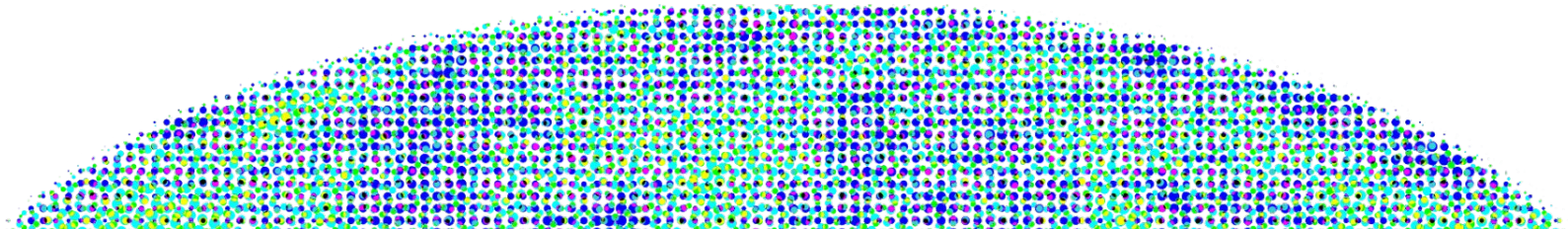# Risk Updates and First Simulation Results

