

Plan Performance Index as a Measure of Schedule Deviation and Performance



UNC CHARLOTTE

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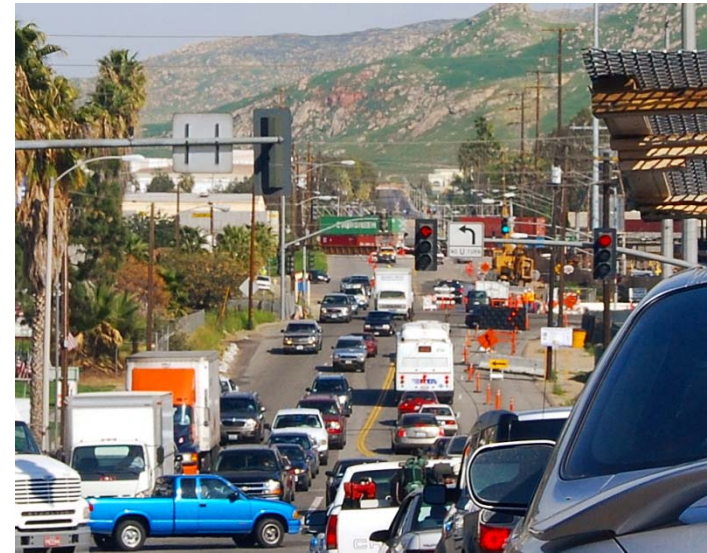
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Transportation Construction

DOTs across the country are:

- Completing an increased number of 3R projects under significant traffic volumes
- Resulting in:
 - Increased safety risks:
(workers & traveling public)
 - Increased traffic delays



Why Require a Schedule?

Owner uses a construction schedule

- To ensure the Contractor has a plan that conforms to the contract requirements
- To understand the extent and timing of their obligations
- As a datum for measuring progress
- As a framework for quantifying impacts

Measuring Progress

- Monitor progress based on the value of work completed
- “Unsatisfactory progress” defined as a fixed percentage behind a baseline schedule
- Lack an objective & quantitative means for contractually requiring a schedule revision



Schedule Control Systems

Plan and Schedule

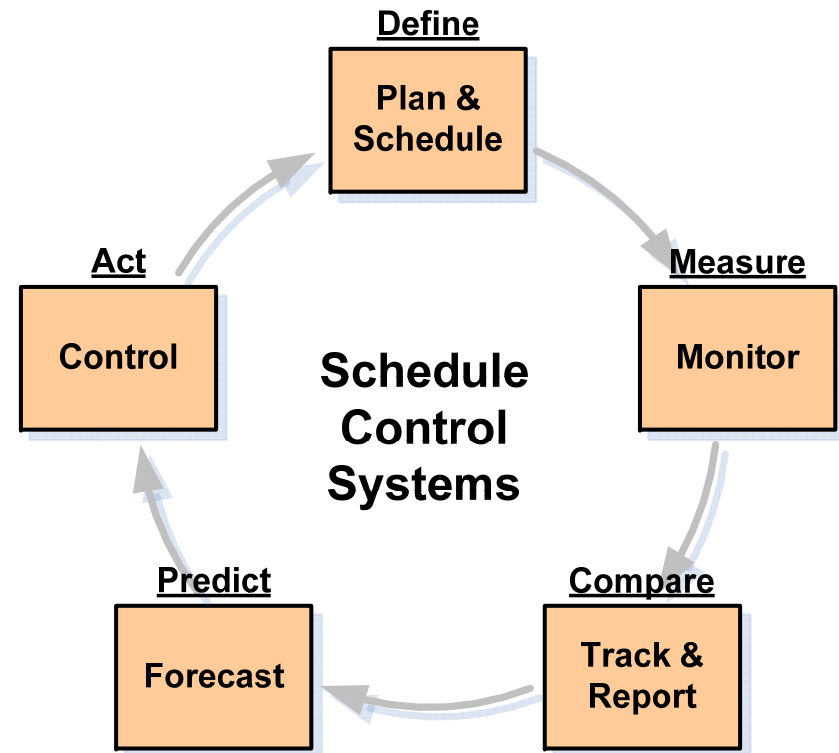
- Value loaded baseline schedule
- BCWS curve

Monitor

- Measure field progress
- Calculated BCWP

Track and Report

- Schedule Variance
- Schedule Performance Index



Schedule Control Systems

Control methods are predicated on the assumption that

The Work performed

is essentially the same as

The Work scheduled

When Should We Re-Baseline?

