

Analyzing Schedule Impacts Using The Half-Step Schedule Analysis Methodology On Projects Where Lost Time Was Recovered Through Schedule Mitigation

September 26, 2023
12:10 PM – 12:45 PM



Agenda

- Introduction
- Overview
- Retrospective Schedule Observations
- Half-Step Schedule Analysis Methodology
- Half-Step Prospective Approach
- Wrap Up

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Introduction

- Education
 - B.S. Construction Management Engineering Technology, UNC Charlotte
 - M.S. Construction and Facilities Management, UNC Charlotte
- Certifications
 - Planning and Scheduling Professional (PSP) – AACE
- 10+ Years Experience
 - Proactive: Scheduling, Time Extensions, Risk and Change Analysis, Project Controls, Dispute Resolution
 - Forensic Analysis: Scheduling, Changes, Evaluation of Delays, Acceleration, Productivity, Cost

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Contractual Requirements

- Critical Path Method (CPM) Schedule requirement
 - Dependent upon project size, value, complexity
 - Initial baseline schedule development and monthly schedule updates
- Owner's Schedule Performance Evaluation
 - What happens if a contractor falls behind schedule?
 - Timely notice and properly supported time extension request
 - Detailed recovery plan and recovery schedule
 - Preliminary Notice of Default ("NOD") by Owner

Contractual Requirements – Example 1

- VDOT SP108 – Progress Schedules¹



2. Progress Evaluation and Unsatisfactory Performance

A. **Progress Deficiency and Schedule Slippage** – The Engineer will assess the current status of the Work each month, based on the monthly Update Progress Schedule submission, and relative to the SOR. The Contractor's actual progress may be considered unsatisfactory, as determined by the Engineer, if any of the following conditions occur:

- (1) The Actual Progress Percent Complete for Work completed to date, based on the current estimate, falls behind the Baseline Cumulative Progress Percent Complete by more than ten (10) percent, relative to the SOR.
- (2) A Contract milestone or the Project Completion Date is currently projected to complete more than twenty-one (21) days after the date specified in the Contract, as applicable.

¹ Source: VDOT Special Provision (SP108) for Progress Schedules - Category II Projects, dated March 21, 2022

Contractual Requirements – Example 1

- VDOT SP108 – Progress Schedules¹



B. Notice of Unsatisfactory Performance – When the Engineer determines that actual progress of the Work is unsatisfactory, the Engineer will issue a written notice of unsatisfactory performance to the Contractor. The Engineer will also advise the Contractor that five (5) percent retainage of the monthly progress estimate is being withheld and will continue to be withheld as described in Section 109.08(c), for each month the Contractor's actual progress is remains unsatisfactory. Within fourteen (14) days from the date of receipt of the Engineer's notice, the Contractor shall respond by submitting a written statement describing any actions taken or proposed by the Contractor to correct the progress deficiency. If the Contractor's response includes a proposed recovery plan, the current Project Schedule shall be modified accordingly to reflect the Contractor's proposed recovery plan. The Contractor may submit to the Engineer a written explanation along with supporting documentation to establish that such delinquency is attributable to conditions beyond its control. If the Engineer accepts the Contractor's recovery plan, the modified Project Schedule showing the recovery plan will be considered the current Update Schedule and will not replace the SOR.

If the Contractor fails to respond within the time required, or the response is unacceptable, its prequalification status may be changed as provided in Section 102.01 of the Specifications, and the Contractor may be temporarily disqualified from bidding on contracts with the Department as provided in Section 102.08, if progress remains unsatisfactory at the time of preparation of the next monthly progress estimate. The Engineer may delay these actions when a Contract time extension is under consideration.

¹ Source: VDOT Special Provision (SP108) for Progress Schedules - Category II Projects, dated March 21, 2022

Contractual Requirements – Example 2

- SCDOT SP– Construction Schedules¹



Contracts with a CPM – Level II and III Schedule:

Monthly CPM updates are required for contracts with a CPM Level II or Level III schedule requirement as defined under **Submission, Review and Acceptance Process**. The contractor shall update actual completed quantities and physical percent complete (% of work complete for the activity) for all activities impacted during the most recent estimate period.

Budgeted cost of the work performed (Earned Value) from the schedule update and budgeted cost of work planned (Planned Value) from the accepted baseline schedule are used to determine project variance in Primavera utilizing Schedule Variance Index (SVI). The calculation used by Primavera is:

$$\text{Schedule Variance Index (SVI)} = (\text{Earned Value} - \text{Planned Value}) / \text{Planned Value}$$

Where $\text{SVI} < -0.10$, the contract is considered to be slipping behind plan.

¹ Source: SCDOT Special Provision (SP) for Construction Schedules - Level 2 & 3 Schedules, dated November 4, 2013

Contractual Requirements – Example 2

- SCDOT SP– Construction Schedules¹



Level II or III Schedules:

In any estimate period where the SVI is $(-0.20, -1.0]$ as defined under: **Contracts with a CPM – Level II and III Schedule:**

First Offense:

- PND w/o bonding notification
- Request recovery plan

Second Offense:

- PND w/bonding notice
- Request recovery plan
- Hold PND to monitor recovery plan. If plan not met, move to delinquency

If significant contract changes are necessary, and upon approval by the SCDOT, a **re-baseline** to the initial CPM will be allowed per the CPM schedule specification and the payout schedule may be adjusted accordingly.