J. Zivick

3 May 2024

Overall Schedule Contingency

Deterministic 2/20/2035
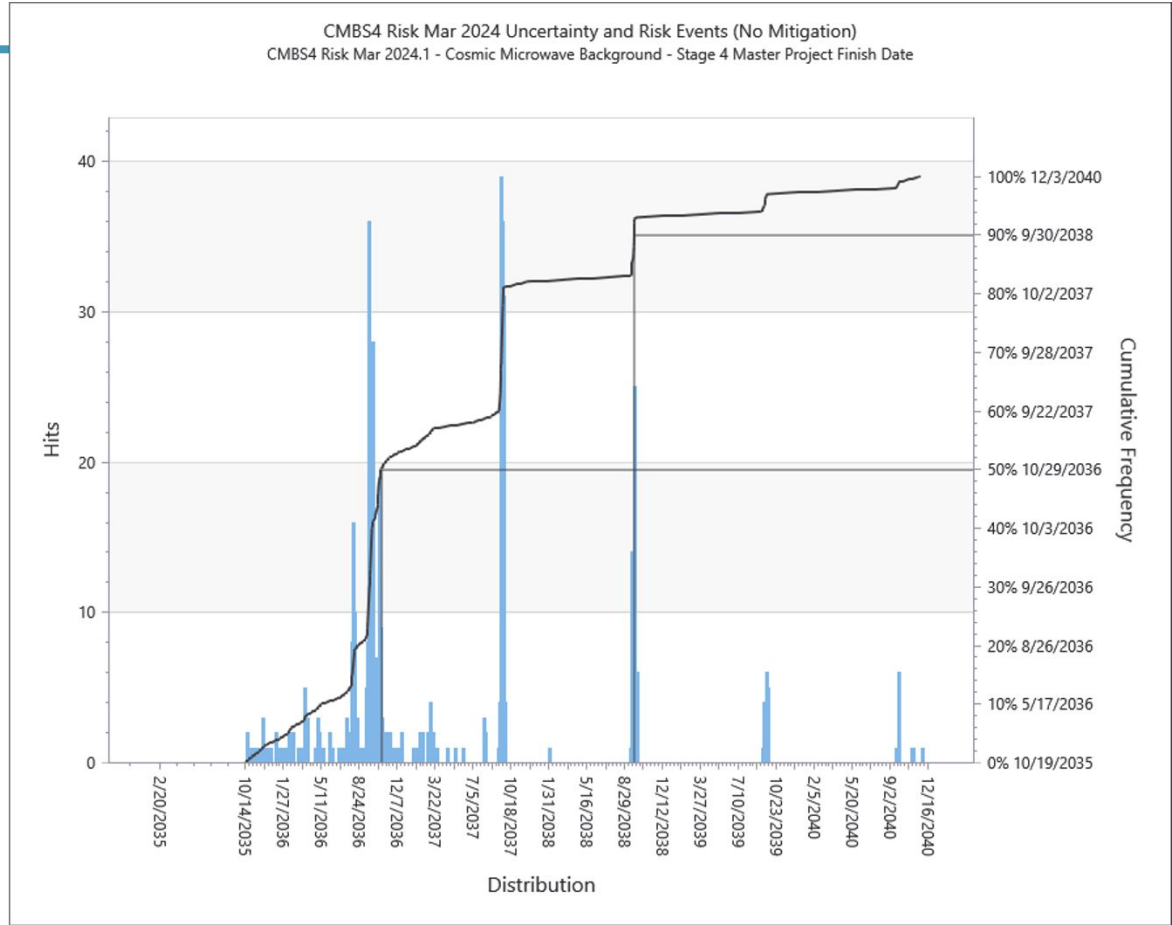
P50 10/29/2036

P90 9/30/2038
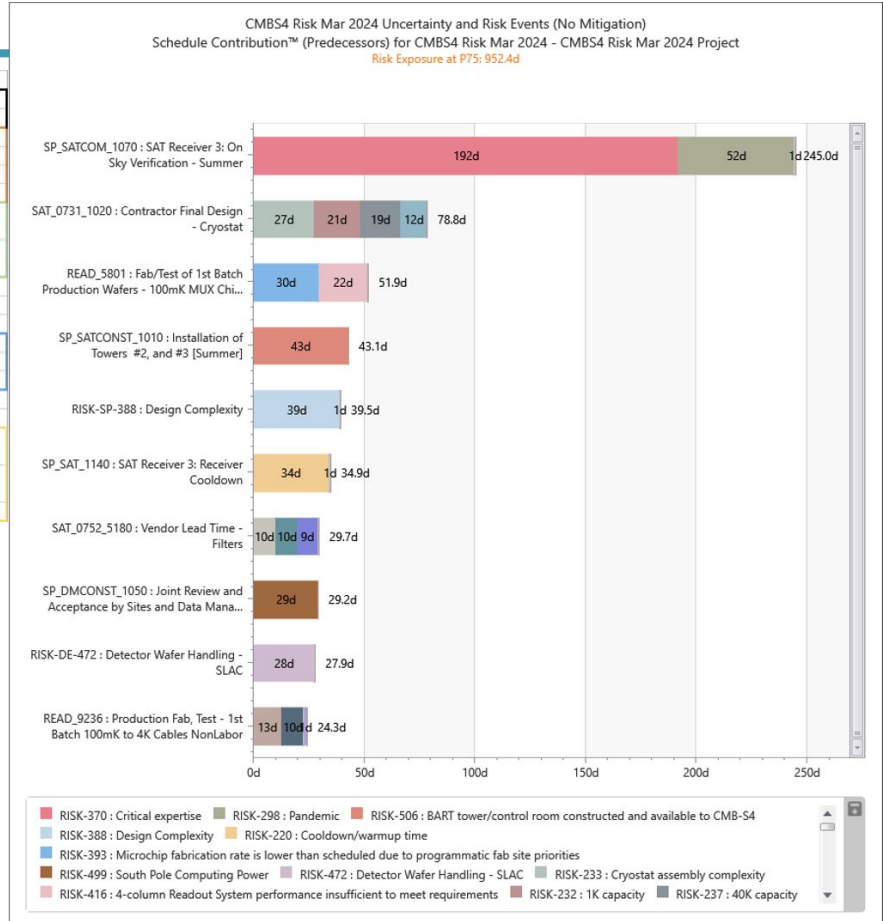
Total Project Schedule contingency
@ 90% Confidence
3 years, 7.5 months

CMBS4 Risk Mar 2024 Uncertainty and Risk Events (No Mitigation)
CMBS4 Risk Mar 2024.1 - Cosmic Microwave Background - Stage 4 Master Project Finish Date

Project-wide Risk Drivers for Schedule Contingency

Activity	Associated Risks
SP_SATCOM_1070 : SAT Receiver 3: On Sky Verification - Summer	RISK-370 : Critical expertise
	RISK-298 : Pandemic
SAT_0731_1020 : Contractor Final Design - Cryostat	RISK-233 : Cryostat assembly complexity
	RISK-232 : 1K capacity
	RISK-237 : 40K capacity
	RISK-264 : Focal Plane temperature
READ_5801 : Fab/Test of 1st Batch Production Wafers - 100mK MUX Chips NonLabor	RISK-393 : Microchip fabrication rate is lower than scheduled due to programmatic fab site priorities
	RISK-416 : 4-column Readout System performance insufficient to meet requirements
SP_SATCONST_1010 : Installation of Towers #2, and #3 [Summer]	RISK-506 : BART tower/control room constructed and available to CMB-S4
RISK-SP-388 : Design Complexity	RISK-388 : Design Complexity
SP_SAT_1140 : SAT Receiver 3: Receiver Cooldown	RISK-220 : Cooldown/warmup time
SAT_0752_5180 : Vendor Lead Time - Filters	RISK-251 : IR reflecting/scattering filter
	RISK-253 : Band defining filter
	RISK-252 : IR absorbing filter
SP_DMCONST_1050 : Joint Review and Acceptance by Sites and Data Management	RISK-499 : South Pole Computing Power
RISK-DE-472 : Detector Wafer Handling - SLAC	RISK-472 : Detector Wafer Handling - SLAC
READ_9236 : Production Fab, Test - 1st Batch 100mK to 4K Cables NonLabor	RISK-446 : Risk of not have multiple/sufficiently qualified vendors to produce 100mK-to-4K and 4K-to-300K cables at the production rate required
	RISK-527 : Vendors for superconducting NbTi and Manganin cables don't meet promised production rate for 100mK-to-4K and 4K-to-300K cables.
	RISK-155 : Wiring Yield, Reliability

