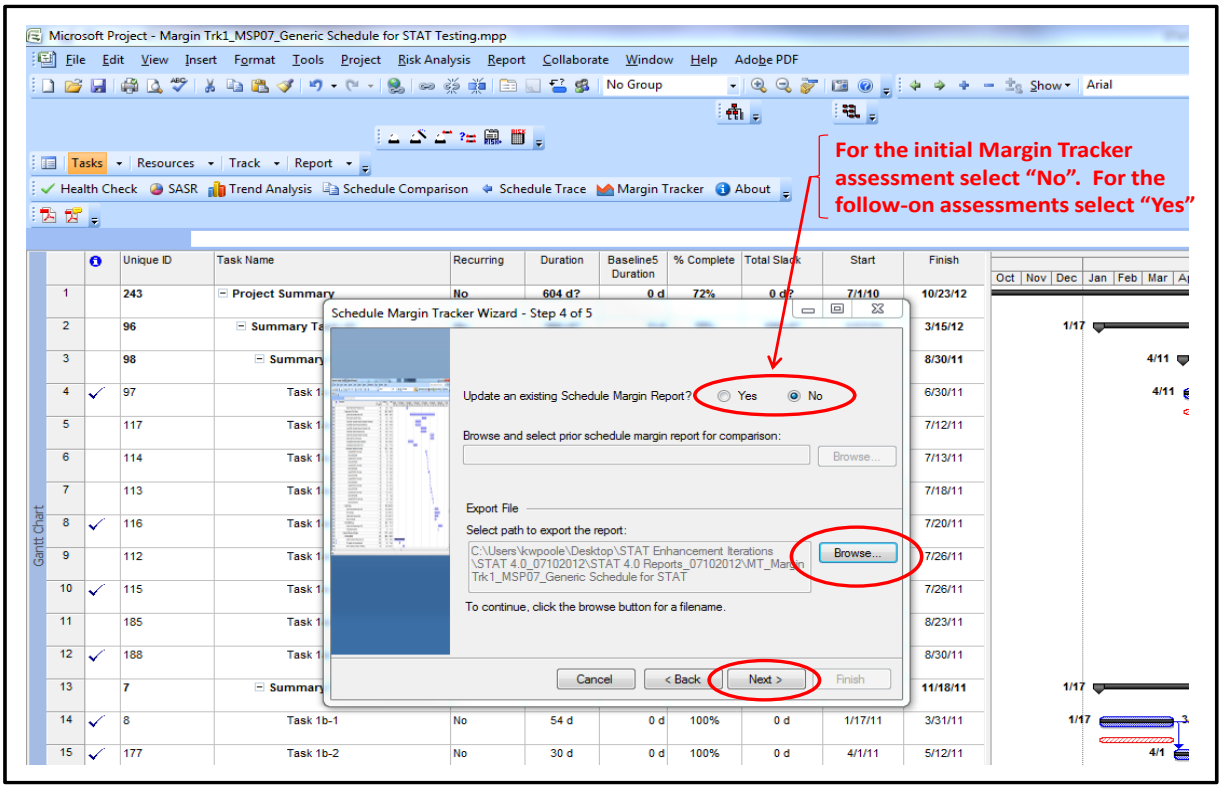


Figure 8-5: Margin Tracker Wizard Step 4

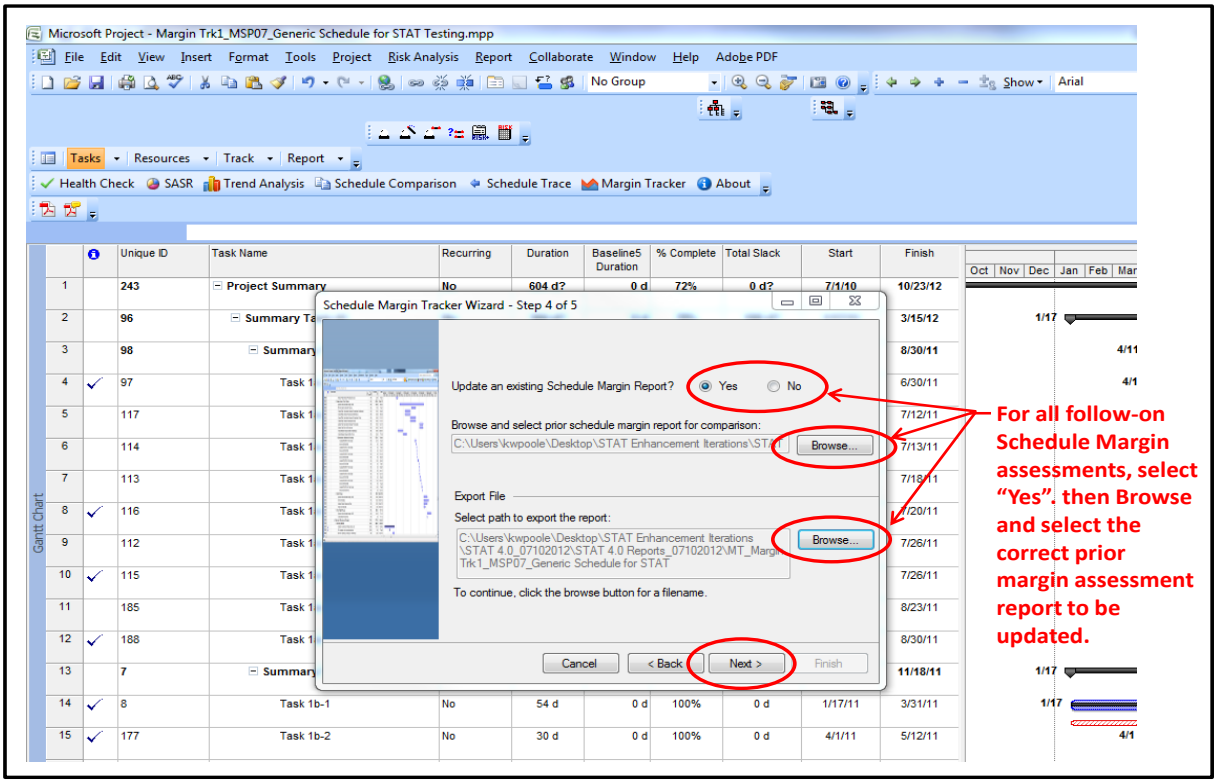


Figure 8-6: Margin Tracker Wizard Step 4

Step 5 of the Schedule Margin Tracker wizard produces a final dialogue box (See Figure 8-7) that allows the user to complete the final step in initiating the desired comparison output report. This dialogue box informs the user that Microsoft Excel 2000 or later must be installed. The user is also informed that the processing time for transferring the data results into the Excel template may take several minutes if the schedule file size is very large.

Click "Finish" to allow the Margin Tracker to complete the necessary processing and compilation of margin data. The STAT tool will then produce the desired tracking output report within excel to be used by the management team in their oversight and control of project schedule margin.