¹ Source: SCDOT Special Provision (SP) for Construction Schedules - Level 2 & 3 Schedules, dated November 4, 2013

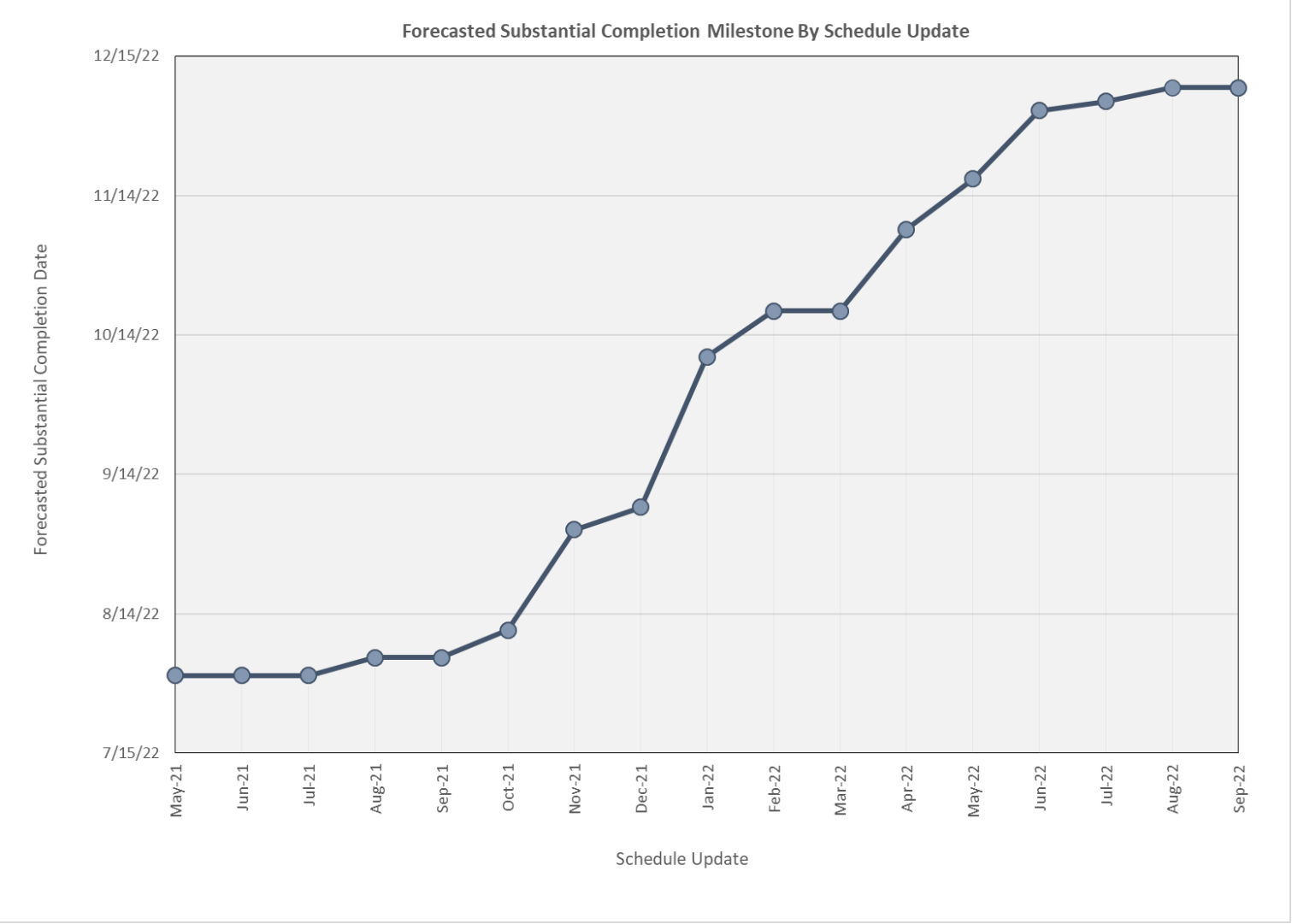
Consequences of a Late Schedule

- Withholding of monthly progress payments due
- Withholding of liquidated damages
- Changes to Contractor's prequalification status resulting in disqualification from bidding on future contracts
- Notice of Delinquency to Contractor's bonding company
- Notice of Default / Breach of Contract, potentially leading to termination