Never – “the baseline is the baseline”

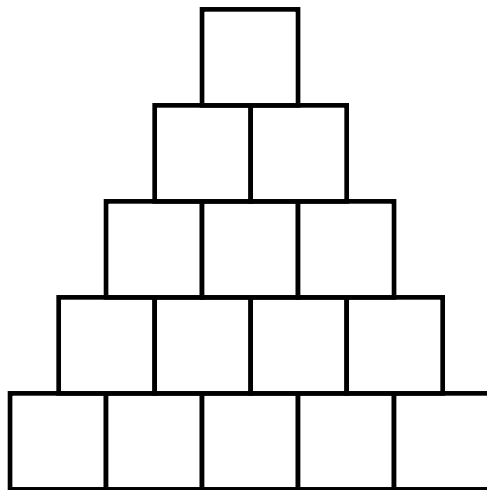
Change – to incorporate an approved change

Objectively – based on an objective measure

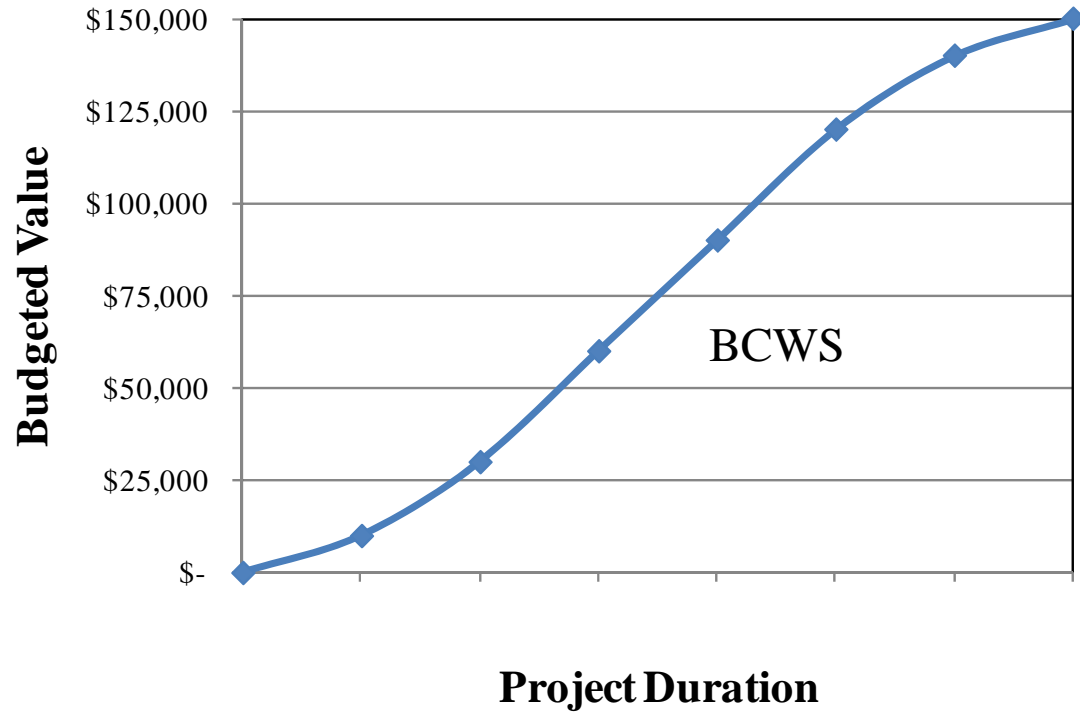
Monthly – Every update a Re-Baseline



What if...



