

PERCEPTION[®]

Tracking Progress & EAC

A Training Tutorial

PERCEPTION takes a snap shot of project performance information every time a user executes the roll-up process. This process rolls up costs and measures progress and forecasts costs and schedules for each defined level of the WBS (SWBS, PWBS, COA, and CLIN)

This information is stored on the *PERCEPTION* Database“History Table.” The system generates a variety of graphics reports using this history information to track performance for any and all levels of the defined WBS.

This tutorial describes how to generate additional graphical reports using this historical data.

These additional reports are generated using a Microsoft Excel workbook named “TrackingEAC.xls” that has been specifically linked directly to the *PERCEPTION* “History Table.”

This tutorial is structured into three basic sections:

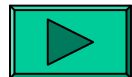
- 1. Descriptions of each of the additional graphical tracking reports**
- 2. Instructions for setting up the Excel workbook so that it links directly to the *PERCEPTION* “History Table.”**
- 3. Instructions for the user to select any particular project and generate the reports automatically.**

The following slide provides options for the user to proceed to any one of these sections.

Training Sections



Descriptions Of Tracking Reports



Initial Set Up of *PERCEPTION* History Table Database Query.



Initiating A Project History Tracking Analysis

What Additional Information Can The Project Historical Data Provide?

Tracking Progress

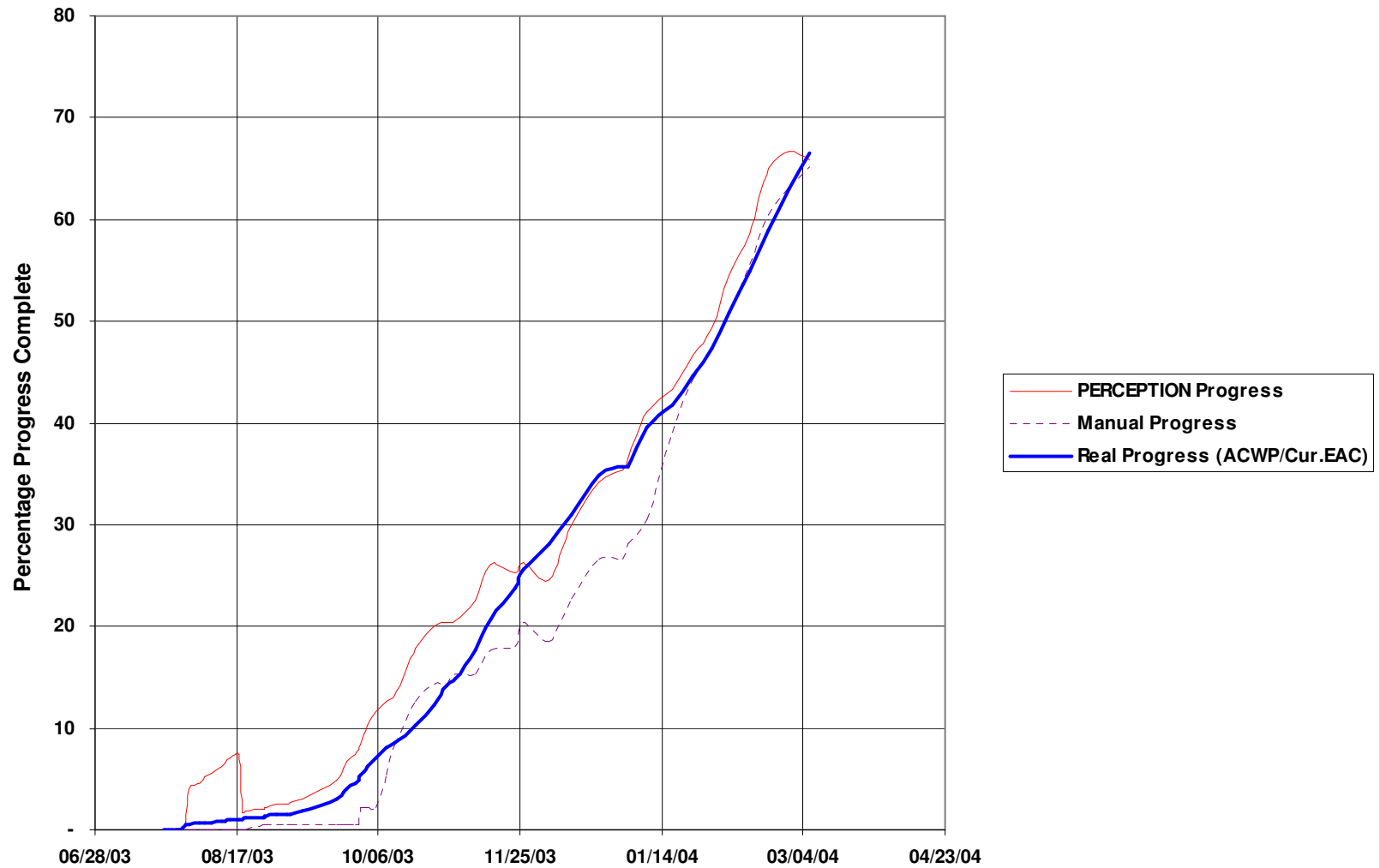
PERCEPTION tracks a project's progress as automatically determined by the system from recorded cost performance of project work orders.

PERCEPTION also can track a project's progress as determined manually from physical observations of work orders and their estimated state of completion.

The following figure plots the following progress estimates over the course of the project:

- a) *PERCEPTION*'s automated progress**
- b) Manually entered progress**
- c) “Real Progress” defined as actual costs divided by current EAC.**

Measured Progress



PERCEPTION's Automated Progress Assessment

PERCEPTION's automated approach to measuring progress takes into account both completed work orders and an assessment of in-process work orders.

Progress achieved from completed work orders is the percentage that the completed work order budgets comprise of the total budget for all work orders.

Progress estimated for in-process work orders is based on the charges to date to these in-process work orders with effects of over-runs or under-runs experienced from the completed work.

Manual Progress Assessment

Like the *PERCEPTION* progress, the manual progress takes into account both completed work orders and an assessment of in-process work orders.

Progress achieved from completed work orders is the percentage that the completed work order budgets comprise of the total budget for all work orders.

However, for manual progress estimated for in-process work orders requires a physical review of those work orders. This usually is a subjective assessment, which requires expensive labor resources to ascertain.

Since the manual progress assessment is subjective, it often is not very accurate, especially when individuals charged with making these manual assessments are busy with other responsibilities.

Manual progress often tends to be optimistic, especially when costs and schedules become problematic.

The manual assessment also often suffers from not being able to measure all in-process work orders at the same moment in time. When time charges continue to be collected, earlier assessments will become obsolete, yet these figures are rolled together with more timely assessments in order to obtain an overall progress figure.

“Real” Progress Assessment

Real progress is simply using the following formula:

$$\text{Real Progress} = \text{ACWP} / \text{Final Total Cost}$$

Prior to knowing the final total cost, the estimate at completion (EAC) can be used.

Real progress can be reconstructed back in time at various stages when ACWP was collected. This provides a means for measuring how closely interim assessments of progress actually were when they were assessed.

Historically, the *PERCEPTION* progress tracks very closely to good manual progress assessments, often the two methods varying by only a few percentage points.

A clear benefit of the *PERCEPTION* progress is that it is free, while the manual progress is not.

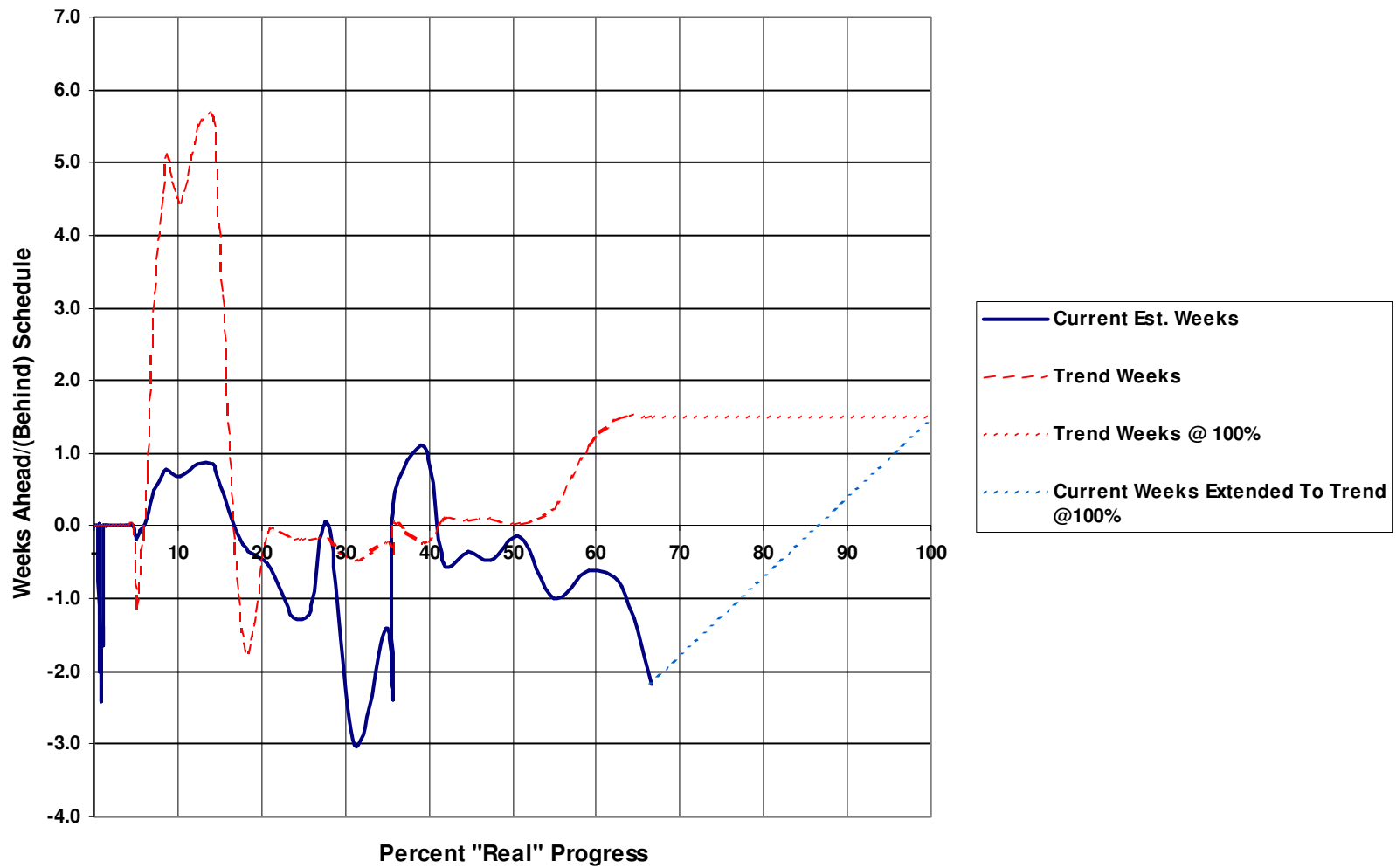
As the project nears its final state of completion, all progress figures should be converging to 100%.

Tracking Schedule

PERCEPTION tracks a project's schedule variance (ahead or behind schedule) based upon the progress and planned work order schedules.

PERCEPTION also tracks a trend of these variance estimates.