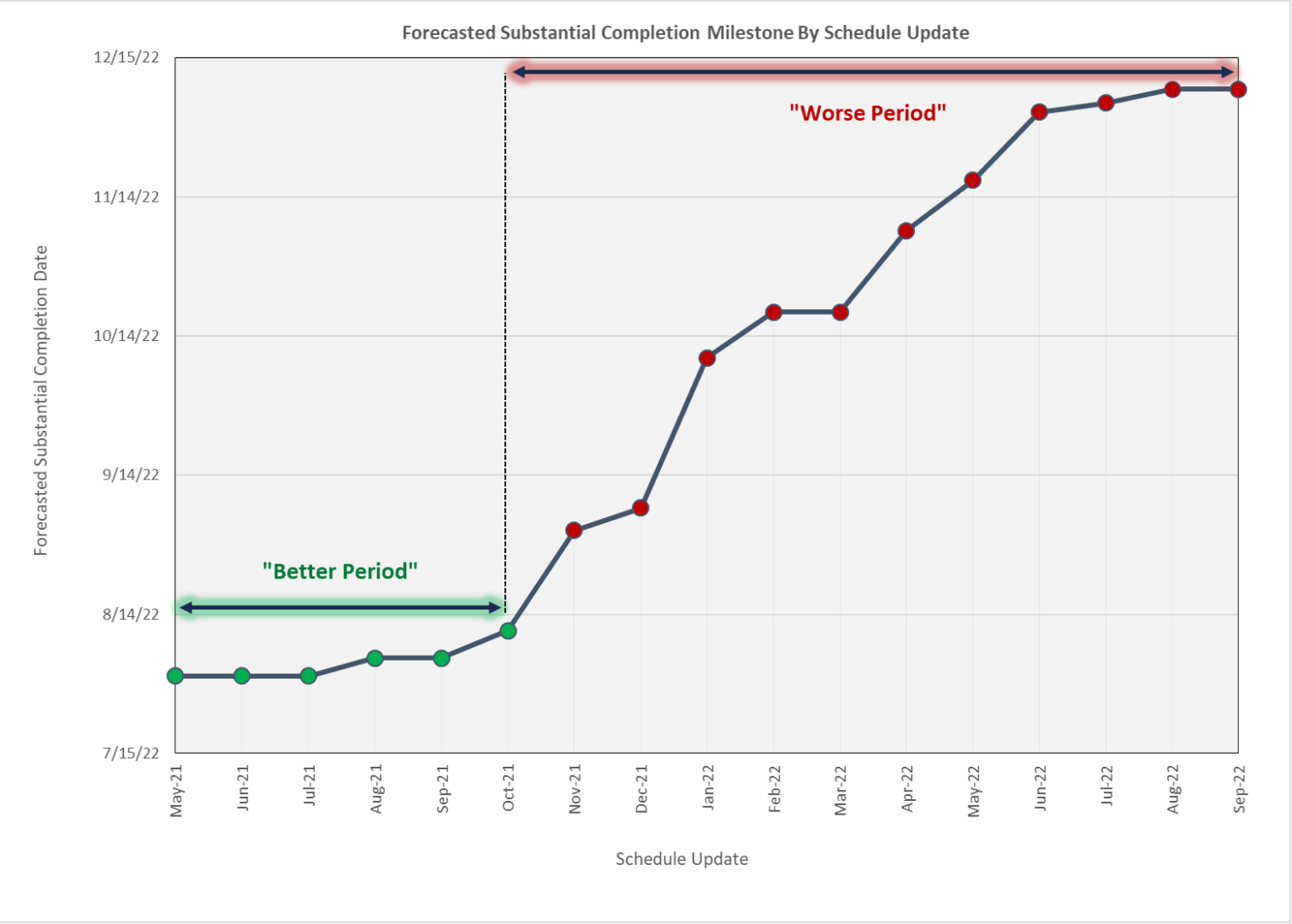
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Retrospective Schedule Observations