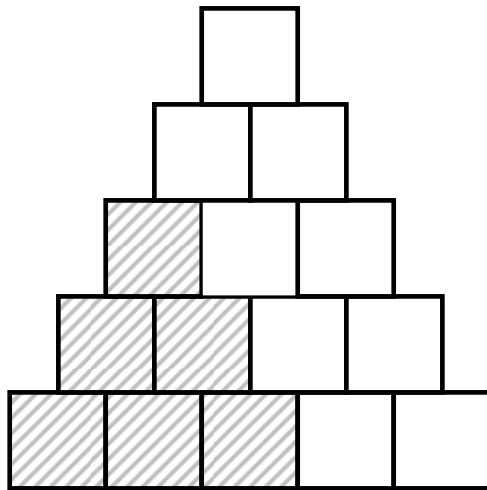
The Work



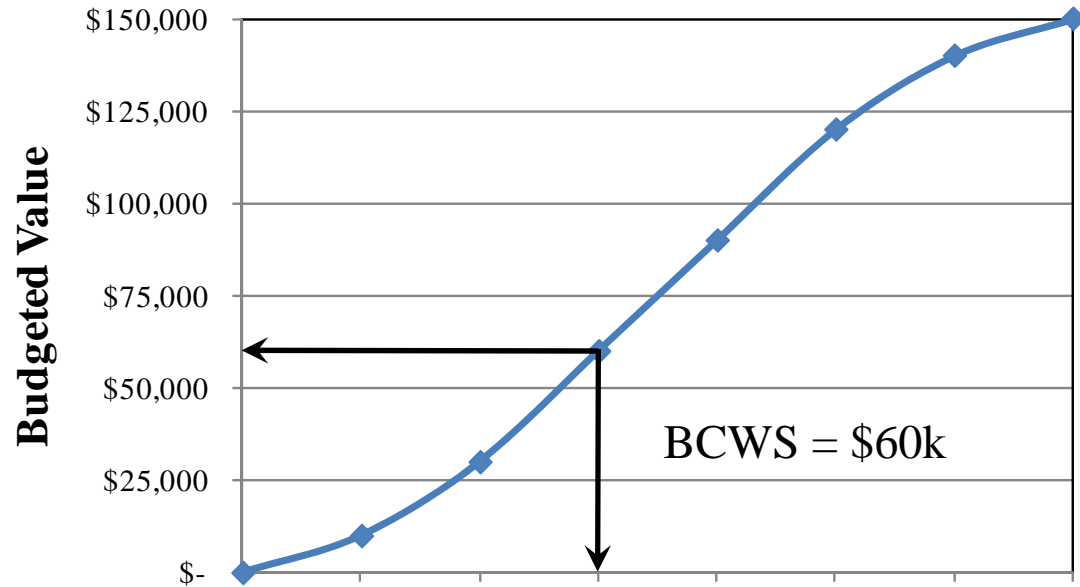
Planned Progress

What if...

In 3 months time...



The Work

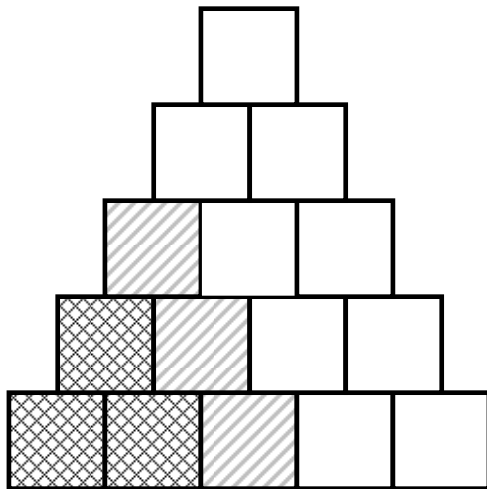


Project Duration

Planned Progress

What if...

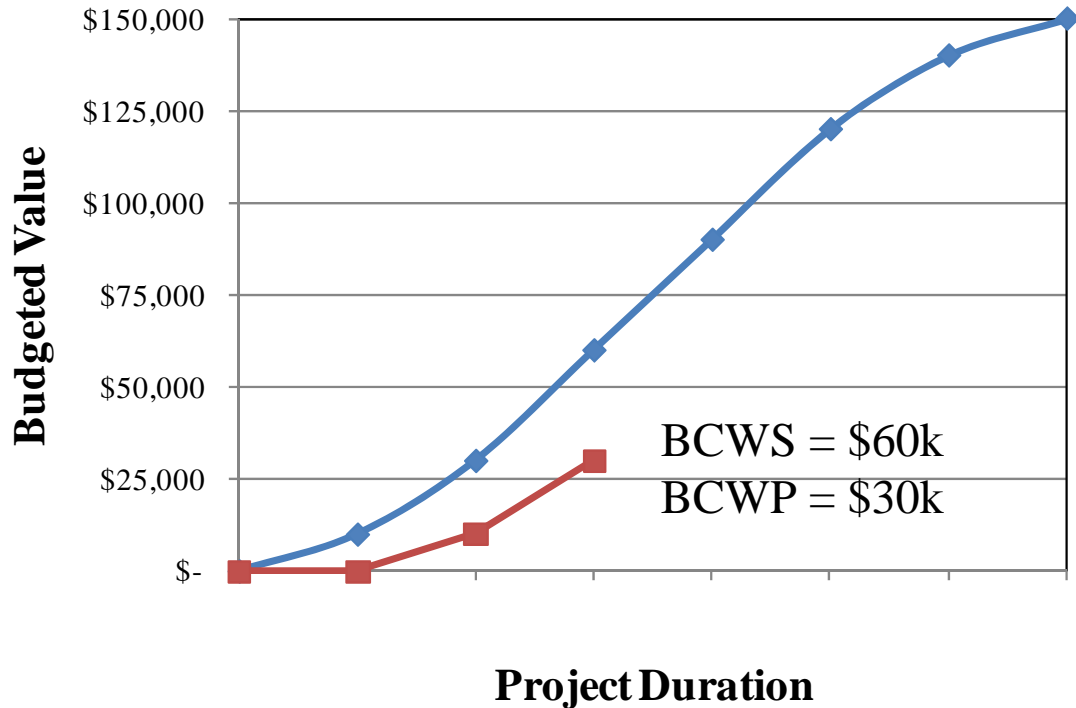
After 3 months time...