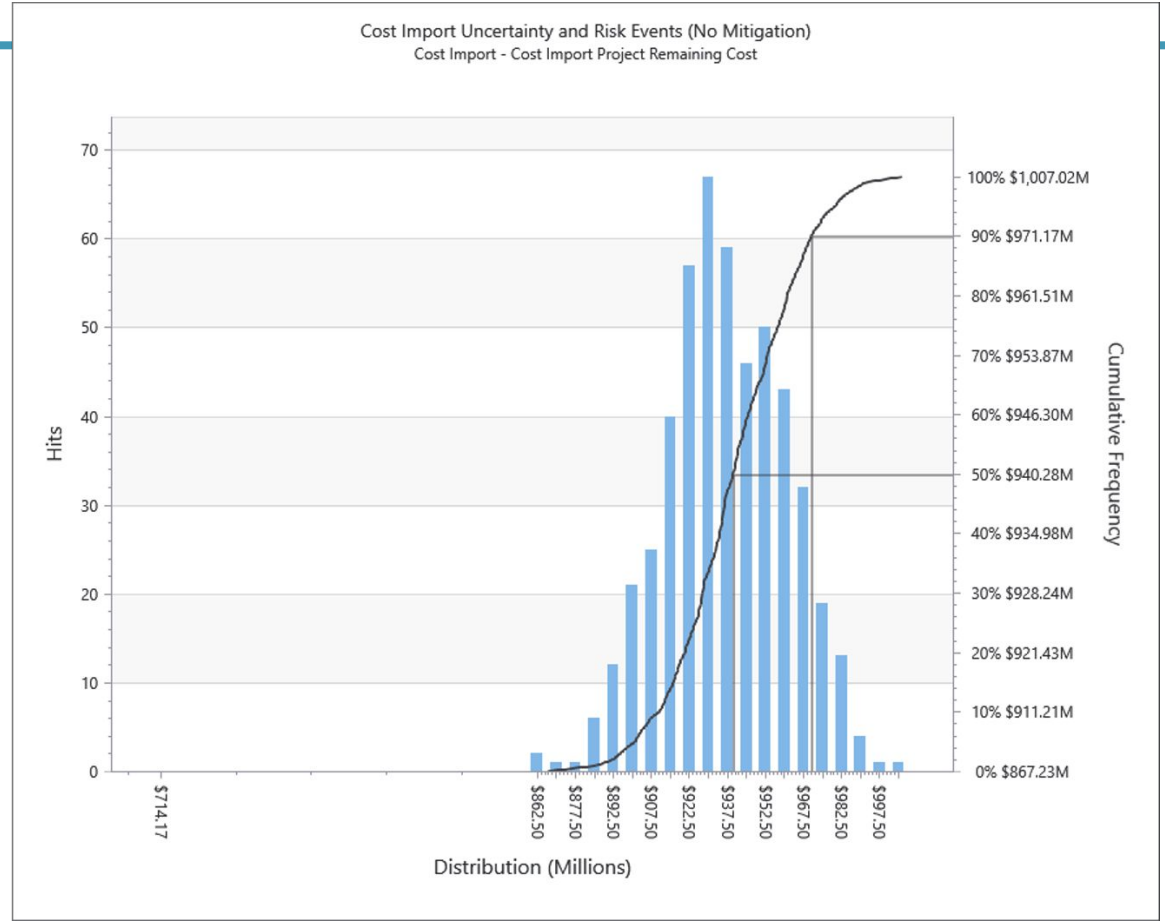# Overall Budget Contingency

Deterministic - $714.17M

P50 $940.28M

P90 $971.17M

Total Project Budget Contingency
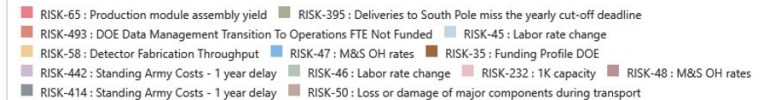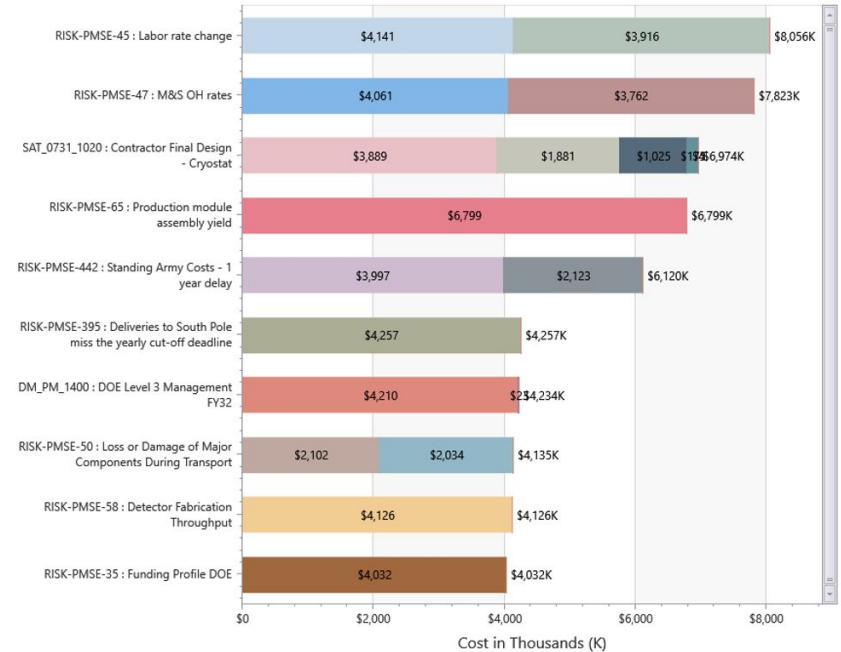@ 90% Confidence
$257M
36%