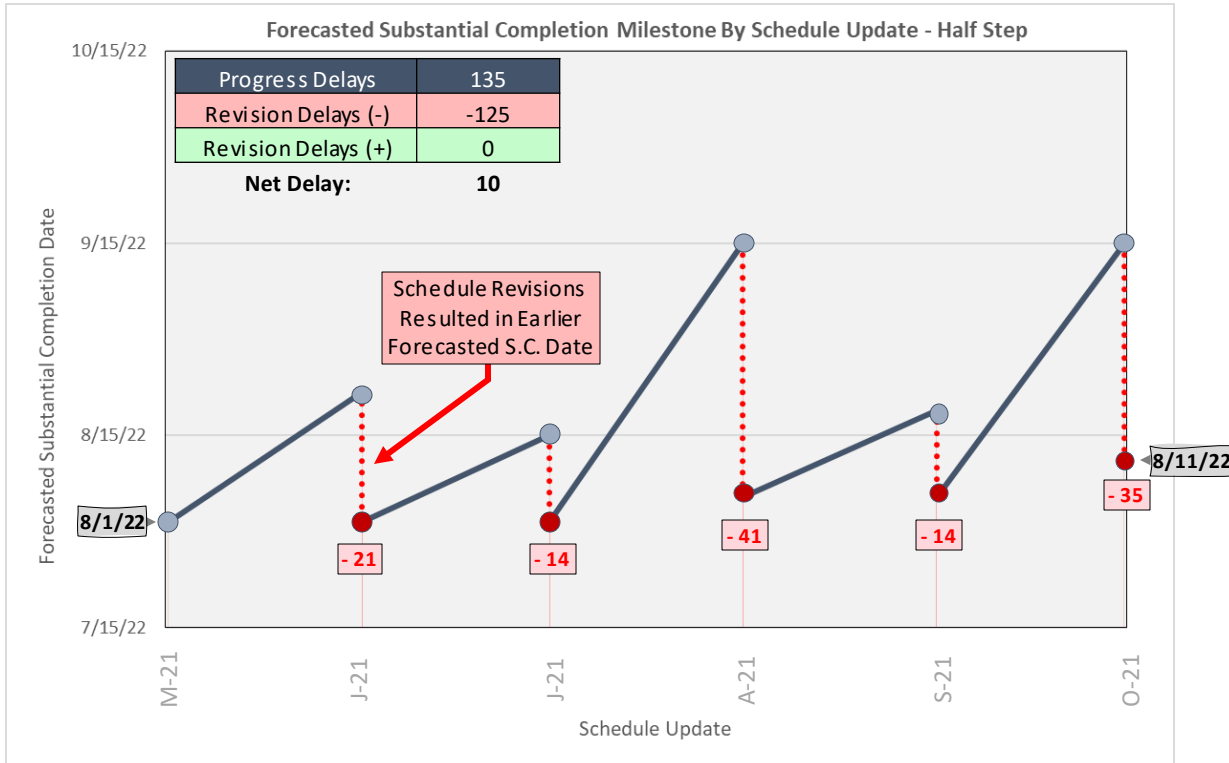
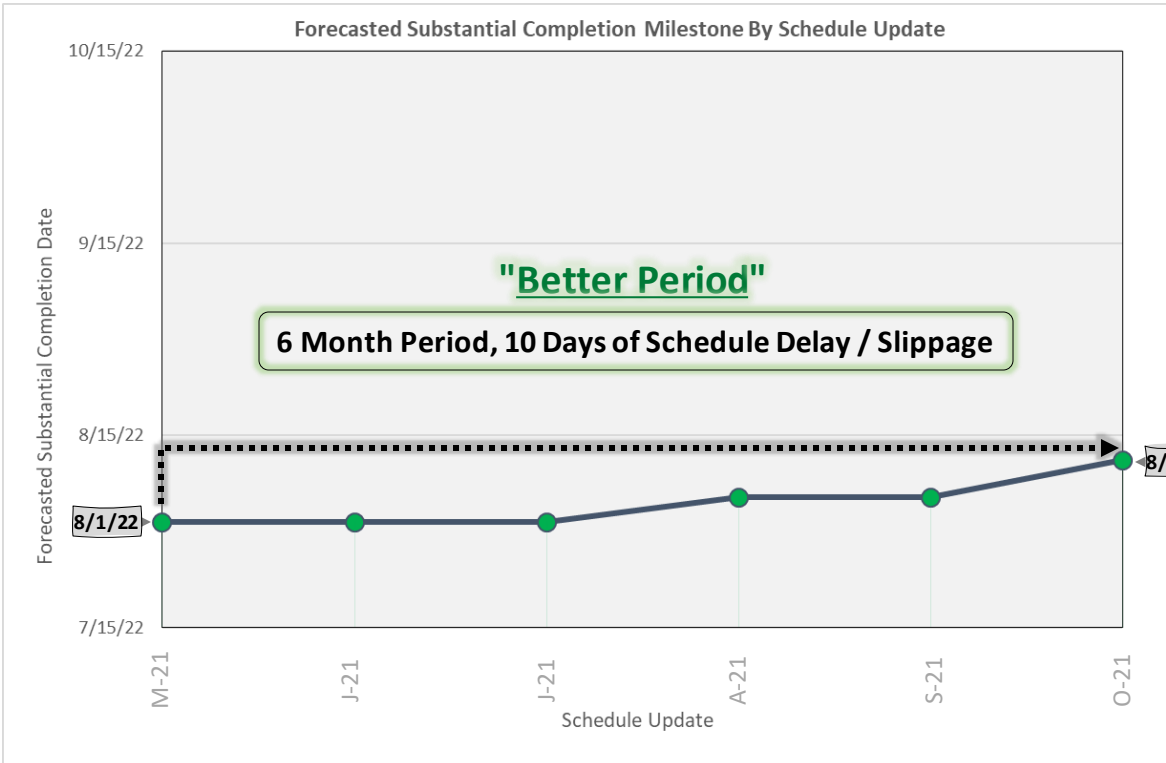


Retrospective Schedule Observations



Retrospective Schedule Observations

- “Better Period” with minimal delay is misleading



Retrospective Schedule Observations

- Due to the Contract provisions, the contractor inevitably implements schedule revisions or re-baselines the schedule to maintain schedule compliance and/or mitigate schedule delays
- As a result, two challenges arise:
 1. Contractor unsure how to pursue schedule delays that were previously mitigated
 2. Contractor believes delays have occurred, but the schedule critical path says otherwise and points to another delay event or party

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Half-Step Schedule Analysis Methodology

- AACE RP 10S-90: Cost Engineering Terminology

HALF-STEP/DUAL-TRACKING SCHEDULE UPDATES – Half-step, also known as dual-tracking, is a schedule update maintenance method designed to isolate the effect of actual progress in an update period from changes made to the CPM schedule itself. See also: SCHEDULE UPDATE. (June 2018)

- AACE RP 29R-03: Forensic Schedule Analysis
 - Method Implementation 3.4: Observational / Dynamic / Contemporaneous Split
 - Bifurcation split of pure progress versus non-progress revisions (schedule revisions)

Half-Step Schedule Analysis Methodology

- AACE RP 29R-03 MIP 3.4: Observational / Dynamic / Contemporaneous Split
- **Retrospective** technique that uses project schedule updates to quantify the loss or gain of time
- **Observational** technique, no insertion or deletion of delays, observes schedule behavior based on unaltered, existing schedule logic
- **Dynamic** method due to logic revisions which may have changed from previous schedule updates
- **Split** – updates are evaluated after bifurcating pure progress from non-progress revisions

Half-Step Schedule Analysis Methodology

- Pure-progress
 - Actualization of start and finish dates of an activity and reduction of remaining duration
- Non-progress schedule revision types:
 - Addition, deletion or revision to activities
 - Addition, deletion or revision to schedule logic (including revisions to lead or lag values)
 - Addition, deletion or modified project or activity level constraints
 - Changes to original duration for activities that have not started
 - Changes to remaining duration for activities that have started
 - Changes to calendar assignments
 - Changes to network calculation options within software