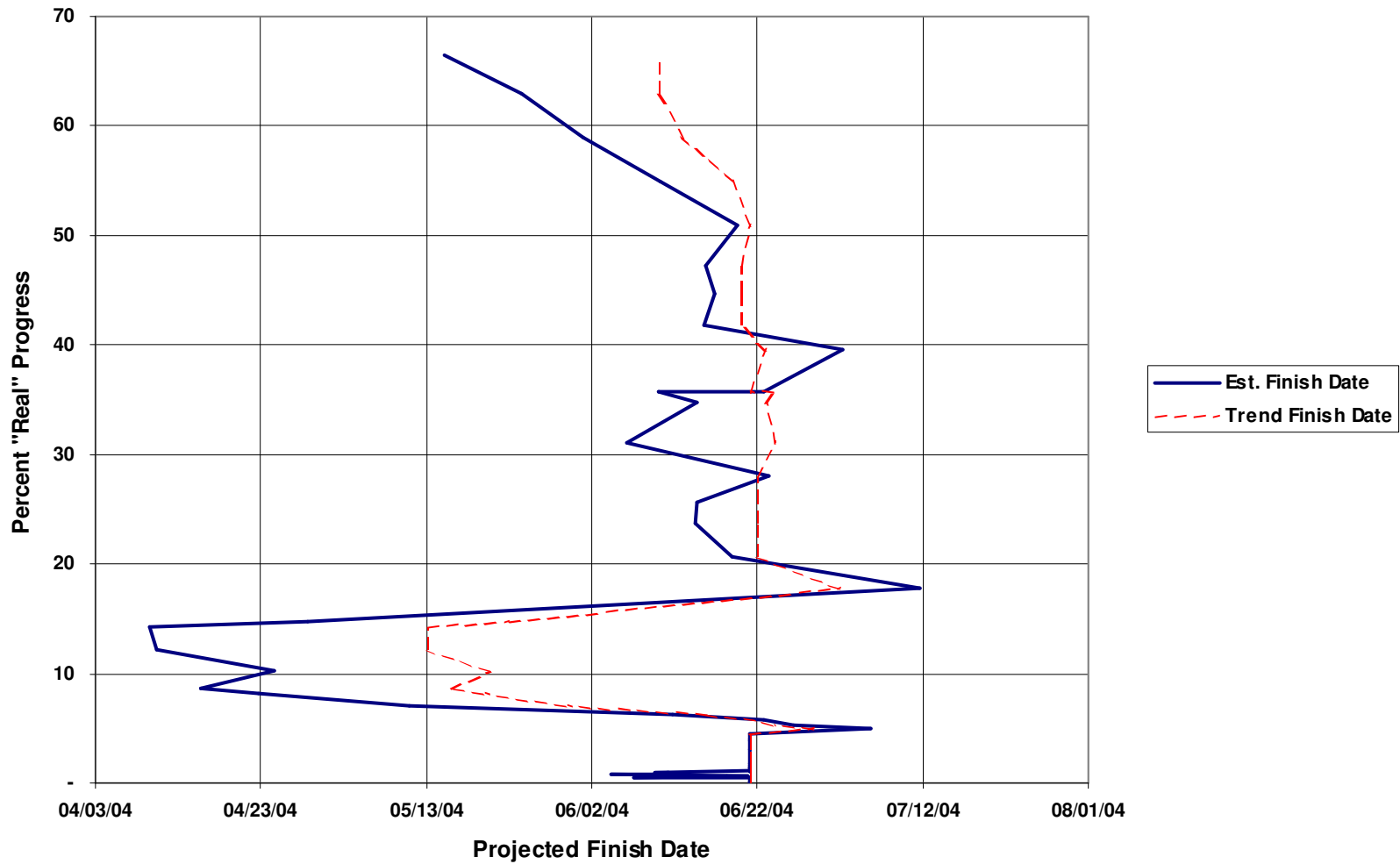
Tracking Schedule Variance In Weeks



Using this schedule variance information, *PERCEPTION* tracks a project's estimated finish date based upon the progress and planned work order schedules.

***PERCEPTION* also tracks a trend of these finish date estimates.**

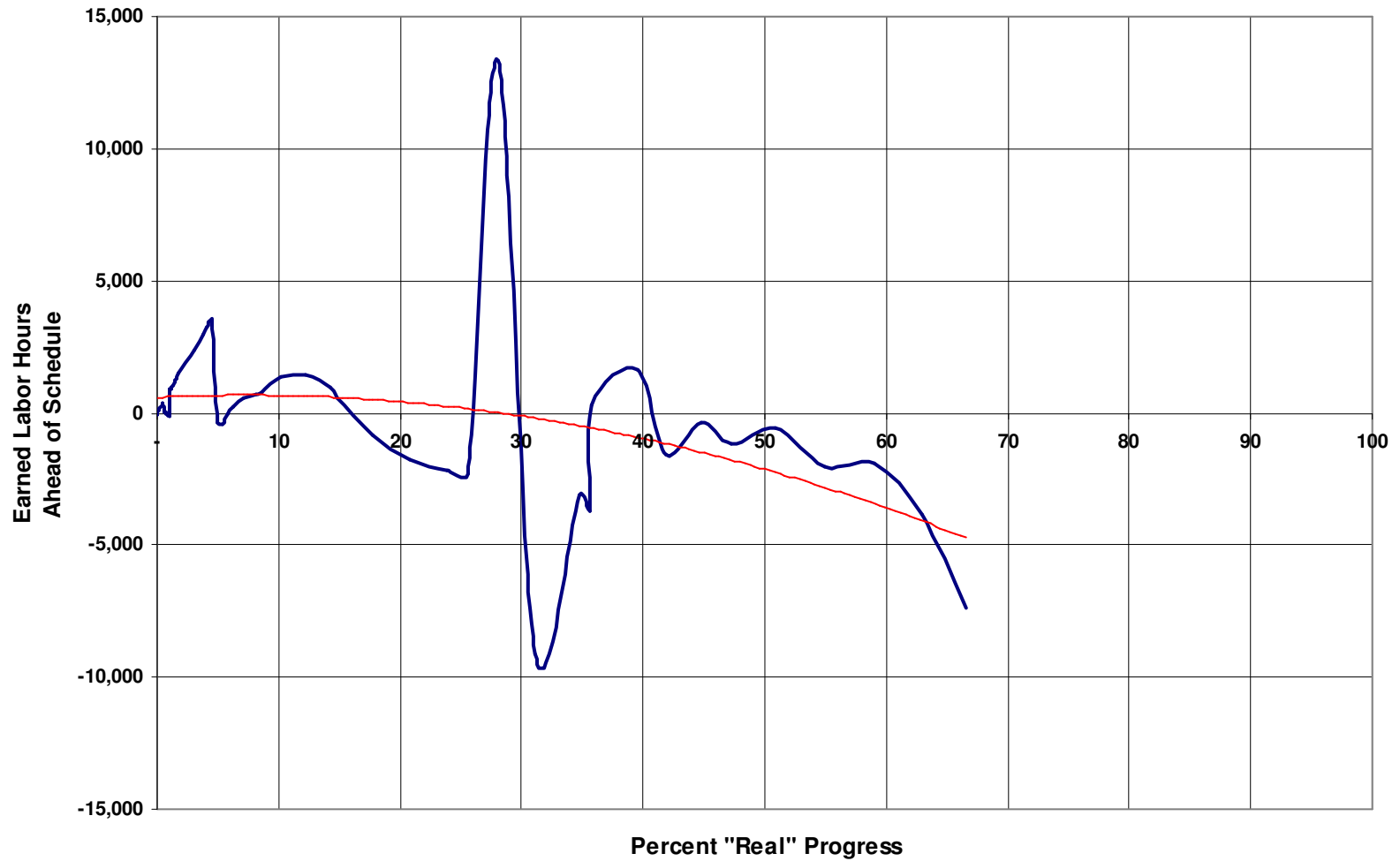
Forecasting Project Finish Date



The system tracks schedule variance in terms of labor hours. It is the difference between the earned value (BCWP) and the Budgeted Cost of Work Scheduled:

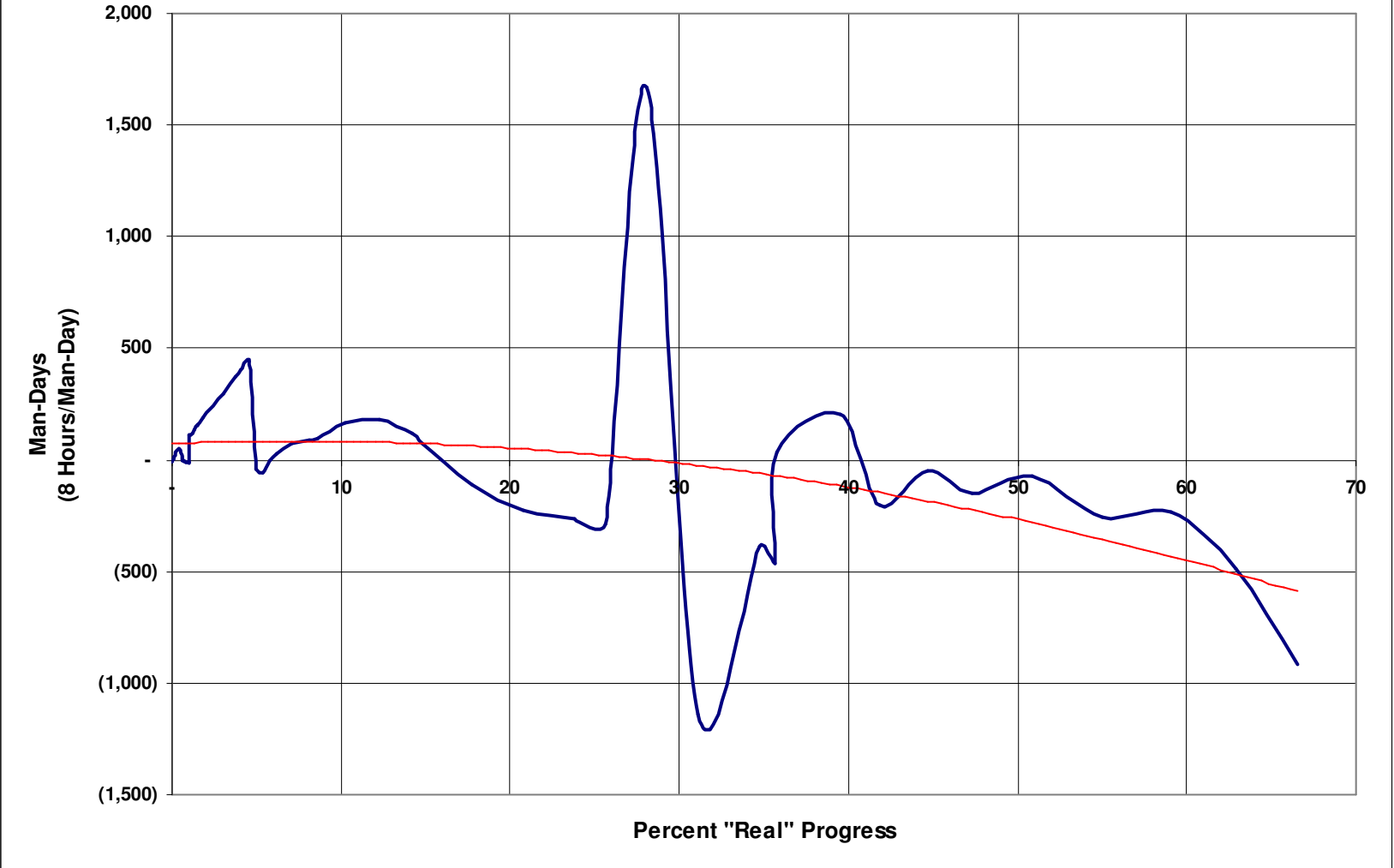
$$\text{Schedule Variance} = \text{BCWP} - \text{BCWS}$$