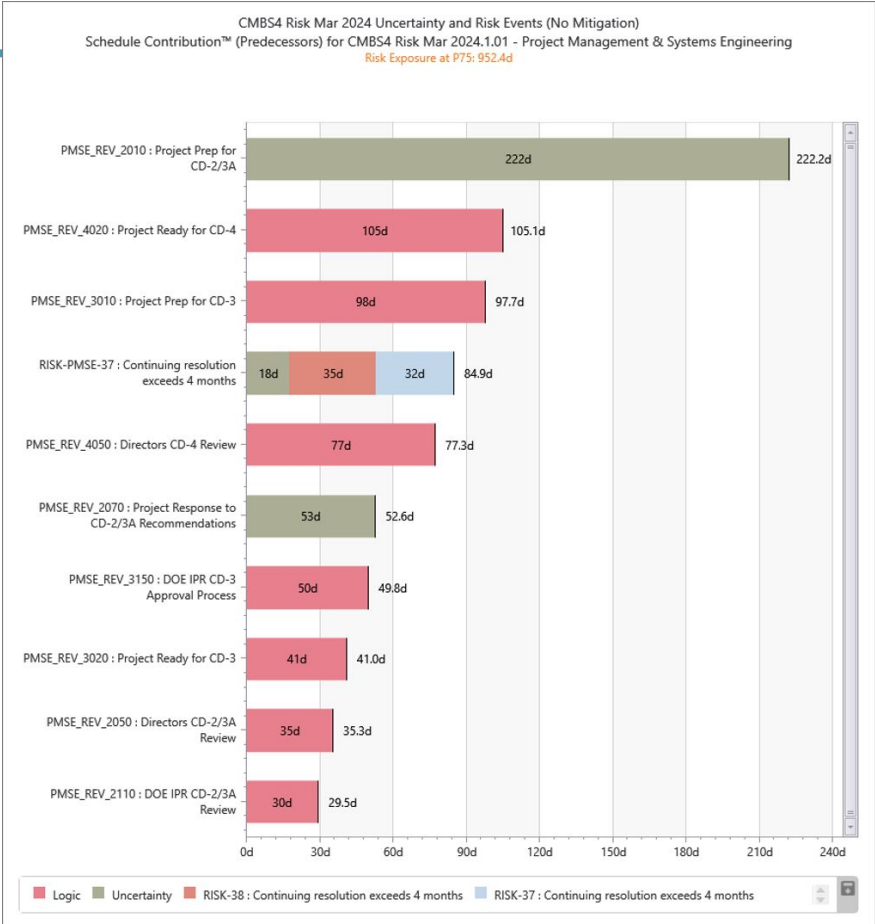

Cost Import Uncertainty and Risk Events (No Mitigation)
Cost Import - Cost Import Project Remaining Cost

CMB S4

Project-wide Risk Drivers for Budget Contingency

Activity	Associated Risks
RISK-PMSE-45 : Labor rate change	RISK-45 : Labor rate change
	RISK-46 : Labor rate change
RISK-PMSE-47 : M&S OH rates	RISK-47 : M&S OH rates
	RISK-48 : M&S OH rates
SAT_0731_1020 : Contractor Final Design - Cryostat	RISK-232 : 1K capacity
	RISK-237 : 40K capacity
	RISK-233 : Cryostat assembly complexity
	RISK-264 : Focal Plane temperature
RISK-PMSE-65 : Production module assembly yield	RISK-65 : Production module assembly yield
RISK-PMSE-442 : Standing Army Costs - 1 year delay	RISK-442 : Standing Army Costs - 1 year delay
	RISK-414 : Standing Army Costs - 1 year delay
RISK-PMSE-395 : Deliveries to South Pole miss the yearly cut-off deadline	RISK-395 : Deliveries to South Pole miss the yearly cut-off deadline
DM_PM_1400 : DOE Level 3 Management FY32	RISK-493 : DOE Data Management Transition To Operations FTE Not Funded
RISK-PMSE-50 : Loss or Damage of Major Components During Transport	RISK-50 : Loss or damage of major components during transport
	RISK-49 : Loss or damage of major components during transport
RISK-PMSE-58 : Detector Fabrication Throughput	RISK-58 : Detector Fabrication Throughput
RISK-PMSE-35 : Funding Profile DOE	RISK-35 : Funding Profile DOE

1.01 Project Management Risk Drivers for Schedule Contingency

CMBS4 Risk Mar 2024 Uncertainty and Risk Events (No Mitigation)
Schedule Contribution™ (Predecessors) for CMBS4 Risk Mar 2024.1.01 - Project Management & Systems Engineering
Risk Exposure at P75: 952.4d

1.01 Project Management Risk Drivers for Budget Contingency

Cost Import Uncertainty and Risk Events (No Mitigation)
Cost Contribution for 1.01 - Project Management & Systems Engineering
Risk Exposure at P75: $112,681K

1.03 Detectors Risk Drivers for Schedule Contingency

CMBS4 Risk Mar 2024 Uncertainty and Risk Events (No Mitigation)
Schedule Contribution™ (Predecessors) for CMBS4 Risk Mar 2024.1.03 - Detectors
Risk Exposure at P75: 350.8d

1.03 Detectors Risk Drivers for Budget Contingency

Cost Import Uncertainty and Risk Events (No Mitigation)
Cost Contribution for 1.03 - Detectors
Risk Exposure at P75: $29,459K

Risk	Value
RISK-DE-115 : Detector Production Quality Test Feedback Is Delayed	$4,525 / $4,525K
RISK-DE-118 : Technical Detector Requirements are not Met	$4,461 / $4,461K
RISK-DE-109 : Stability Of Detector Fabrication Process and Yield	$4,279 / $4,279K
RISK-DE-116 : Detector Requirements Definition	$2,047 / $2,047K
RISK-DE-117 : Underestimated QA Needs	$2,028 / $2,028K
RISK-DE-470 : Detector Wafer Handling - NIST	$402 / $402K
RISK-DE-469 : Detector Wafer Handling - JPL	$391 / $391K
DE_MGMT_1002 : L2 CAM FY24	$371 $17 $388K
RISK-DE-473 : Detector Wafer Handling - UCB	$386 / $386K
RISK-DE-471 : Detector Wafer Handling - SeeQC	$385 / $385K