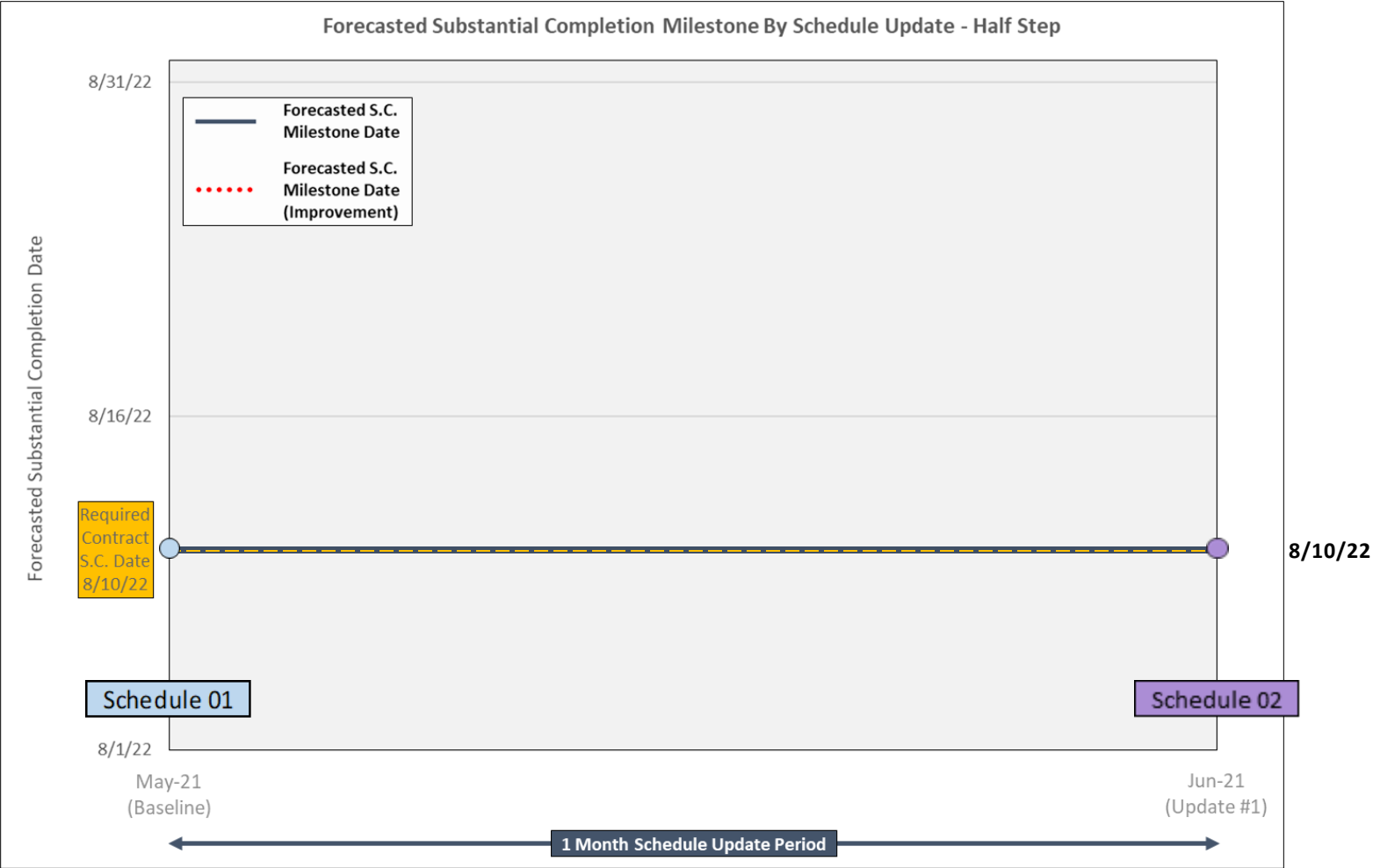
Half-Step Schedule Analysis Methodology

- Terminology

- Schedule 01 – Previous schedule (earlier data date)
- Schedule 02 – Current schedule (later date date)
- Schedule H1 – Half Step schedule
 - Schedule 01 updated with progress data from Schedule 02 and recalculated