The Work

$$SV = -\$30k$$

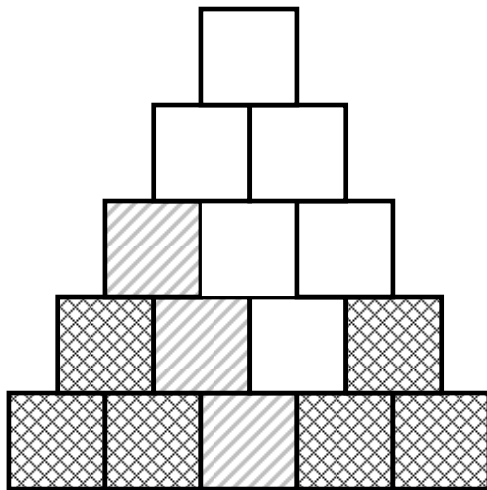
$$SPI = 0.50$$



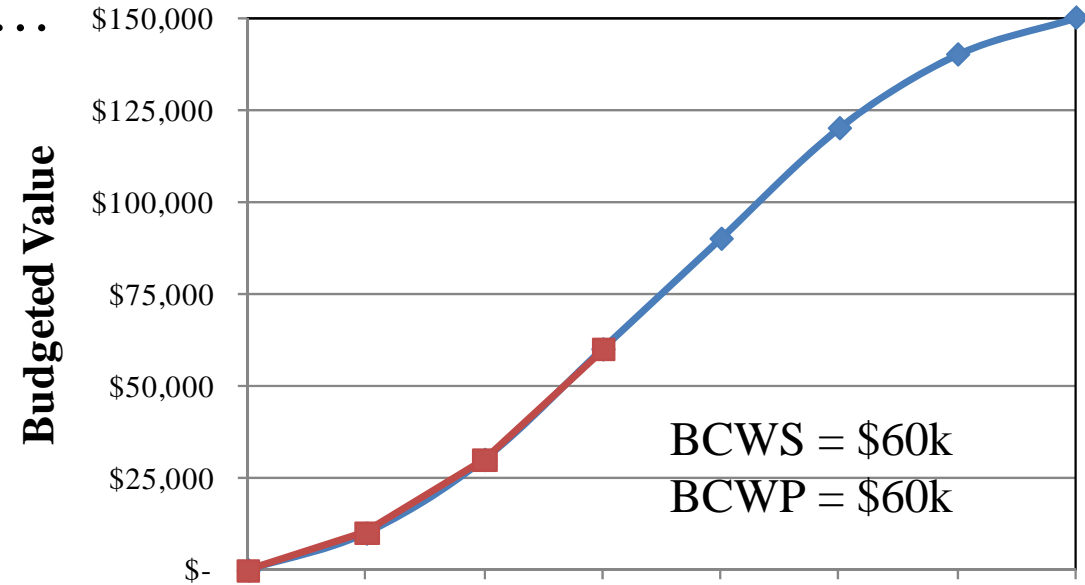
Planned Progress

What if...

But what if after 3 months...



The Work



Project Duration

$$SV = \$0k$$

$$SPI = 1.00$$

Planned Progress

A Concept...

Augment the control system with:

- Budgeted Cost of Scheduled Work Performed

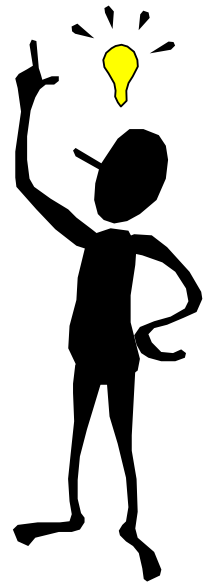
BCSWP = Budgeted value of the scheduled work actually completed