Cost in Thousands (K)

Legend:
- RISK-115 : Detector Production Quality Test Feedback is Delayed
- RISK-118 : Technical Detector Requirements are not Met
- RISK-109 : Stability of Detector Fabrication Process and Yield
- RISK-116 : Detector Requirements Definition
- RISK-117 : Underestimated QA needs
- RISK-470 : Detector Wafer Handling - NIST
- RISK-469 : Detector Wafer Handling - JPL
- RISK-473 : Detector Wafer Handling - UCB
- RISK-471 : Detector Wafer Handling - SeeQC
- RISK-496 : Underestimated Management Needs
- Uncertainty
- RISK-466 : Fabrication Process & Equipment Failures - SLAC
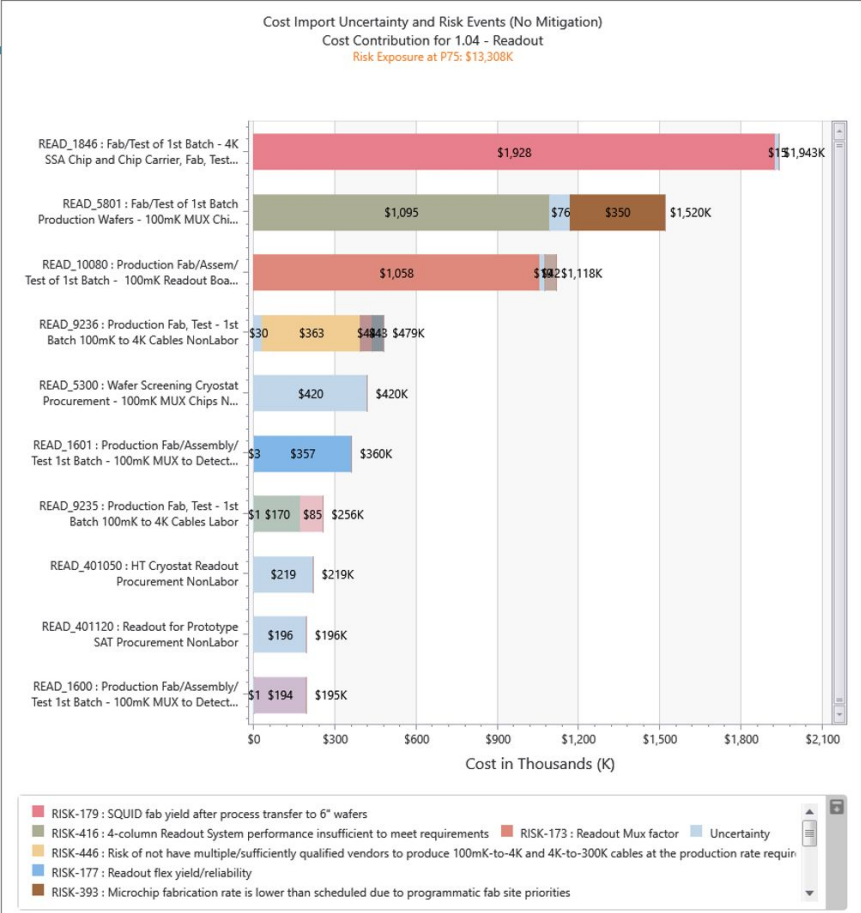
1.03 Detectors Pre-Construction Risks

4 of 35 risks occur prior to start of construction

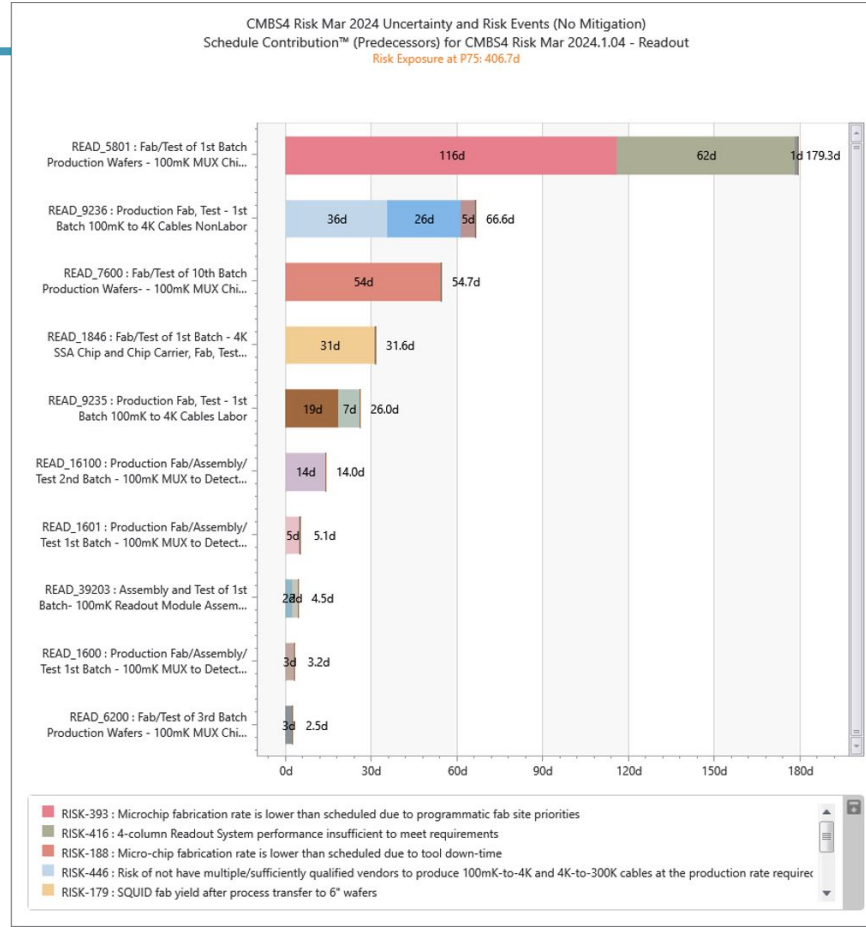31 risks occur after start of construction