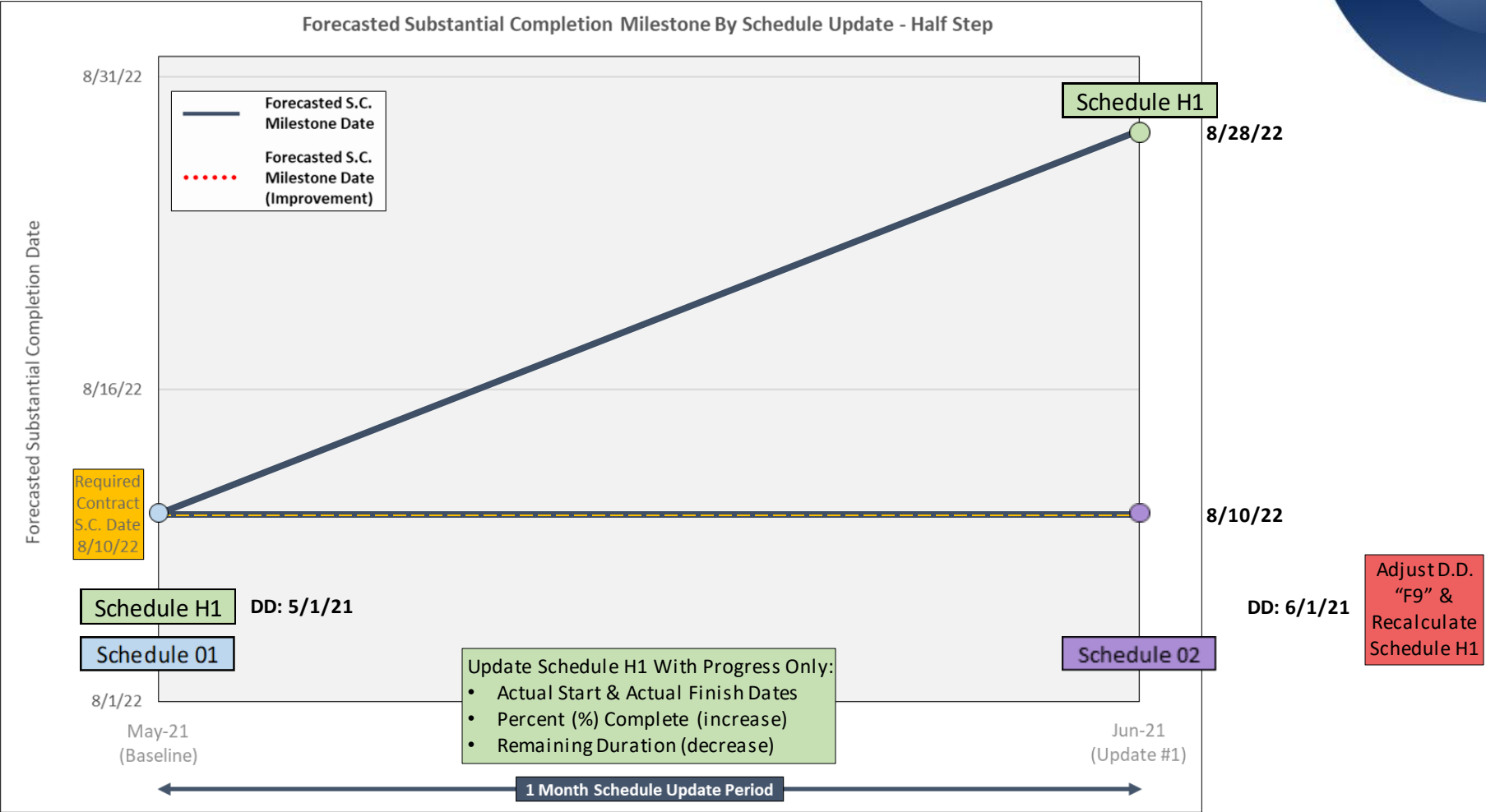
Half-Step Schedule Analysis Methodology

Example



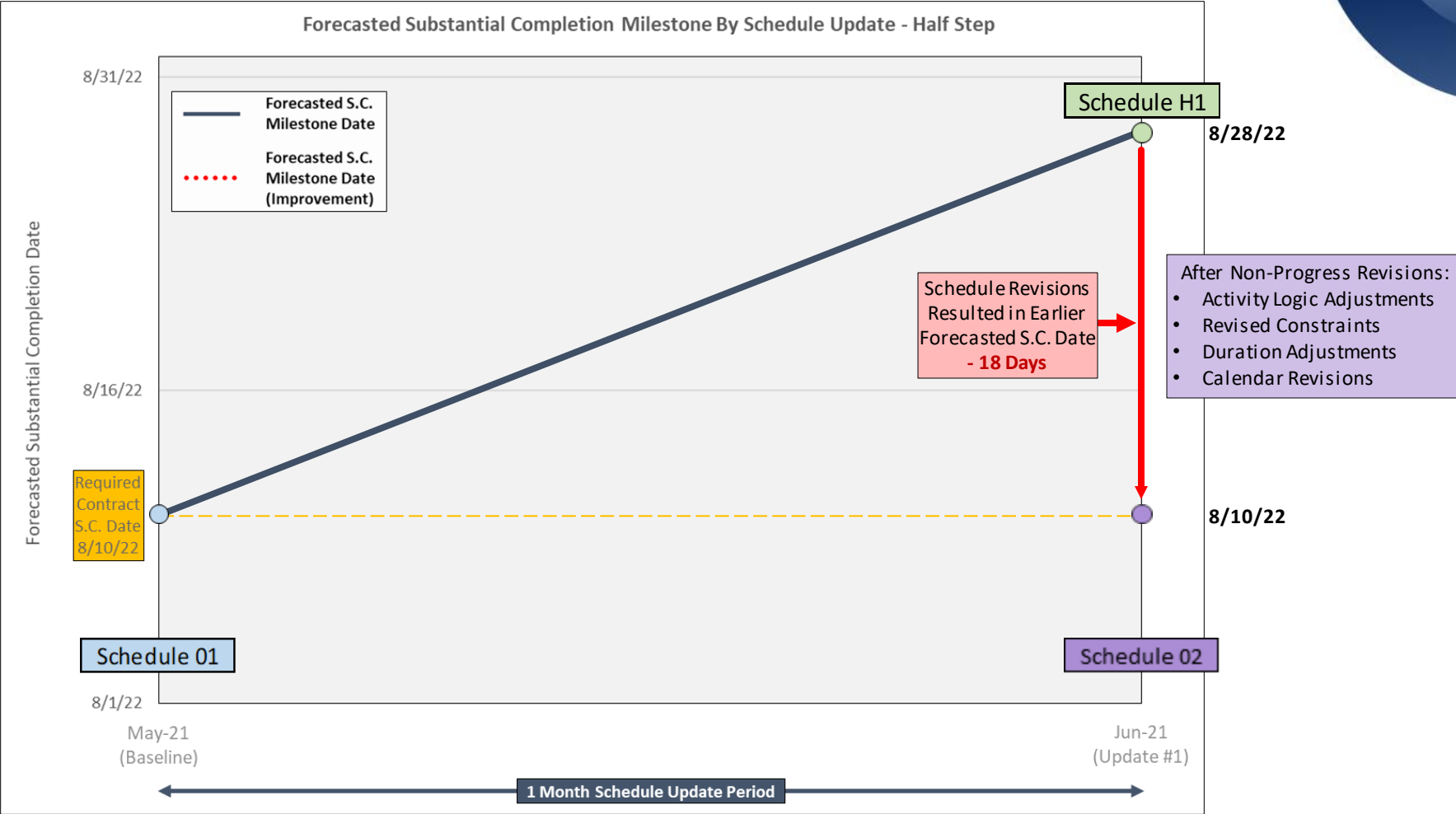
Half-Step Schedule Analysis Methodology

Example



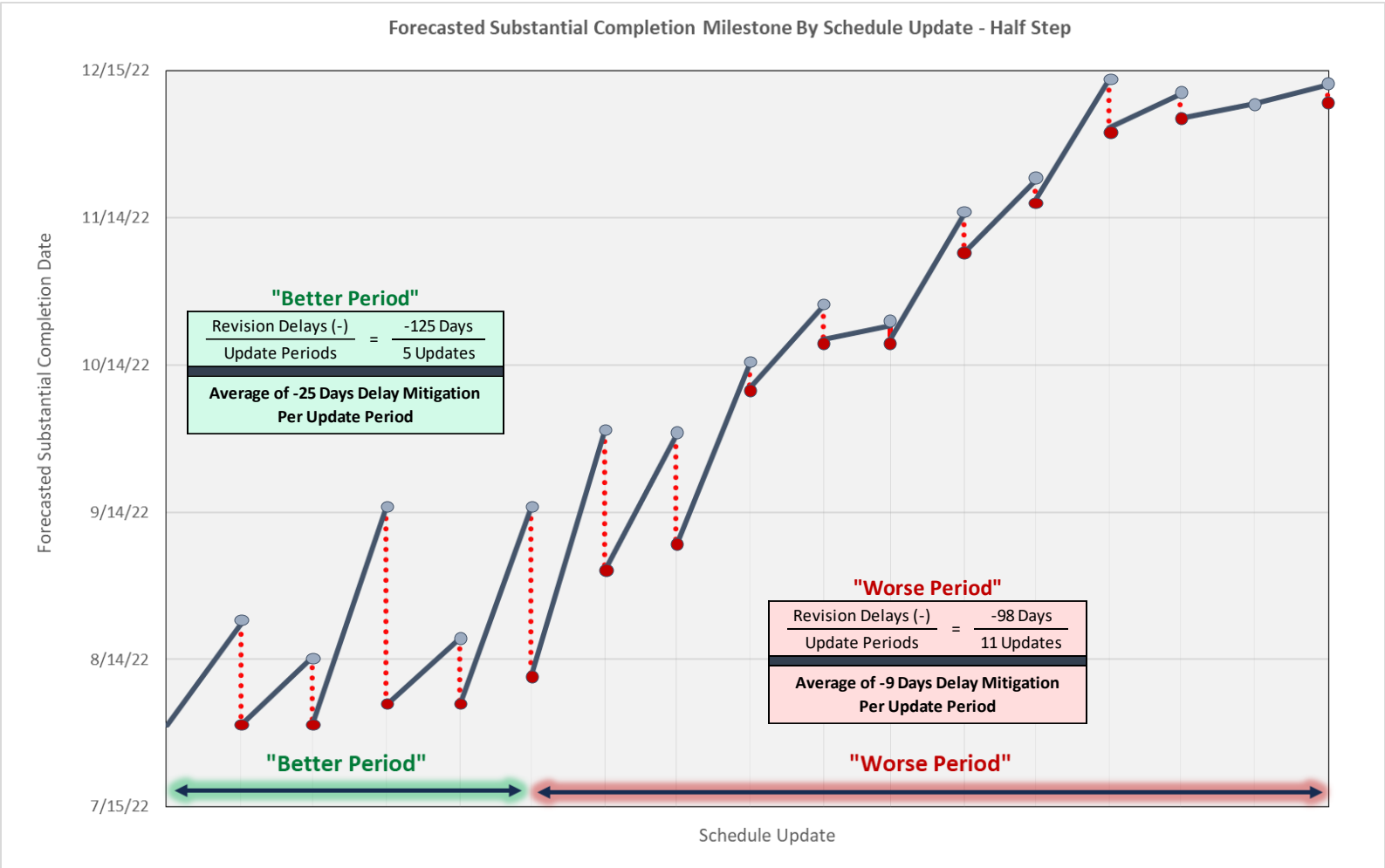
Half-Step Schedule Analysis Methodology

Example



Half-Step Schedule Analysis Methodology

Overall



Half-Step Schedule Analysis Methodology

- Implement Half-Step to isolate schedule changes, reveal the reality of what is going in the schedule / forecasted milestones with progress-only
 - Which party is driving the critical path?
 - Are there any delays to interim milestones or the overall project completion?
 - Was schedule mitigation appropriate to offset the delays incurred?
 - What schedule changes were implemented?
- In comparison to MIP 3.3, the Half-Step allows for easier identification of schedule slippage and gains due to schedule revisions and other non-progress revisions

Half-Step Schedule Analysis Methodology

- Half-Step allows parties to proactively understand the schedule and be better informed in the decision-making process
 - If non-progress schedule revisions are implemented, does this change the critical path?
 - Were the planned mitigation(s) reasonable and achieved by the delaying party?
 - Were the schedule changes made to the driving activity of the critical path, or were the changes made to downstream future critical path work?
 - Were there early delays that were offset that were not realized and could no longer be mitigated, resulting in significant delays later in the project?