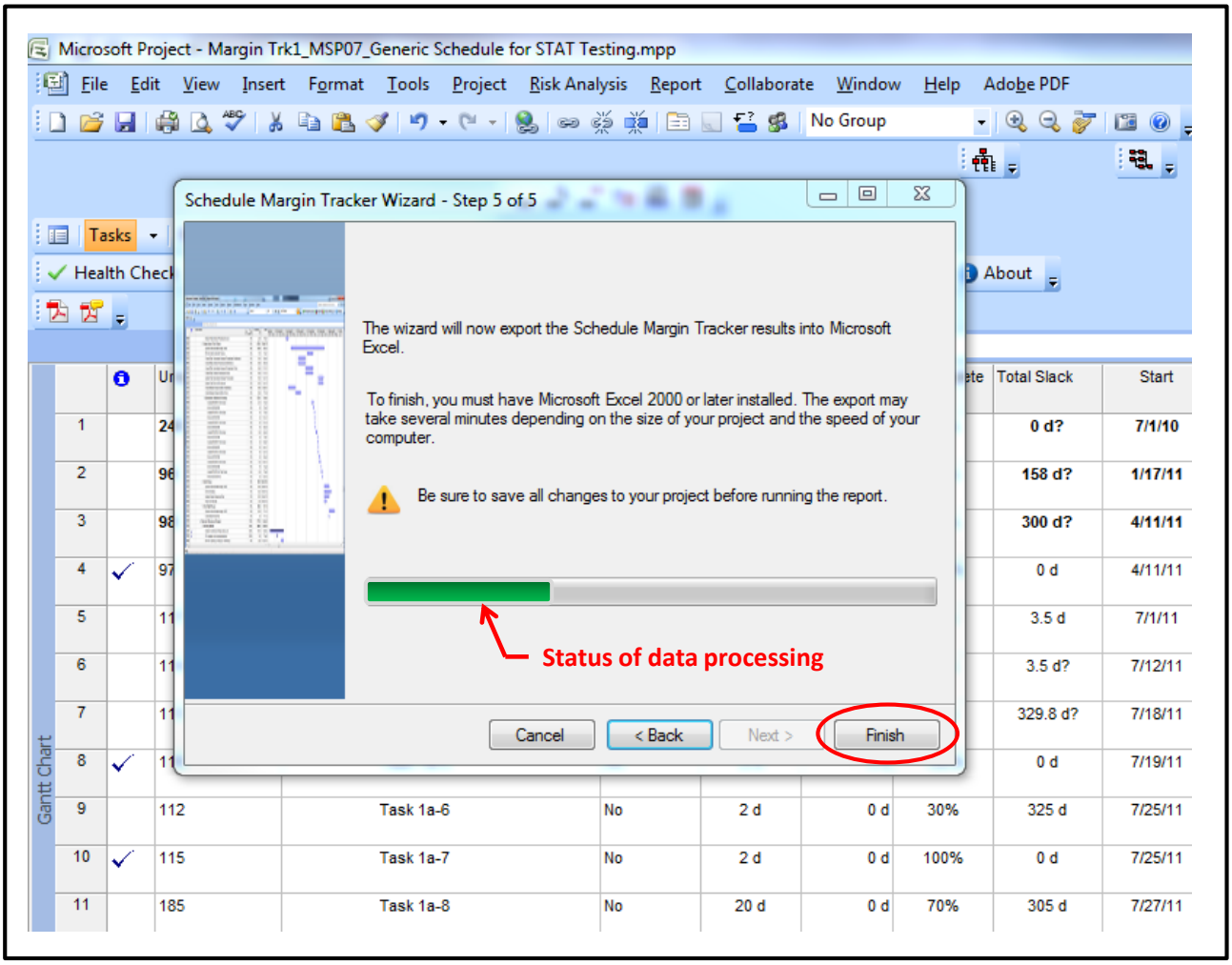


Figure 8-7: Margin Tracker Wizard Step 5

Understanding Schedule Margin Tracking Results

In the normal routine rhythm of project schedule updates and maintenance, there will potentially be problems that occur which require changes/updates to be incorporated into the IMS that have a negative impact on the quantity of existing project schedule margin (reserve) being carried in the project master schedule. Since project managers are the real owners of schedule margin and since

the reason for having schedule margin is to buffer the project from impacts of harmful unknown risks, then it only makes sense to closely monitor and control the quantity and use of existing schedule margin contained in the project IMS. Shown below in Figure 8-8, the Schedule Margin Tracking Report provides a monthly snapshot of past and current quantities of remaining schedule margin. It also provides the capability to document the on-going usage of schedule margin which can only help the schedule management process be more effective in enabling projects to achieve success in meeting their cost, schedule, and technical goals.