Quick Filter Results

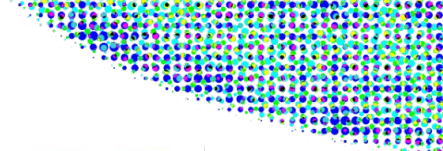| Key	T	WBS L2	Summary	Status	Risk Retirement Date ↑	
RISK-116	🔲	1.03 – DET	Detector Requirements Definition	ACTIVE RISK/OPPORTUNITY	Aug 31, 2026	...
RISK-495	🔲	1.03 – DET	Detector Fabrication Facility Access	ACTIVE RISK/OPPORTUNITY	Sep 30, 2026	...
RISK-117	🔲	1.03 – DET	Underestimated QA needs	UPDATE RISK	Feb 28, 2027	...
RISK-496	🔲	1.03 – DET	Underestimated Management Needs	ACTIVE RISK/OPPORTUNITY	Oct 01, 2027	...

1.04 Readout Risk Drivers for Budget Contingency

Cost Import Uncertainty and Risk Events (No Mitigation)
Cost Contribution for 1.04 - Readout
Risk Exposure at P75: $13,308K

1.04 Readout Risk Drivers for Schedule Contingency

CMBS4 Risk Mar 2024 Uncertainty and Risk Events (No Mitigation)
Schedule Contribution™ (Predecessors) for CMBS4 Risk Mar 2024.1.04 - Readout
Risk Exposure at P75: 406.7d

1.04 Readout Pre-Construction Risks

18 of 24 risks occur prior to start of construction

6 risks occur after start of construction

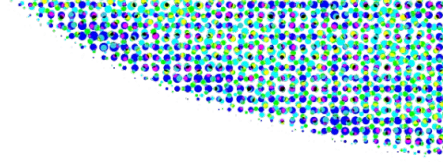| Key	T	WBS L2	Summary	Status	Risk Retirement Date
RISK-445	🔲	1.04 - RO	Might not have multiple/sufficiently qualified vendors to produce flex cables at the rate required	UPDATE RISK	Jan 15, 2025
RISK-178	🔲	1.04 - RO	100mK Readout Module Size	UPDATE RISK	Feb 12, 2025
RISK-166	🔲	1.04 - RO	EMI effects on Readout, Grounding and Shielding	UPDATE RISK	Mar 12, 2025
RISK-416	🔲	1.04 - RO	4-column Readout System performance insufficient to meet requirements	UPDATE RISK	Apr 16, 2025
RISK-184	🔲	1.04 - RO	Warm Electronics module update	UPDATE RISK	Jun 18, 2025
RISK-170	🔲	1.04 - RO	Crosstalk	UPDATE RISK	Sep 18, 2025
RISK-155	🔲	1.04 - RO	Wiring Yield, Reliability	UPDATE RISK	Nov 12, 2025
RISK-177	🔲	1.04 - RO	Readout flex yield/reliability	UPDATE RISK	Dec 17, 2025
RISK-173	🔲	1.04 - RO	Readout Mux factor	UPDATE RISK	Dec 17, 2025
RISK-175	🔲	1.04 - RO	Nyquist fab yield	UPDATE RISK	Jan 14, 2026
RISK-172	🔲	1.04 - RO	Stray inductance and residual impedance	UPDATE RISK	Feb 02, 2026
RISK-167	🔲	1.04 - RO	Magnetic Field environment for Readout	UPDATE RISK	Feb 02, 2026
RISK-163	🔲	1.04 - RO	Readout Noise Performance	UPDATE RISK	Feb 02, 2026
RISK-179	🔲	1.04 - RO	SQUID fab yield after process transfer to 6" wafers	UPDATE RISK	Feb 18, 2026
RISK-391	🔲	1.04 - RO	Micro-chip fabrication rate is lower than scheduled due to 2nd fabrication site unavailability	UPDATE RISK	Jun 17, 2026
RISK-182	🔲	1.04 - RO	Test bed uniformity	UPDATE RISK	Jul 15, 2026
RISK-446	🔲	1.04 - RO	Risk of not have multiple/sufficiently qualified vendors to produce 100mK-to-4K and 4K-to-300K cables at the production rate required	PROPOSE ACTIVE RISK AFTER UPDATE	Sep 16, 2026
RISK-415	🔲	1.04 - RO	Micro-fabrication cost might be higher than budgeted	UPDATE RISK	Apr 14, 2027