Tracking Schedule Variance In Man-Hours

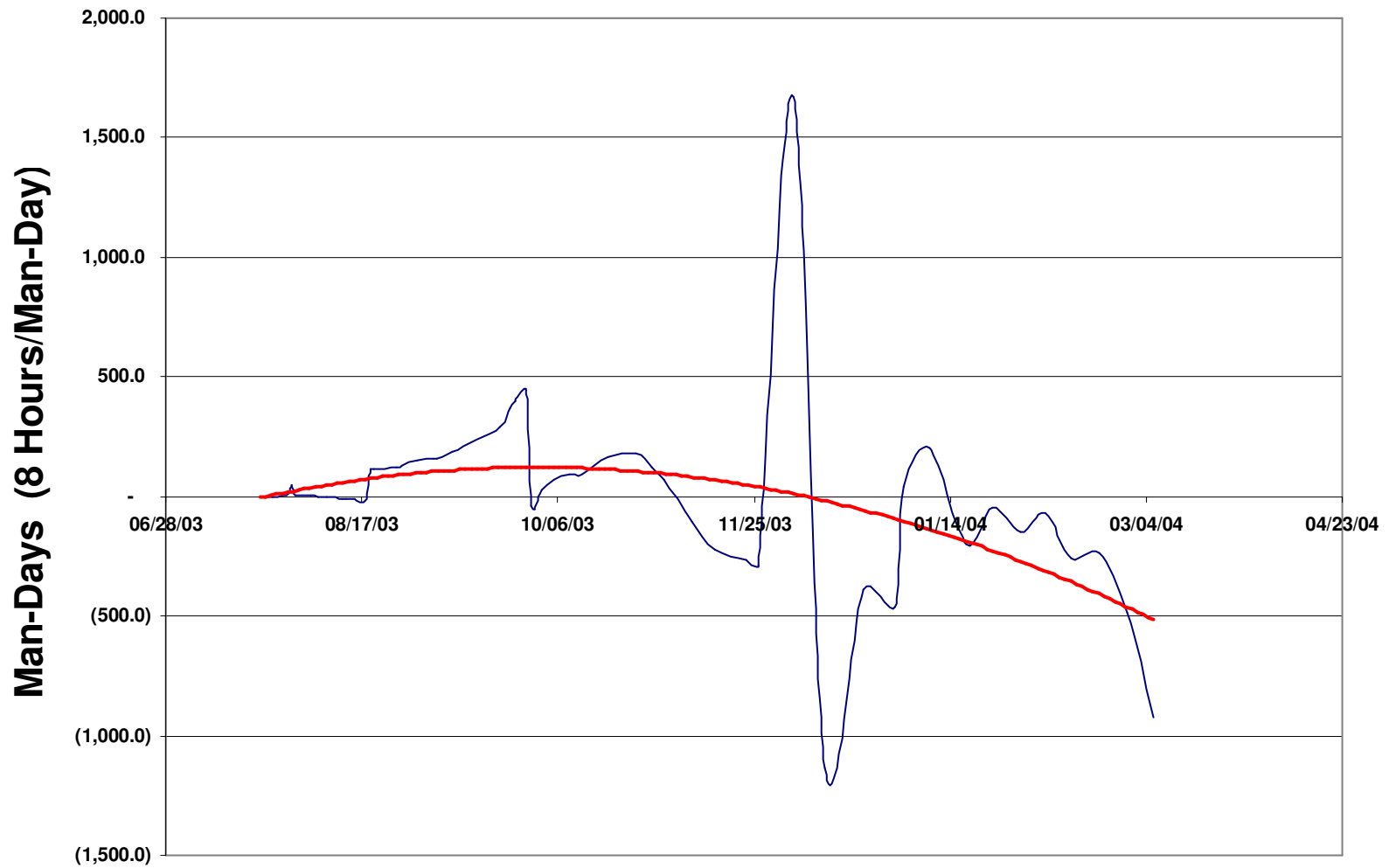


An alternate display of schedule variance is given in terms of man-days ahead/behind schedule.

Tracking Schedule Variance In Man-Days



Tracking Schedule Variance In Man-Days

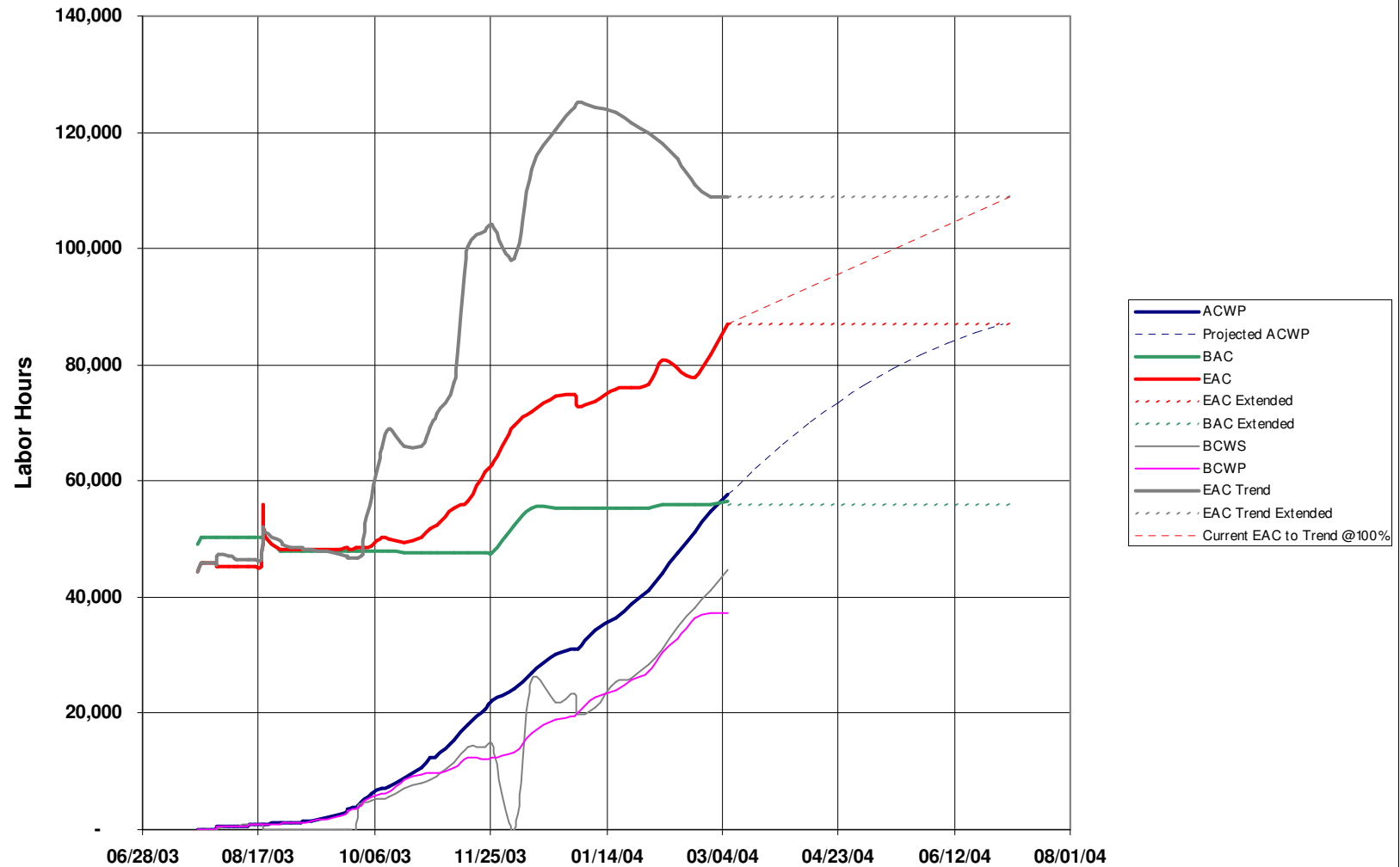


Tracking Costs

The tracking analysis displays the history of costs as measured in the following categories:

- The Budget At Completion (BAC)
- The Estimate At Completion (EAC) as measured by *PERCEPTION*
- The Trend of EACs
- The Actual Cost of Work Performed (ACWP)
- The Budgeted Cost of Work Performed (BCWP), or Earned Value
- The Budget Cost of Work Scheduled (BCWS)

Tracking Costs



In addition, the analysis displays how the projected remaining actual costs will likely be distributed from the date of the last recorded historical ACWP through to the time forecast for the EAC.

The time forecast for the EAC is the *PERCEPTION*'s estimate of weeks ahead or behind schedule applied to the planned finish date for the project.

Tracking EAC

Estimates At Completion, or EACs, are always subjects of considerable discussion. There is no silver bullet formula that is so good that it accurately predicts the exact final cost of a project from day one through to the end of the contract. There are too many unknowns, and there are too many conditions that can change over the remaining time of a contract.

Nevertheless, the EAC should provide management with an indication of whether or not the contract is headed in the right direction or not, whether it will be profitable or not.

The EAC should be realistic, neither too optimistic, nor too pessimistic, unless, of course, the facts at hand warrant otherwise.

If early in the project the EAC varies too much from the total budget, there is an all-too typical reaction from project managers that the EAC is unrealistic and not credible.

On the other hand, EACs that jump quickly over a short period of time also suffer from being regarded as unrealistic and not credible.

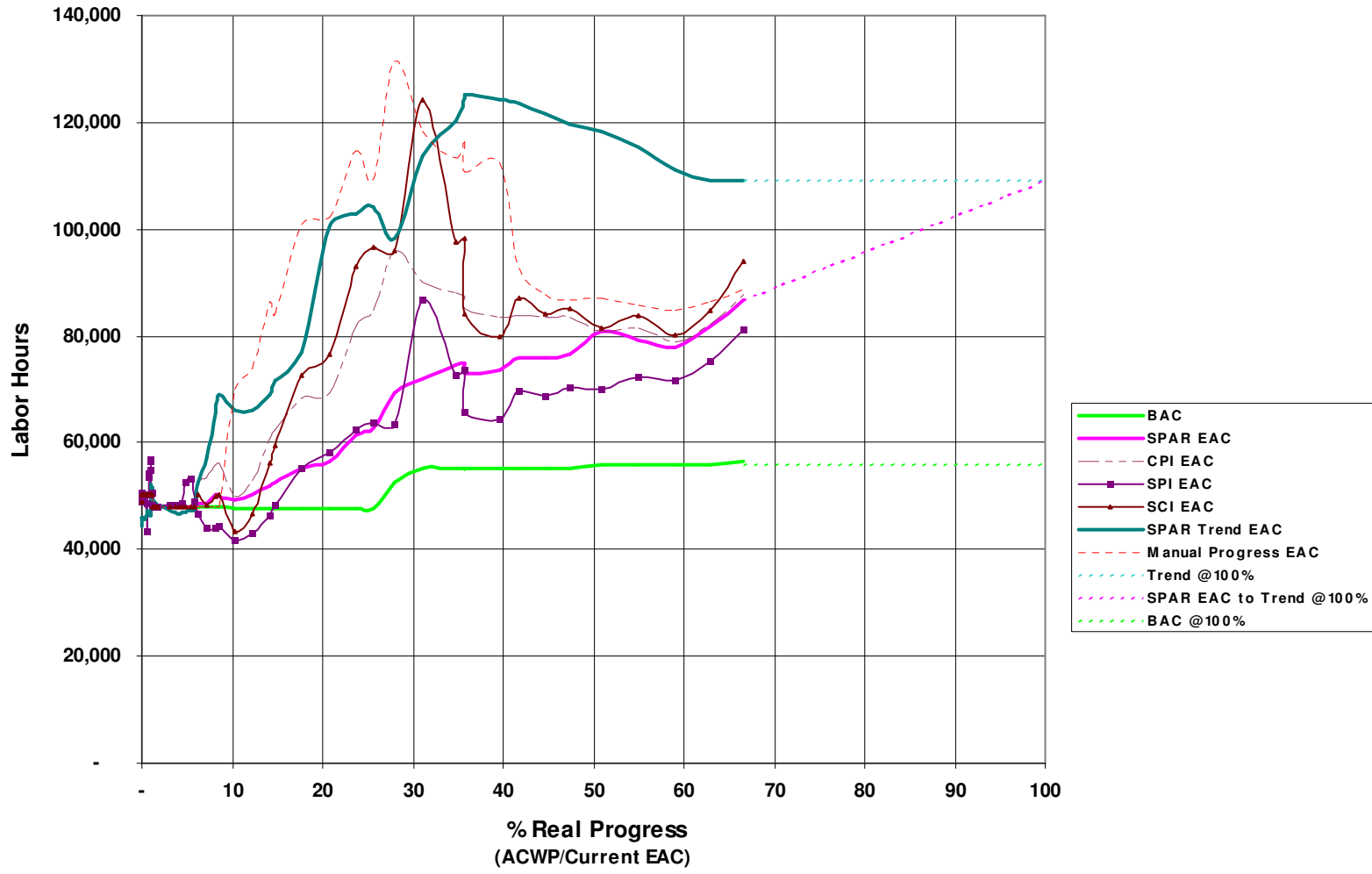
What's needed, therefore, is an EAC that reflects current performance, reflects changes being made that affect costs, yet does not change radically from one period to the next.