- Plan Variance

$PV = BCSWP - BCWS$

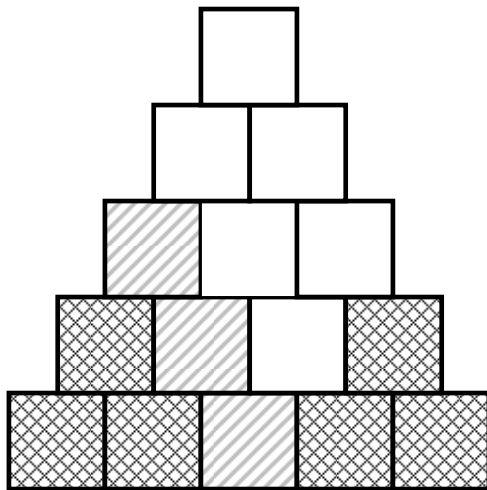
- Plan Performance Index

$PPI = BCSWP / BCWS$



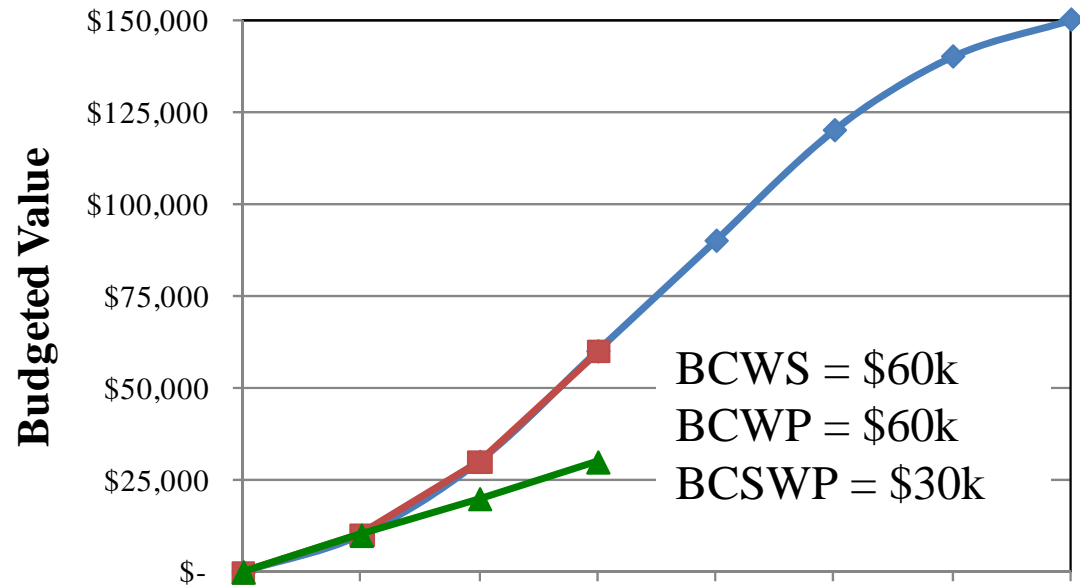
What if...

Now after 3 months...



The Work

$SV = \$0k$ $PV = \$30k$
 $SPI = 1.00$ $PPI = 0.5$



Project Duration

Planned Progress

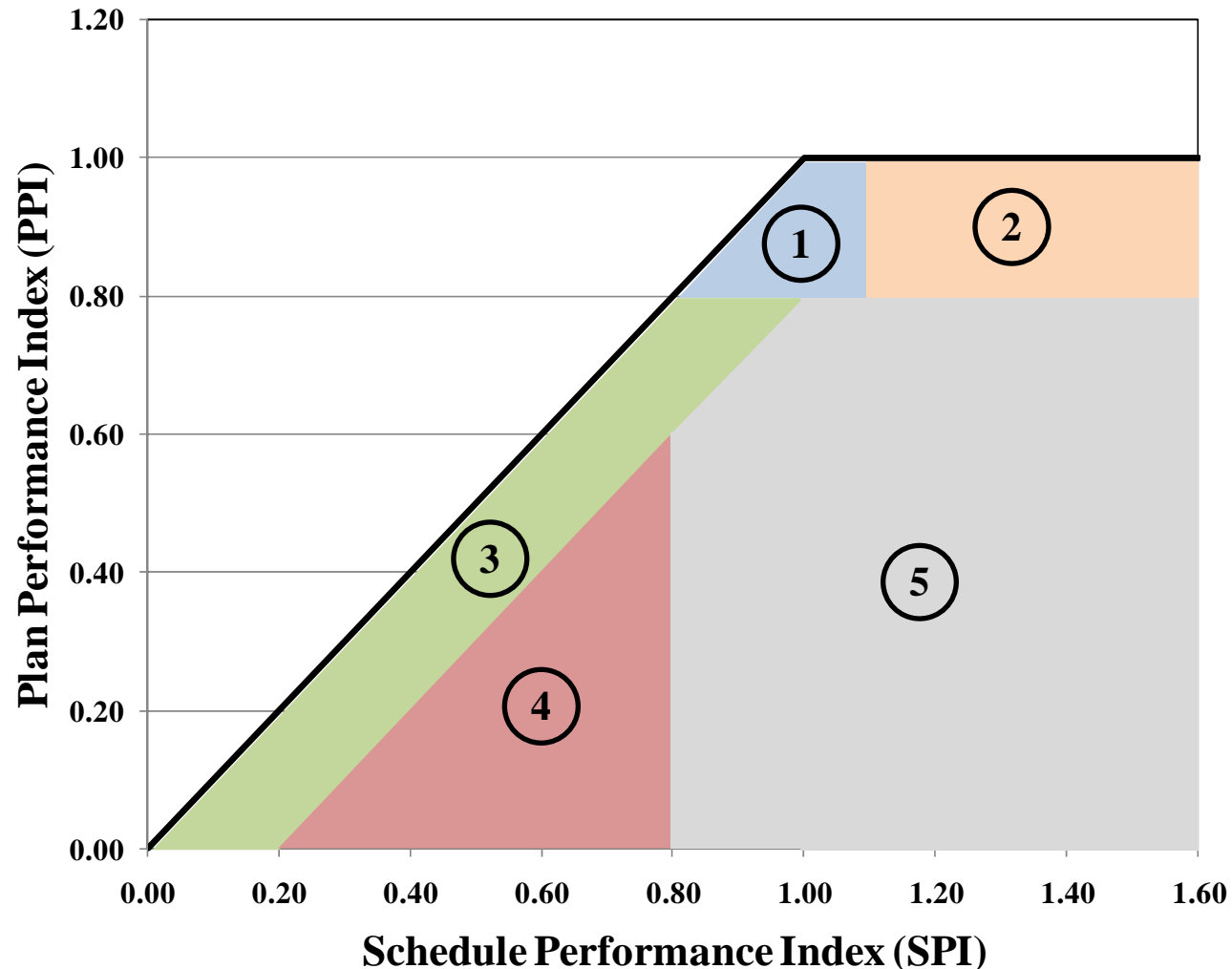
What does it mean?