1.05 Modules Risk Drivers for Budget Contingency

Cost Import Uncertainty and Risk Events (No Mitigation)
Cost Contribution for 1.05 - Module Assembly and Test (MAT)
Risk Exposure at P75: $9,102K

1.05 Modules Risk Drivers for Schedule Contingency

CMBS4 Risk Mar 2024 Uncertainty and Risk Events (No Mitigation)
Schedule Contribution™ (Predecessors) for CMBS4 Risk Mar 2024.1.05 - Module Assembly and Test (MAT)
Risk Exposure at P75: 173.8d
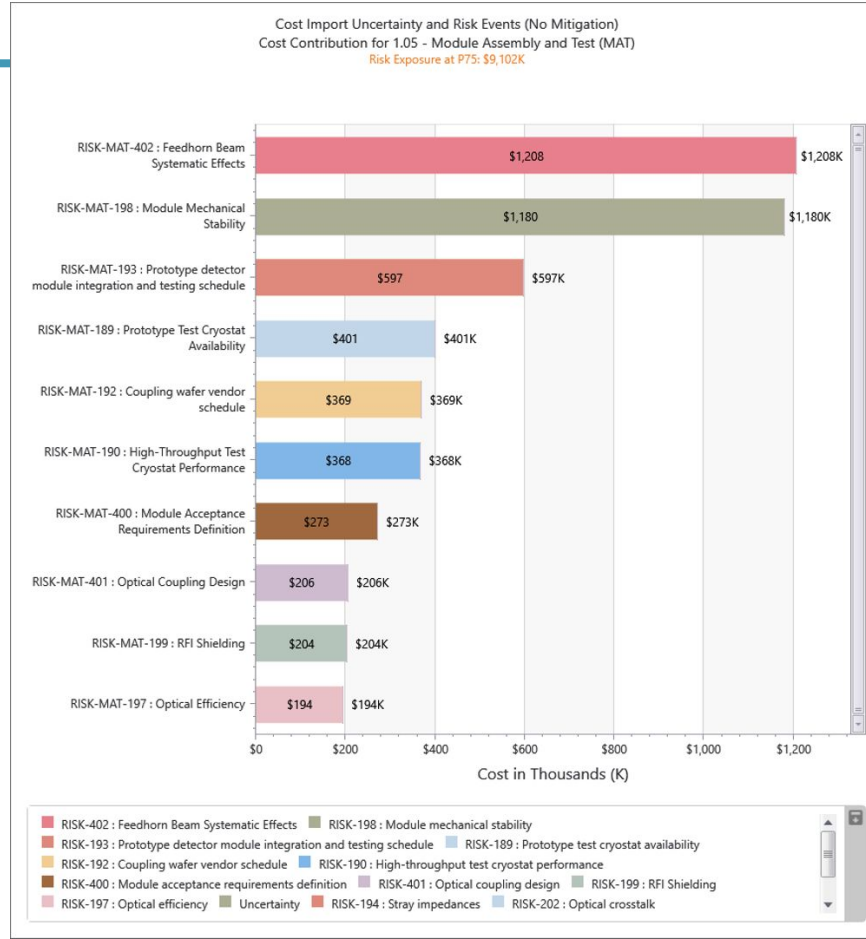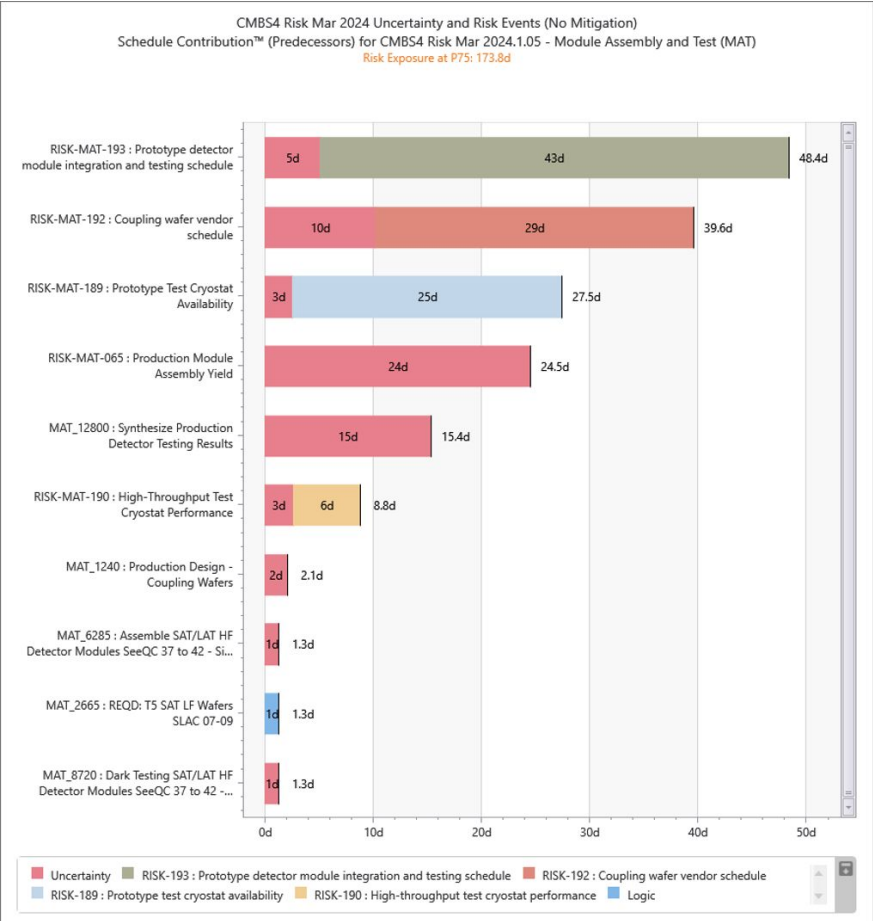
1.05 Modules Pre-Construction Risks