It is critical that managers understand that an EAC is only an estimate, but that it should be providing early indications of problems that should not be ignored or glossed over without serious corrective actions.

The tracking analysis produces a comparison of a number of different EACs, each based upon a different method of determination:

- The Total Budget At Completion (BAC)
- The *PERCEPTION* Automated EAC
- The EAC Derived Directly From ACWP And *PERCEPTION*'s Progress
- The EAC Derived From The Cost Performance Index (CPI)
- The EAC Derived From The Schedule Performance Index (SPI)
- The EAC Derived From The Combined Cost & Schedule Performance Index (SCI)
- The EAC Derived From The Manual Progress Assessment
- The EAC Trend Derived By *PERCEPTION*

Tracking Various EACs



PERCEPTION's Automated EAC

PERCEPTION EAC is based on an objective assessment of facts, the performance of costs incurred to date relative to their earned value budgets.

This method also takes into account the current progress. The system moderates the influence of budget variances upon the EAC when progress is small, but applies increasingly more influence upon the EAC as progress advances.

The *PERCEPTION* EAC, while recognizing the variances early, provides management with some benefit of the doubt that budget problems can be corrected prior to the completion of the contract.

This benefit, however, becomes less and less if variances continue to be a problem.

Total Budget At Completion (BAC)

The BAC is the baseline from which overall cost performance must be measured.

CPI EAC

This is the EAC developed from the Cost Performance Index (“CPI”), the ratio of Budgeted Cost of Work Performed (BCWP) and the Actual Cost of Work Performed (ACWS):

$$\text{BCWP} = \text{BAC} \times \text{PERCEPTION Progress}$$

$$\text{CPI} = \text{BCWP}/\text{ACWP}$$

$$\text{EAC} = \text{ACWP} + (\text{BAC}-\text{BCWP})/\text{CPI}$$

The CPI EAC can vary erratically over the course of a project. At early stages of progress, the CPI EAC can suffer from very large swings from even small changes in the CPI.

SPI EAC

This is the EAC developed from the Schedule Performance Index (“SPI”), the ratio of Budgeted Cost of Work Performed (BCWP) and the Budget Cost of Work Scheduled (BCWS):

$$\text{SPI} = \text{BCWP}/\text{BCWS}$$

$$\text{EAC} = \text{ACWP} + (\text{BAC}-\text{BCWP})/\text{SPI}$$

As with the CPI EAC, the SPI EAC can vary erratically over the course of the project. At early stages of progress, the SPI EAC can suffer from very large swings from even small changes in the SPI.

SCI EAC

This is the EAC developed from the Schedule-Cost Index (“SCI”):

$$\text{SCI} = \text{CPI} \times \text{SPI}$$

$$\text{EAC} = \text{ACWP} + (\text{BAC} - \text{BCWP}) / \text{SCI}$$

As with the other performance index methods, the SCI EAC can vary erratically over the course of the project. At early stages of progress, the SCI EAC can suffer from very large swings from even small changes in the SCI.

Manual Progress EAC

This is an EAC computed as follows:

$$\text{EAC} = \text{ACWP} / \text{Manual Progress}$$

This EAC generally is unreliable particularly where the manual progress assessment is questionable and progress is small.

It also can result in large swings in values over short periods of time where it may be difficult to correlate a correct relationship between ACWP and Manual Progress.

***PERCEPTION* Trend EAC**

The Trend EAC uses a regression formula applied to the *PERCEPTION* EAC figures developed at different points in time as the project advances progress-wise. The regression formula then extrapolates an EAC from the current progress figure out to 100% progress.

The Trend EAC can react more quickly than the *PERCEPTION* EAC as it tries to anticipate a final direction for the incremental changes in the EAC. At early stages of progress, the Trend EAC can suffer from large swings as even small changes in the EAC can result in very large trend values extrapolated too far into the future at 100% progress.

The Trend EAC can be a useful measure especially if cost performance is not steady.

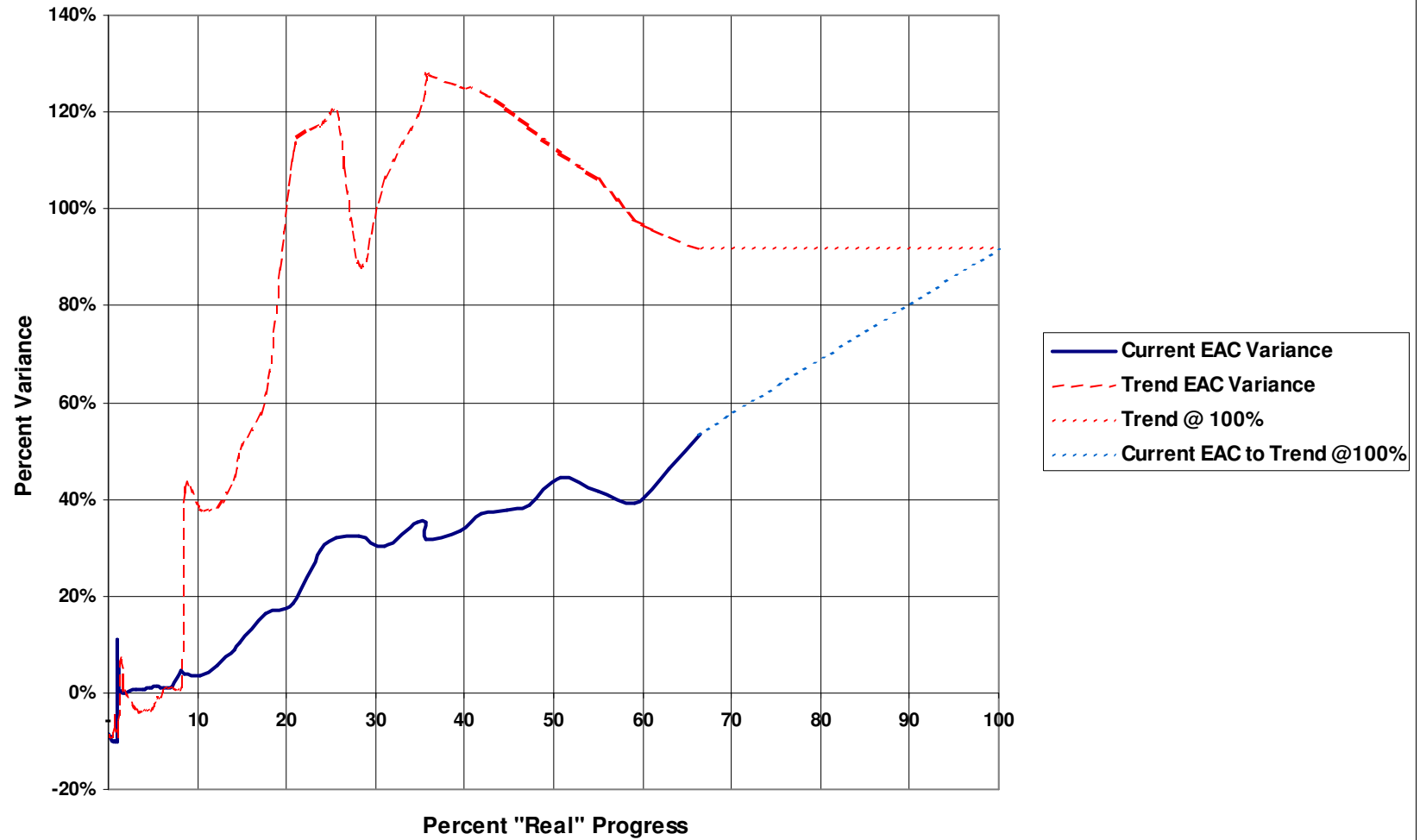
It also can indicate if changes made to improve performance are showing signs of success or not.

Tracking EAC Variance

With the EAC determined, its variance from the BAC also can be tracked.

The EAC analysis displays both the current estimated EAC variance and the trend variance.

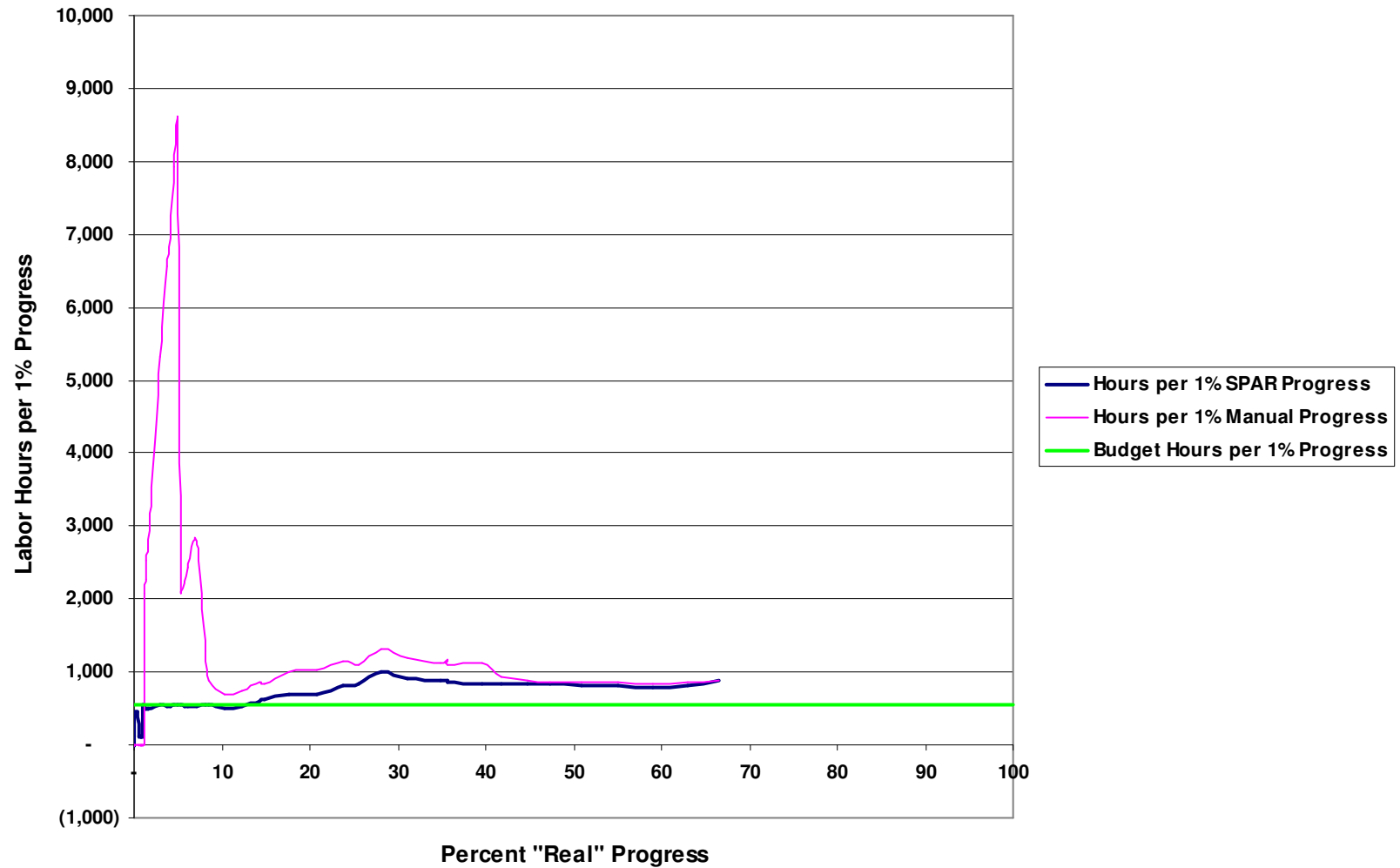
Forecast Labor Hour Variance



Tracking Labor Hours per 1% Progress

Another view of productivity can be seen by tracking actual labor hours per 1% progress against the project budget figure.