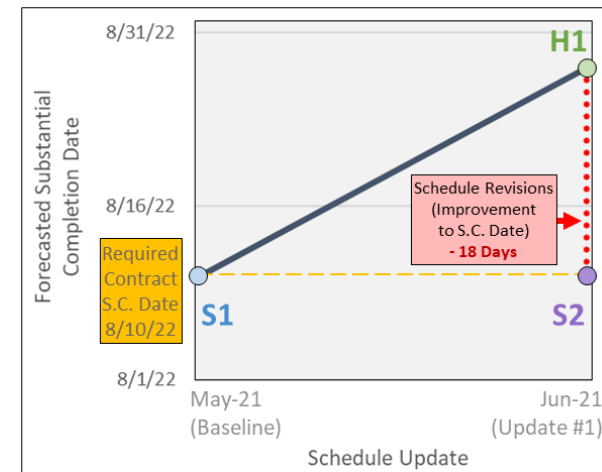
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Half-Step Prospective Approach

Subcontractor or Supplier Caused Delay (Delay Mitigation)

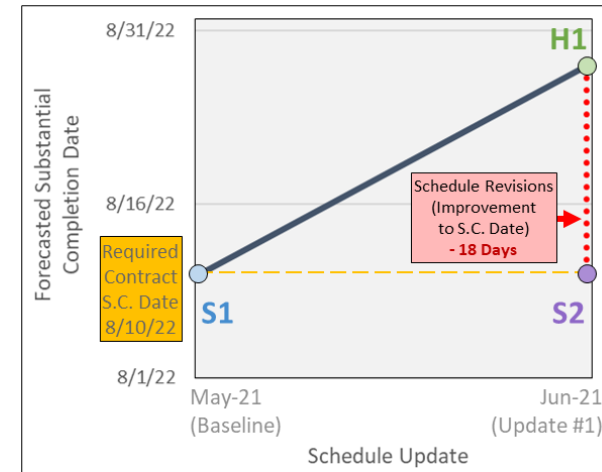
1. Based on the pure-progress update, identify the total days of critical path delay, the delay event/activity, and the responsible party
2. Provide notice of delay to responsible party per the subcontract or supplier agreement
3. Discuss opportunities to mitigate and recover lost time
 - If mitigation opportunities are available, document the changes to the schedule, the justification, and any contemporaneous supporting documentation. Implement schedule revisions and hold the party accountable.
 - If mitigation opportunities are not available, provide formal notice of delay with supporting schedule and cost documentation to the responsible party.



Half-Step Prospective Approach

Contractor Responsible Delay (Delay Mitigation)

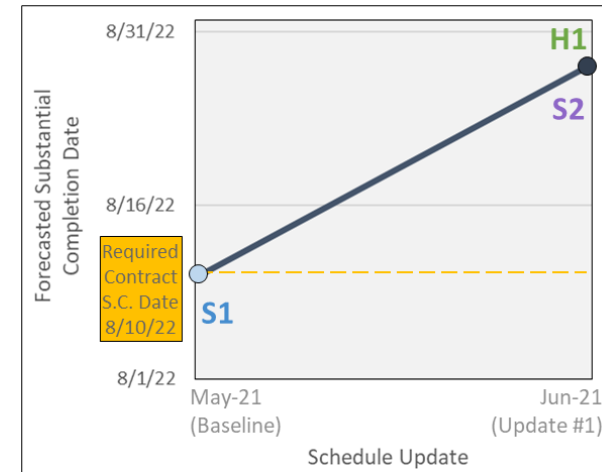
1. Based on the pure-progress update, identify the total days of critical path delay, the delay event/activity, and the responsible party
2. Discuss opportunities to mitigate and recover lost time
 - If mitigation opportunities are available, document the changes to the schedule, the justification, and any contemporaneous supporting documentation. Implement schedule revisions and execute the work according to the revised plan / means and methods for the work.
 - If mitigation opportunities are not available, do not manipulate the schedule in your favor. Eventually, these changes will come to light and negatively impact the contractor's position / entitlement.



Half-Step Prospective Approach

Owner Responsible Delay (**No** Delay Mitigation)

1. Based on the pure-progress update, identify the total days of critical path delay, the delay event/activity, and the responsible party
2. Provide notice of delay to Owner per the Contract
 - Submit timely notice to the proper recipient with the required content
 - Provide supporting schedule documentation / request for additional contract time / compensation
 - Document the delay event with adequate contemporaneous documentation and continue to monitor any changes / impacts



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Conclusion

- Due to DOT schedule specifications and consequences of a late schedule, Contractor implements schedule revisions to mitigate schedule delays, reflecting an on-time completion
- As a result, Contractor unsure of how to pursue schedule delays that were previously mitigated, or the schedule critical path may reflect a different critical path than expected
- AACE RP 29R-03 MIP 3.4 can be used to isolate schedule changes and reveal the reality of what is going on with the schedule and the critical path
- The Half-Step allows parties to proactively understand the schedule and be better informed in the decision-making process



THANK YOU