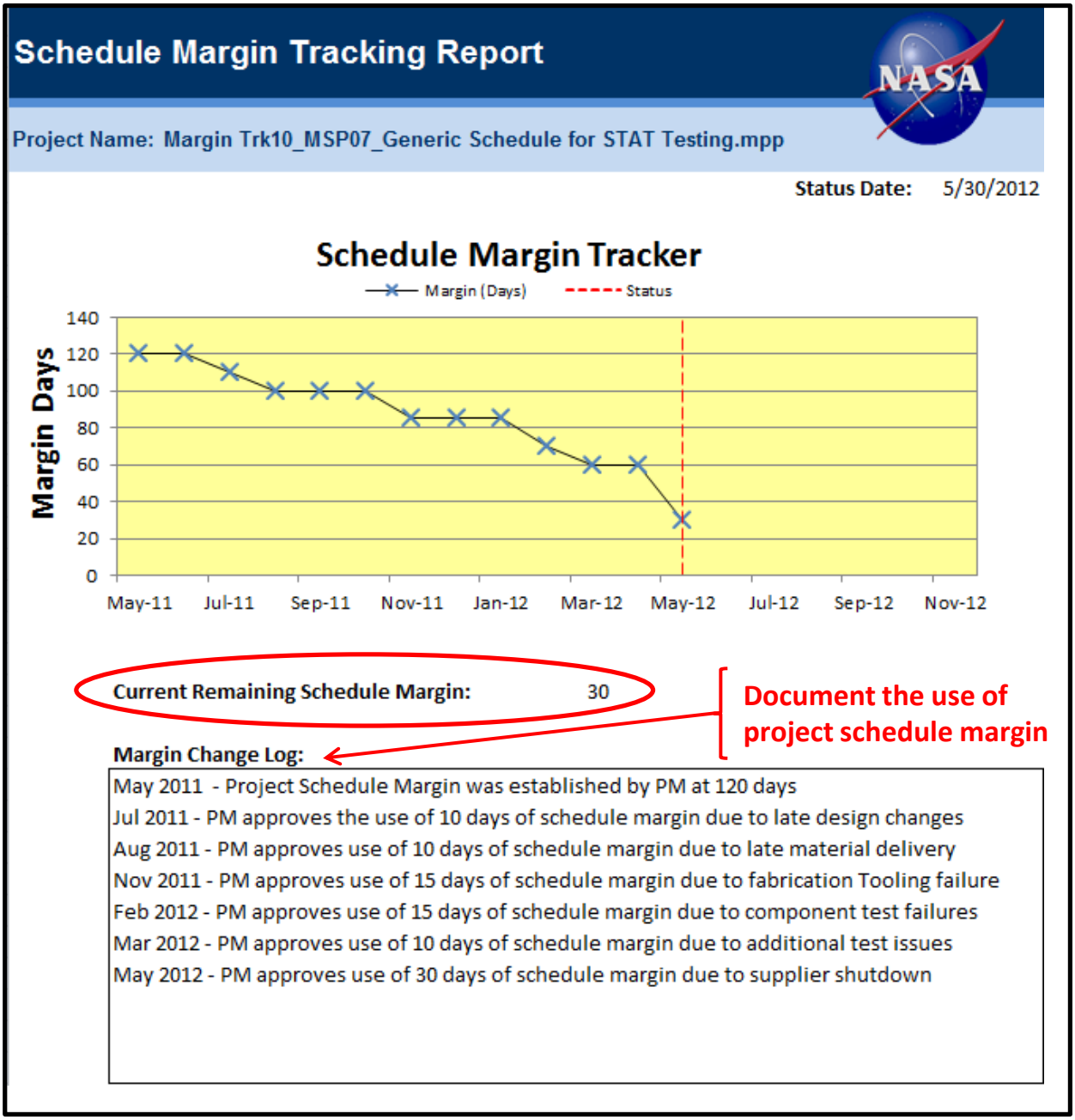


Figure 8-8: Margin Tracking Report with Usage Log

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