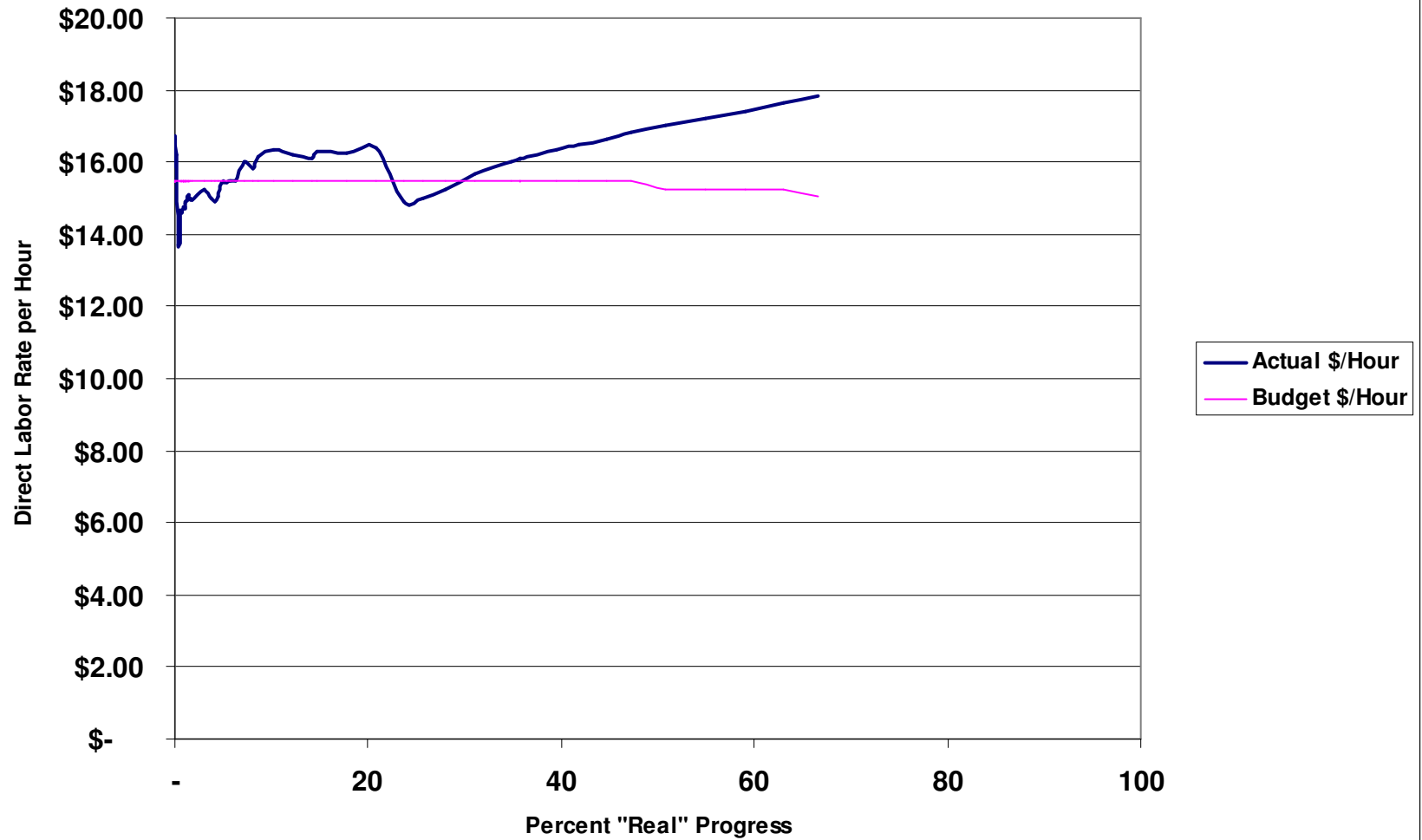
Labor Hours Per 1% Progress



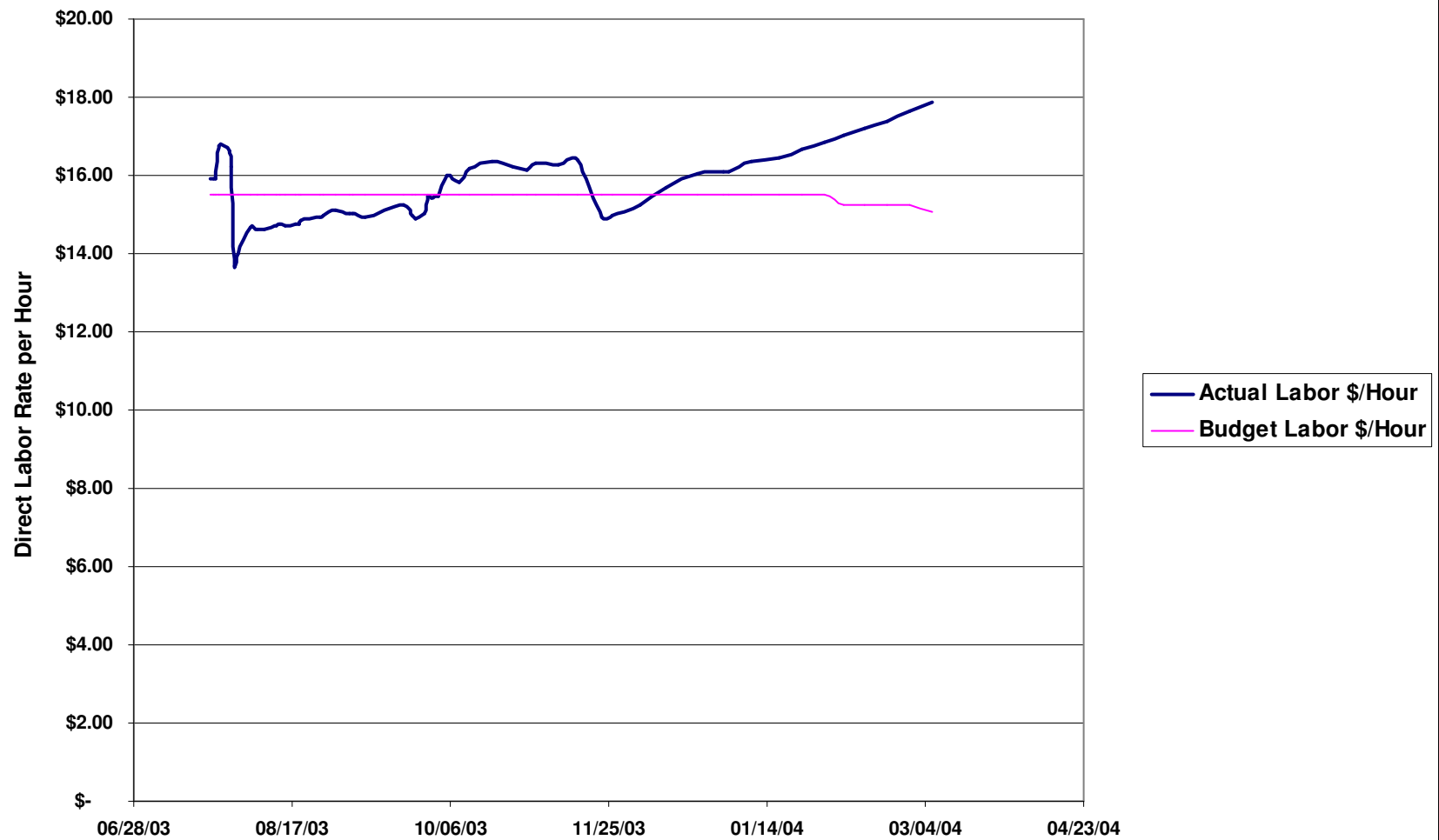
Tracking Labor Rate

Another view of cost performance can be seen by tracking actual labor rate against the project budget figure.

Direct Labor Rate



Direct Labor Rate



End Of Tracking Reports Description

Training Sections



Descriptions Of Tracking Reports



Initial Set Up of *PERCEPTION* History Table Database Query.



Initiating A Project History Tracking Analysis

Setting Up A *PERCEPTION* Database Query For Project Histories

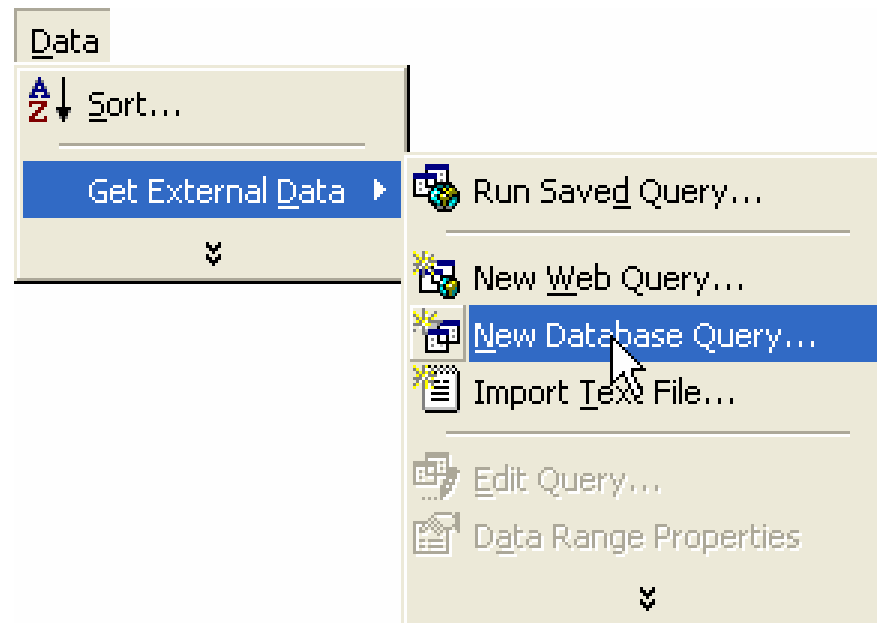
Open the Excel Tracking Template workbook named “TrackingEAC.xls”.