	PPI Near 1	PPI << 1
SPI > 1	Progressing well along the baseline plan. Progress status is <u>Good</u> .	Progressing well along a plan, but not the baseline plan. Progress status <u>undeterminable</u> without a plan/schedule revision.
SPI < 1	Progressing slowly along the baseline plan. Progress status is <u>Poor</u> .	Progressing slowly along a plan, but not the baseline plan. Progress status <u>undeterminable</u> without a plan/schedule revision.

What does it mean?

Boundaries are approximate

1. On Plan, On Schedule
2. On Plan, Ahead of Schedule
3. On Plan, Behind Schedule
4. Off Plan, Behind Schedule (?)
5. Off Plan, On Schedule (?)



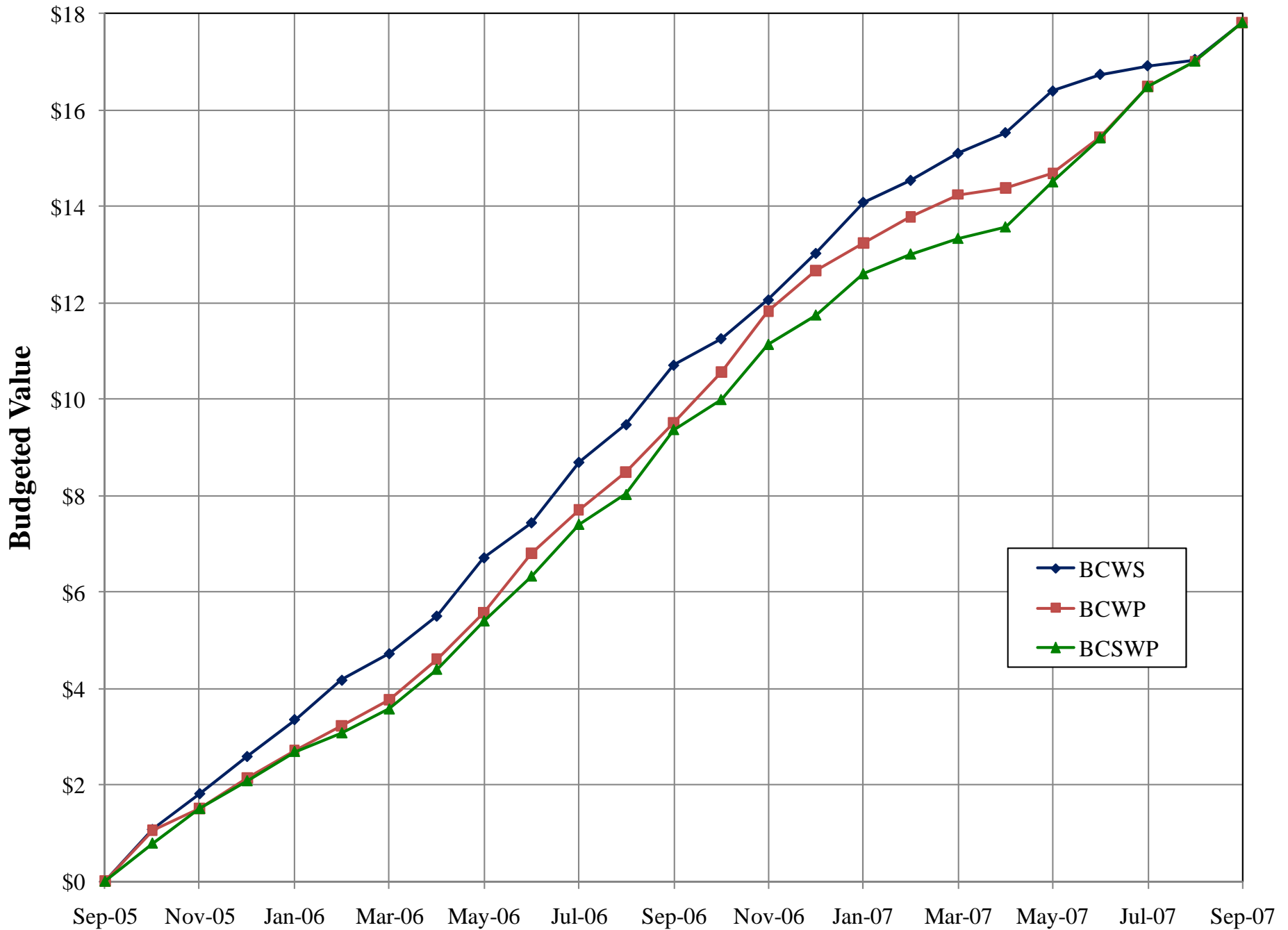
Case Study

- \$17.8M transportation project
 - 3 Bridges, approaches, & appurtenances
- 24 month construction duration
- “Resource” loaded schedules
 - Bid items & unit bid prices
- Baseline and Final schedule update
- Completed on-time and on-budget