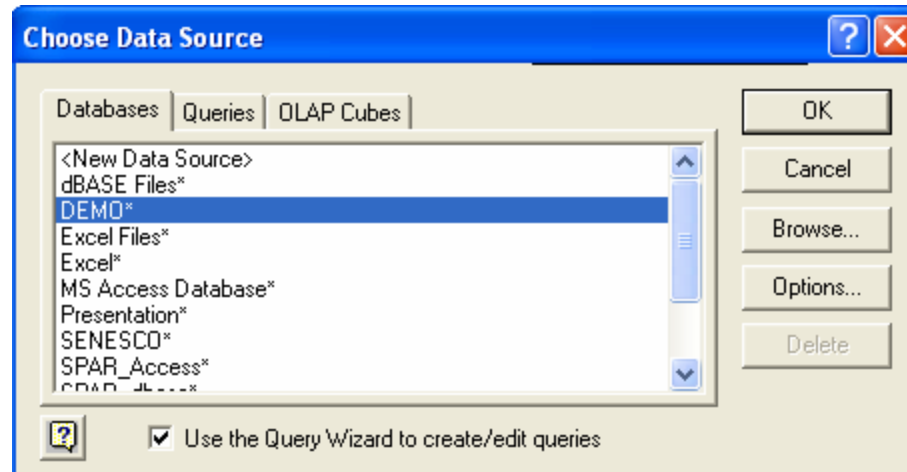
Open the “History Table” worksheet (next figure).

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	contract_ic	proj	ondate	bhours	bldols	bmdols	ahours	aldols	amdols	bcwshrs	bcwsdol	bcwsmat	eachrs
2	47K Tanke	1	01/28/2000	361295	9032375	0	457	12339	0	3689	92225	0	36170
3	47K Tanke	1	02/11/2000	361295	9032375	0	6223.9	168045.3	0	9308	232700	0	36136
4	47K Tanke	1	02/18/2000	361295	9032375	0	8058.15	217570.1	337184	12680	317000	0	359754.
5	47K Tanke	1	02/25/2000	361295	9032375	0	9813.15	264955.1	430773.2	15130	378250	0	358367.
6	47K Tanke	1	03/03/2000	361295	9032375	0	12193.65	329228.6	511357.3	19058	476450	0	359841.
7	47K Tanke	1	03/10/2000	361295	9032375	0	15269.9	412287.3	565361.2	23218	580450	0	359918.
8	47K Tanke	1	03/17/2000	361108	9027700	0	18445.6	498031.2	627003.7	28322	708050	0	360536.
9	47K Tanke	1	03/24/2000	361108	9027700	0	18445.6	498031.2	643752.4	32839	820975	0	360536.
10	47K Tanke	1	03/31/2000	365108	9127700	0	21728.35	586665.5	8634.91	39686	992150	0	362811.
11	47K Tanke	1	04/07/2000	365108	9127700	0	26946.35	727551.5	16721.49	48608	1215200	0	362447.
12	47K Tanke	1	04/14/2000	365108	9127700	0	31149.1	841025.7	27450.04	56608	1415200	0	363876.
13	47K Tanke	1	04/20/2000	365108	9127700	0	40290.6	1087846	0	66062	1651550	0	362953.
14	47K Tanke	1	04/27/2000	365108	9127700	0	45717.3	1234367	0	77879.81	1946995	0	363303.
15	47K Tanke	1	05/04/2000	365108	9127700	0	53810.3	1452878	0	83266.49	2081662	0	362676.
16	47K Tanke	1	05/11/2000	365108	9127700	0	61120.08	1650242	0	91517.51	2287938	0	358968.
55	47K Tanke	1	05/18/2000	377761	9444025	0	69250.78	1869771	0	101498.6	2537465	0	37148
18	47K Tanke	1	05/26/2000	377761	9444025	0	75563.51	2040215	0	114062.4	2851560	0	371331.
19	47K Tanke	1	06/01/2000	378361	9459025	0	80123.03	2163322	0	122411.4	3060286	0	357995.
20	47K Tanke	1	06/08/2000	379026	9475650	0	88619.59	2392729	0	136136.9	3403422	0	359916.
21	47K Tanke	1	06/15/2000	379026	9475650	0	97489.98	2632229	0	115862	2896551	0	361754.
22	47K Tanke	1	06/23/2000	379026	9475650	0	106273.3	2869379	0	130445.9	3261148	0	360724.
23	47K Tanke	1	06/29/2000	379026	9475650	0	114977	3104378	0	139696.5	3492413	0	358921.
24	47K Tanke	1	07/06/2000	382667	9566675	0	115234.3	3111326	0	149513.7	3737842	0	343003.
25	47K Tanke	1	07/13/2000	382667	9566675	0	123397.4	3331731	0	163064.6	4076616	0	344376.
26	47K Tanke	1	07/20/2000	382711	9567775	0	131445.2	3549021	0	173777.1	4344426	0	346604.
27	47K Tanke	1	07/27/2000	382711	9567775	0	139573.4	3768481	0	167988.3	4199707	0	347630.
28	47K Tanke	1	08/03/2000	383279	9581975	0	147440.4	3980890	0	182332.7	4558318	0	347380.
29	47K Tanke	1	08/11/2000	383279	9581975	0	148330.6	4004927	0	197849.3	4946233	0	336677.
30	47K Tanke	1	08/17/2000	383279	9581975	0	155568.5	4200350	0	208231.9	5205798	0	337592.
31	47K Tanke	1	08/24/2000	383279	9581975	0	162783.7	4395159	0	220643.1	5516078	0	338469.
32	47K Tanke	1	08/31/2000	384261	9606525	0	170047.8	4591290	0	234435.2	5860879	0	337392.
33	47K Tanke	1	09/07/2000	391861	9796525	0	175655.2	4742689	0	249625.2	6240629	0	343387.

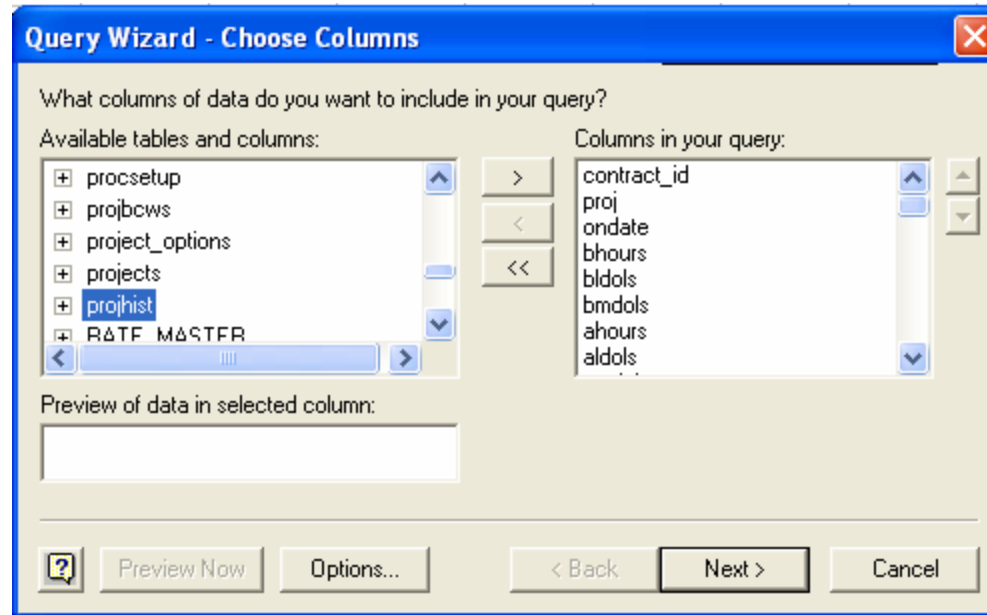
History Table / Graph Progress / Graph EACs / Projecting / EACs /

In the main menu of the “History Table” worksheet, click on “New Database Query.”



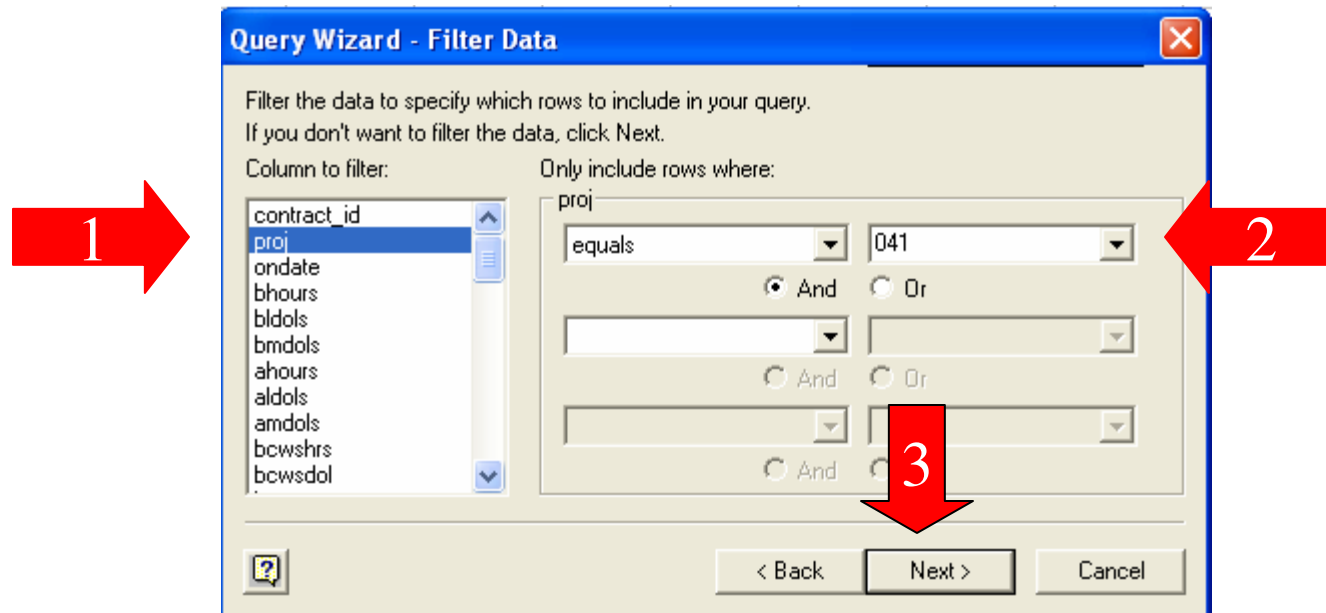


Choose the desired *PERCEPTION* database. Then, click on the “OK” button.



1. Select the “projhist” table from the drop down list.
2. Then, click on the transfer “>” button that will copy all columns of this table for the query.
3. Click on the “Next” button to continue.

1. Select the column named “proj” to filter.



2. To the right, “only include rows where...” enter “equals”, then the desired project number for analysis.

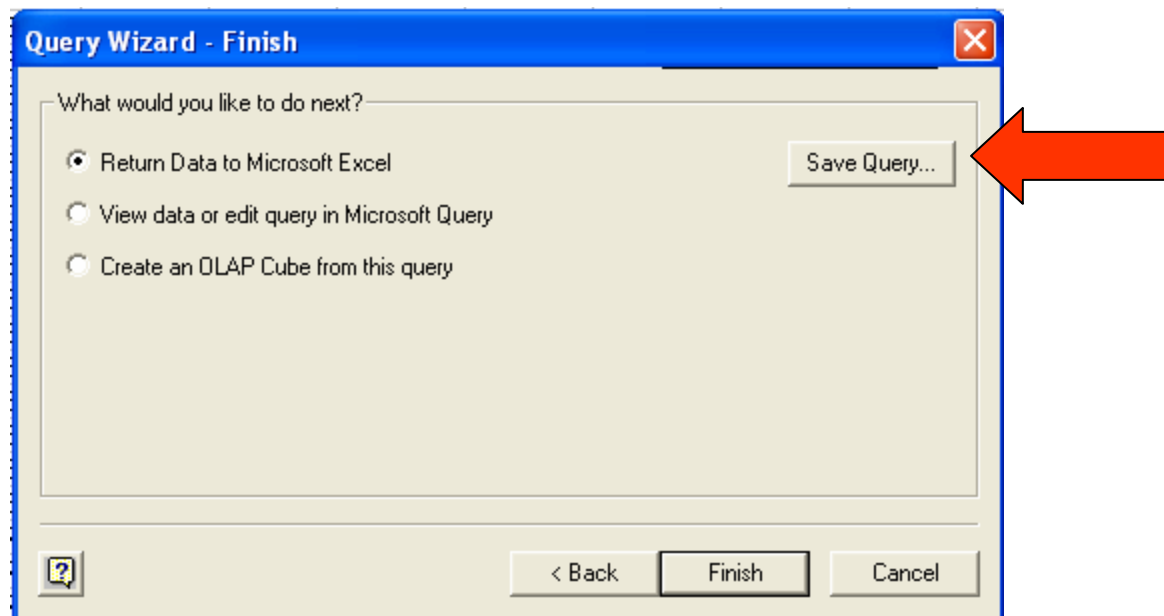
3. Then, click on the “Next” button.

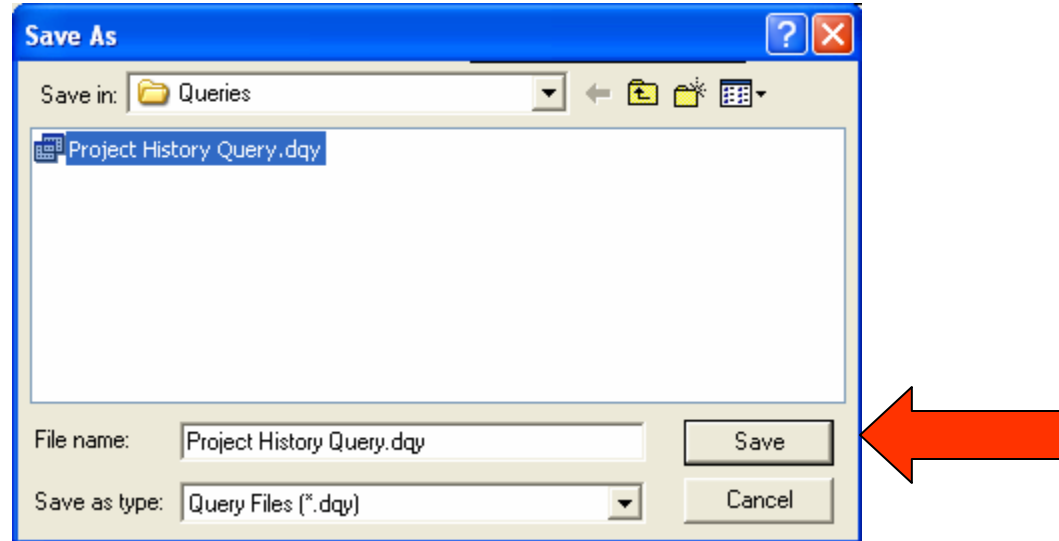
1. Select the sort order for “ondate.” This sorts the historical data by date.



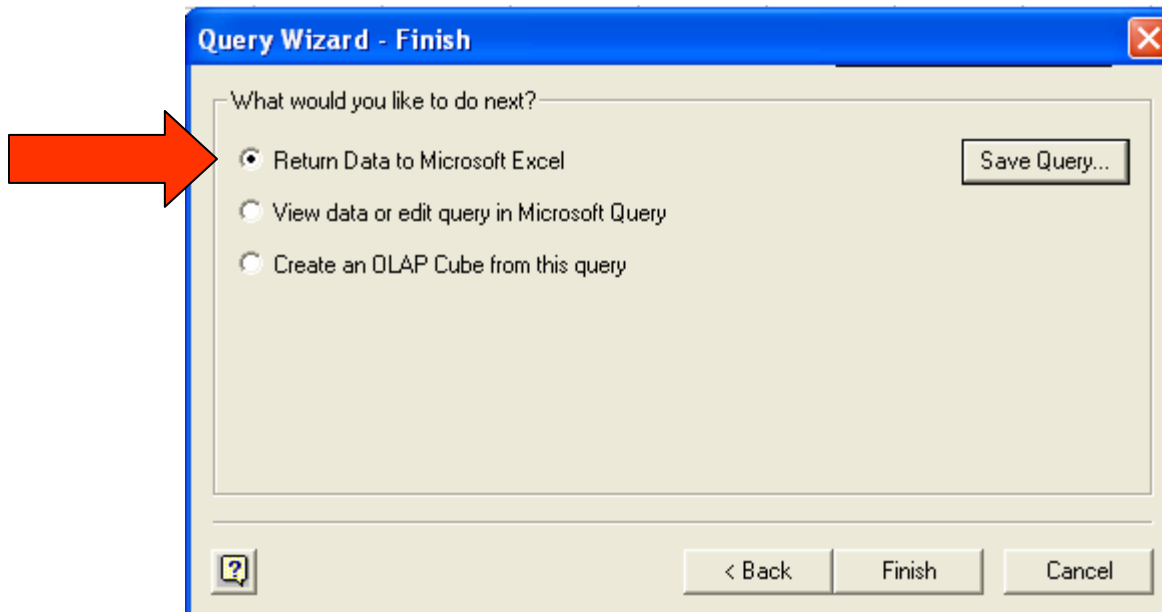
2. Then, click on the “Next” button.

Click on the “Save Query” button to save this setup for future use

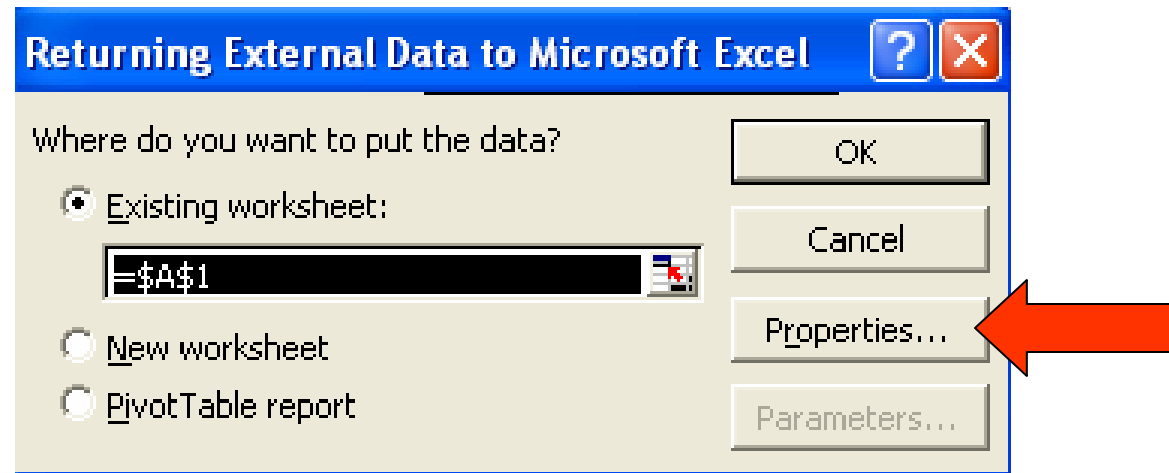




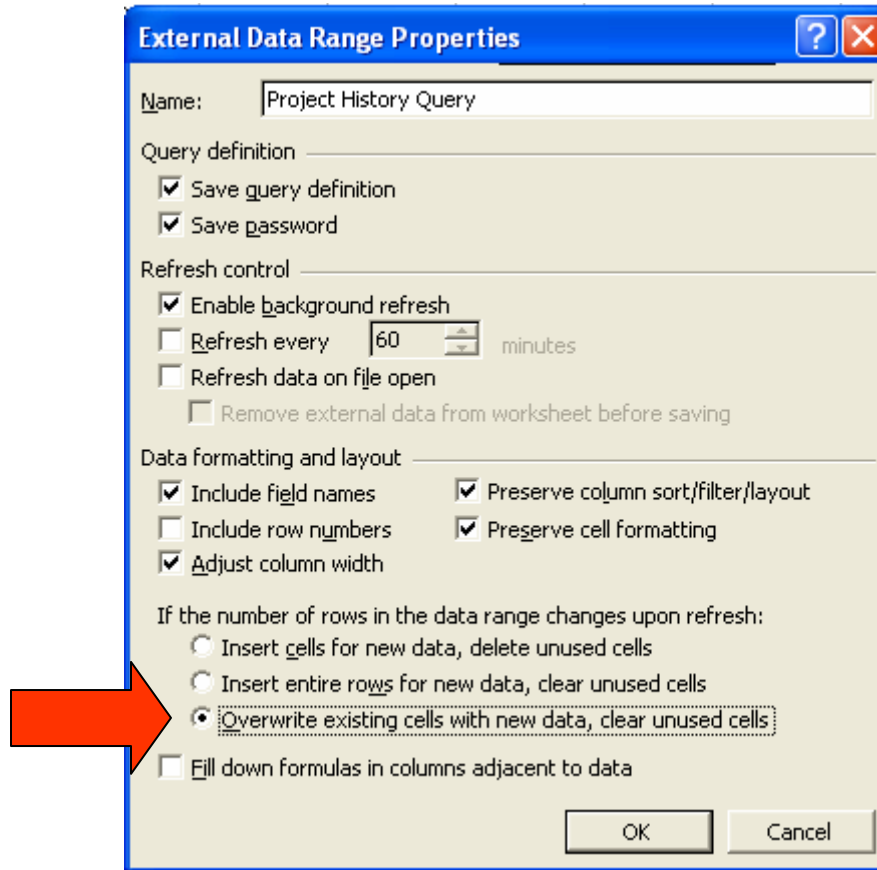
1. Enter a name (“Project History Query.dqy”) for this query.
2. Then click on the “Save” button.



Turn on the option to “Return Data to Microsoft Excel.”



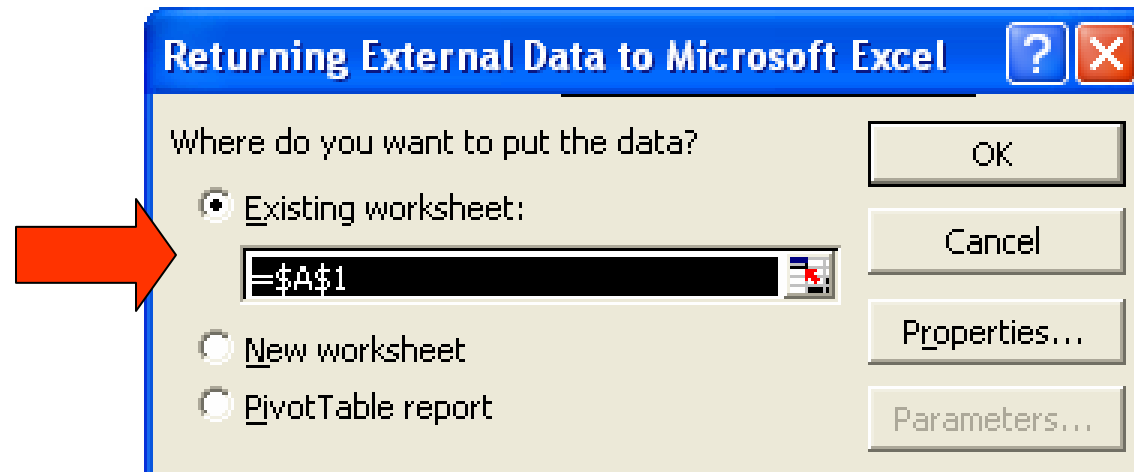
Click on the “Properties” button to set required data transfer options.



1. Turn on the option to “Overwrite existing cells with new data, clear unused cells.”

2. Click on the OK button.

1. Turn on the option to put the data in the “Existing worksheet (“History Table” worksheet)
2. Ensure that the queried data will be inserted into the worksheet, starting at \$A\$1.



3. Click on the OK button to complete the query setup.

End Of Query Set Up

Training Sections



Descriptions Of Tracking Reports



Initial Set Up of *PERCEPTION* History Table Database Query.