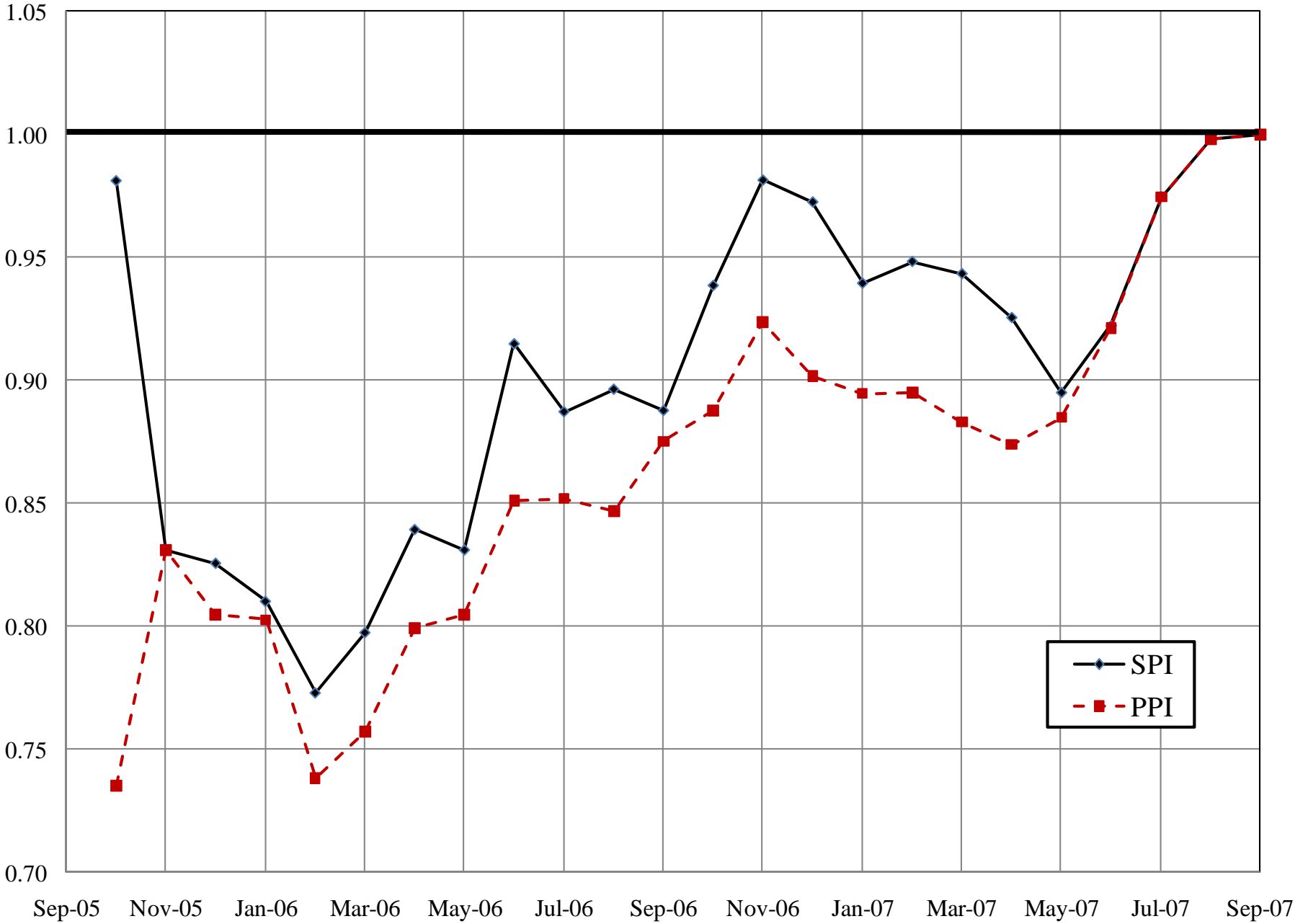


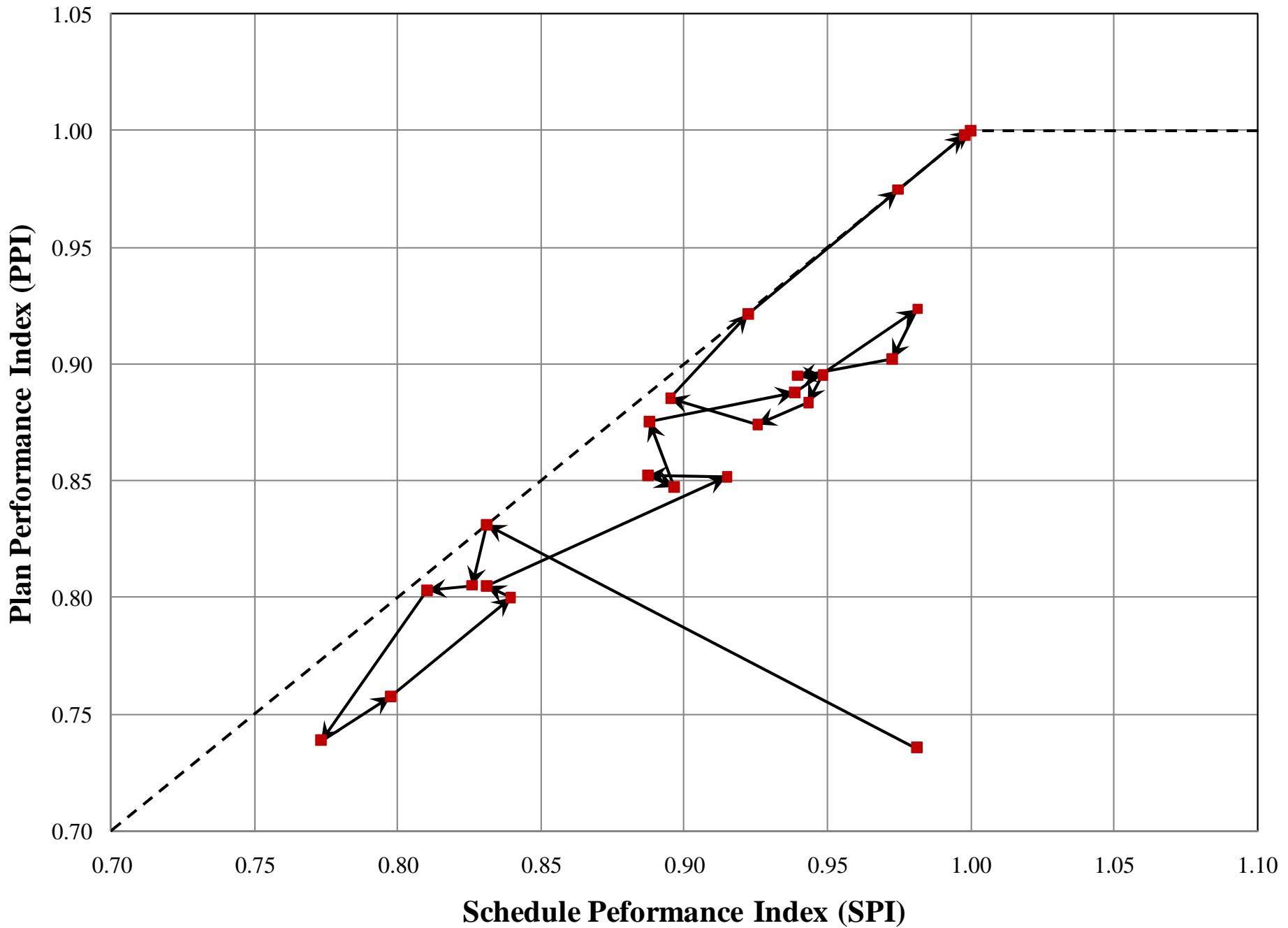
Progress Metrics

- BCWS
 - Linearly distributed activity value over scheduled working days from baseline schedule
- BCWP
 - Linearly distributed activity value over actual working days from final schedule update
- BCSWP
 - For each activity in each month, BCSWP is minimum of BCWS and BCWP



Schedule / Performance Index





Conclusions

- The baseline plan was effective:
 - completed the project on-time
 - held fast to the plan, even when behind schedule
 - especially when falling behind
- PPI values provided reassurance when SPI values were low



Conclusions

- No need for “additional” schedule information
- Schedule loaded with value
 - Bid item quantities
 - Unit bid prices
 - Budgeted value of work scheduled per period
- Regular schedule updates
 - Budgeted value of work performed per period

Conclusions

- Plan performance metrics can:
 - provide additional insight into the meaning of SPI and SV metrics
 - be applied during construction to identify deviation from baseline plan
 - quantify deviation from the baseline plan
 - form a quantitative and objective contractual vehicle for triggering a schedule revision

Thank you



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