Initiating A Project History Tracking Analysis

Execute A Project History Tracking Analysis

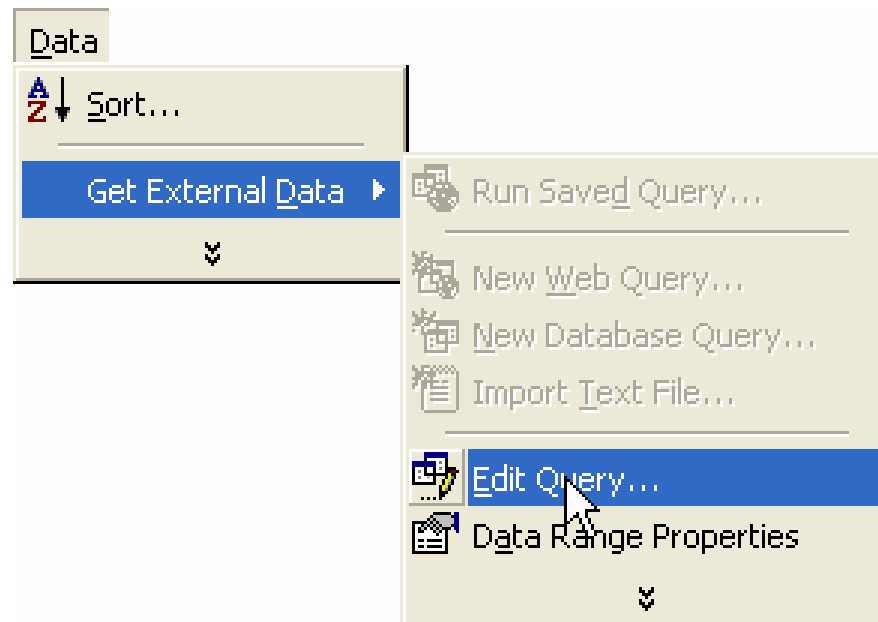
Once the query setup has been completed, the following procedure can be followed for selecting and reporting on any project managed in the *PERCEPTION* Database.

1. Open the Excel Tracking Template workbook named “TrackingEAC.xls”.

2. Open the “History Table” worksheet.

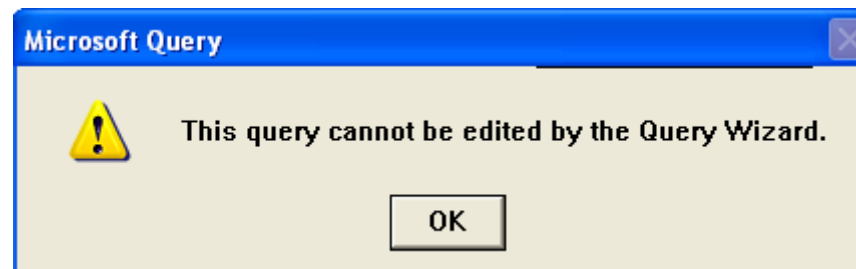
Note: The query set up requires that you have the “History Table” worksheet opened.

**Click on main menu of the worksheet selection to
“Edit Query.”**



Ignore error message.

Click OK.



System will display the previously-loaded project history table with “Criteria Field” and “Value” displayed.

Microsoft Query - [Project History Query]

File Edit View Format Table Criteria Records Window Help

SQL [Icons]

projhist

- * aheadwks
- ahours
- aldols
- amdols
- aodols

Criteria Field: proj
Value: '039'
or:

	contract_id	proj	ondate	bhours	bldols	bmdols	ahours	
▶	039	039	2003-07-11	0.00	0.00	0.00	0.00	0.00
	039	039	2003-08-12	0.00	0.00	0.00	78.00	966
	039	039	2003-08-15	0.00	0.00	0.00	105.25	130
	039	039	2003-08-19	0.00	0.00	0.00	120.75	147
	039	039	2003-08-21	0.00	0.00	0.00	142.75	176
	039	039	2003-08-22	0.00	0.00	0.00	164.25	205
	039	039	2003-08-31	0.00	0.00	0.00	231.00	287
	039	039	2003-09-02	0.00	0.00	0.00	251.00	310
	039	039	2003-09-09	91442.90	0.00	3126056.90	294.50	371
	039	039	2003-09-21	91442.90	0.00	3126056.90	774.38	105
	039	039	2003-09-24	91442.90	0.00	3126056.90	825.63	111

2. Then, click the “Query Now” button.



1. Change the “Value” of the project number to the one required for the tracking analysis.

The screenshot shows the Microsoft Query application window titled "Microsoft Query - [Project History Query]". The menu bar includes File, Edit, View, Format, Table, Criteria, Records, Window, and Help. The toolbar contains various icons for file operations, SQL execution, and data manipulation. A red arrow points to the "Query Now" button (represented by an exclamation mark icon) in the toolbar. Below the toolbar, a list box labeled "projhist" contains a search field with an asterisk and a list of field names: aheadwks, ahours, aldols, amdols, and aodols. Below the list box, a criteria field is set to "proj" with a value of "041". A red arrow points to this criteria field. At the bottom, a data table is displayed with the following columns: contract_id, proj, ondate, bhours, bldols, and bmdc. The table contains 14 rows of data, with the last row showing a contract_id of 039 and a bmdc value of 3126056.90.

contract_id	proj	ondate	bhours	bldols	bmdc
039	039	2003-07-11	0.00	0.00	0.00
039	039	2003-08-12	0.00	0.00	0.00
039	039	2003-08-15	0.00	0.00	0.00
039	039	2003-08-19	0.00	0.00	0.00
039	039	2003-08-21	0.00	0.00	0.00
039	039	2003-08-22	0.00	0.00	0.00
039	039	2003-08-31	0.00	0.00	0.00
039	039	2003-09-02	0.00	0.00	0.00
039	039	2003-09-09	91442.90	0.00	3126056.90
039	039	2003-09-21	91442.90	0.00	3126056.90
039	039	2003-09-24	91442.90	0.00	3126056.90
039	039	2003-09-25	91442.90	0.00	3126056.90

2. Click the “Return Data” button



1. The system will then retrieve the new project's history data.

The screenshot shows the Microsoft Query interface for a 'Project History Query'. A red arrow points to the 'Return Data' button in the toolbar. The 'Criteria Field' is set to 'proj' with a value of '041'. The resulting data table is as follows:

	contract_id	proj	ondate	bhours	bldols	bmdols
▶	041	041	2003-07-22	49060.92	760444.26	1440637.31
	041	041	2003-07-23	50406.47	781300.25	1440637.31
	041	041	2003-07-24	50406.47	781300.25	1440637.31
	041	041	2003-07-25	50406.47	781300.25	1440637.31
	041	041	2003-07-28	50406.47	781300.25	1440637.31
	041	041	2003-07-29	50406.47	781300.25	1440637.31
	041	041	2003-07-30	50406.47	781300.25	1440637.31
	041	041	2003-07-31	50406.47	781300.25	1439921.81
	041	041	2003-08-04	50406.47	781300.25	1439921.81
	041	041	2003-08-06	50406.47	781300.25	1439921.81
	041	041	2003-08-08	50406.47	781300.25	1439921.81
	041	041	2003-08-12	50406.47	781300.25	1439921.81
	041	041	2003-08-13	50406.47	781300.25	1439921.81
	041	041	2003-08-15	50406.47	781300.25	1439921.81

The resulting reports are found on the following two worksheets:

“Graph Progress”

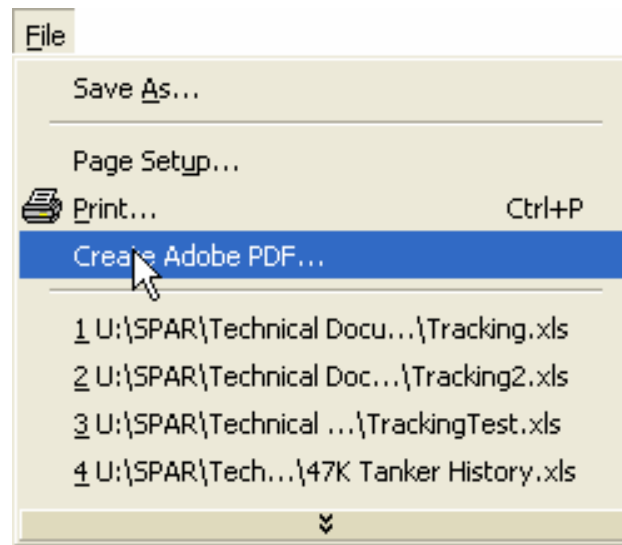
- Comparing Progress Figures
- Tracking Schedule Variance In Weeks
- Forecasting Finish Date
- Tracking Schedule Variance in Man-Days
- Tracking Schedule Variance in Labor Hours

“Graph EACs”

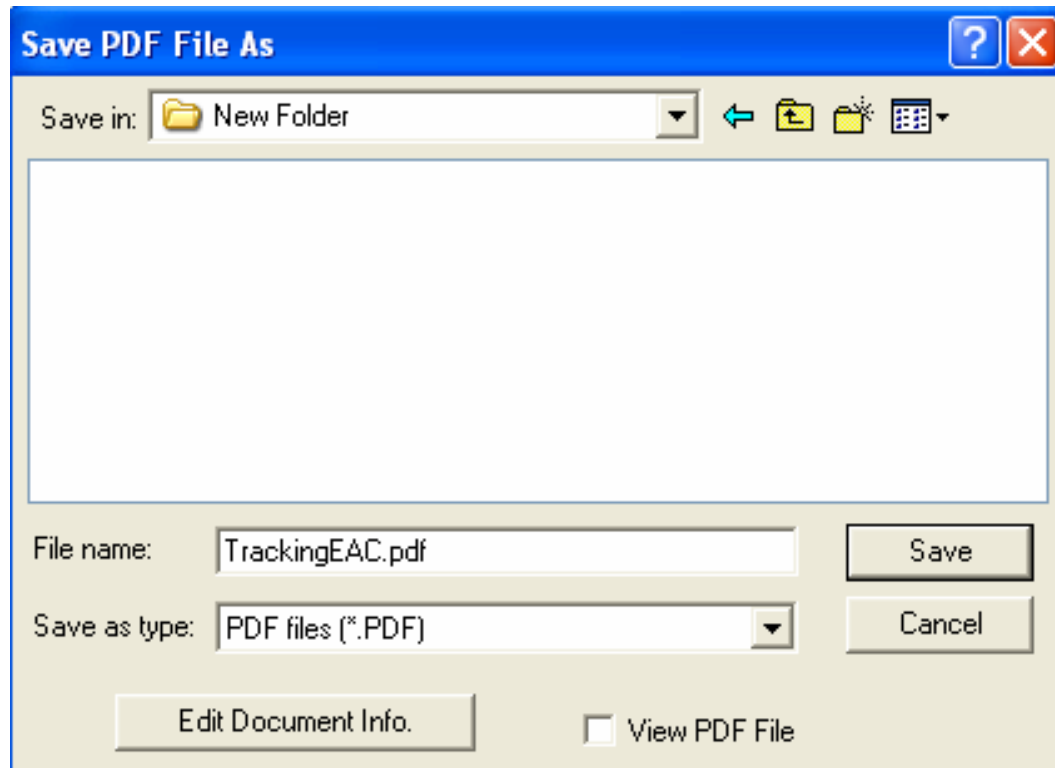
- Tracking Costs: BAC, EAC, ACWP, BCWS & BCWP & Trend
- Tracking & Comparing Various EACs
- Forecasting Labor Hour Variance

To email these reports, output them to Acrobat PDF Writer:

Open a report worksheet and click on *File/Create Adobe PDF*



**Identify a PDF file name and directory to store it.
Then click on *Save*.**



This file then can be emailed and/or printed directly.

End Of Tutorial

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