15 of 18 risks occur prior to start of construction

3 risks occur after start of construction
(recently added 3 construction risks)

Key	T	WBS L2	Summary	Status	Risk Retirement Date
RISK-189	🟥	1.05 – MAT	Prototype test cryostat availability	UPDATE RISK	Nov 01, 2024
RISK-192	🟥	1.05 – MAT	Development of multiple optical coupling wafer vendors	UPDATE RISK	Apr 24, 2025
RISK-398	🟥	1.05 – MAT	Prototype testing uniformity	UPDATE RISK	May 19, 2025
RISK-201	🟥	1.05 – MAT	Module heat-sinking	UPDATE RISK	May 19, 2025
RISK-399	🟥	1.05 – MAT	Dilution fridge vendor delay for high-throughput test cryostats	UPDATE RISK	Sep 24, 2025
RISK-193	🟥	1.05 – MAT	Prototype detector module integration and testing schedule	UPDATE RISK	Nov 03, 2025
RISK-403	🟥	1.05 – MAT	Optical coupling layout	UPDATE RISK	Nov 16, 2026
RISK-401	🟥	1.05 – MAT	Optical coupling design	PROPOSE ACTIVE RISK AFTER UPDATE	Nov 16, 2026
RISK-199	🟥	1.05 – MAT	RFI Shielding	UPDATE RISK	Nov 16, 2026
RISK-198	🟥	1.05 – MAT	Module mechanical stability	UPDATE RISK	Nov 16, 2026
RISK-197	🟥	1.05 – MAT	Optical efficiency	UPDATE RISK	Nov 16, 2026
RISK-402	🟥	1.05 – MAT	Feedhorn Beam Systematic Effects	PROPOSE ACTIVE RISK AFTER UPDATE	Dec 23, 2026
RISK-400	🟥	1.05 – MAT	Module acceptance requirements definition	PROPOSE ACTIVE RISK AFTER UPDATE	Dec 23, 2026
RISK-194	🟥	1.05 – MAT	Stray impedances	UPDATE RISK	Dec 23, 2026
RISK-202	🟥	1.05 – MAT	Optical crosstalk	UPDATE RISK	Apr 08, 2027

1.06 LAT Risk Drivers for Schedule Contingency

1.06 LAT Risk Drivers for Budget Contingency

Cost Import Uncertainty and Risk Events (No Mitigation)
Cost Contribution for 1.06 - Large Aperture Telescopes (LAT) and Receivers
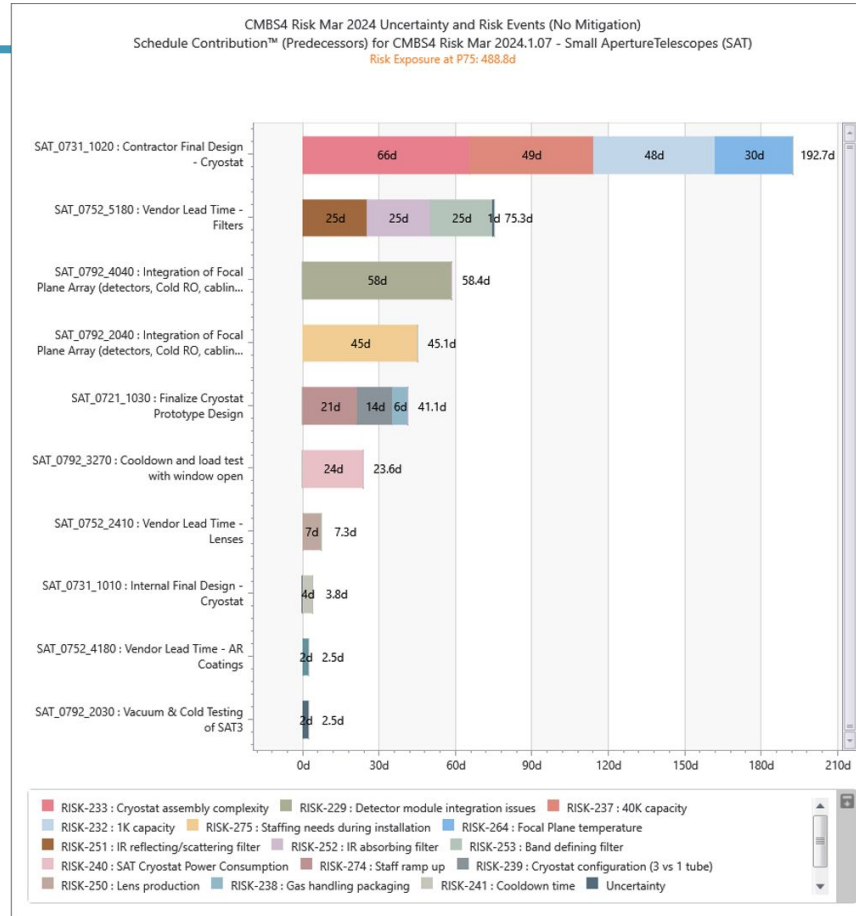Risk Exposure at P75: $20,329K
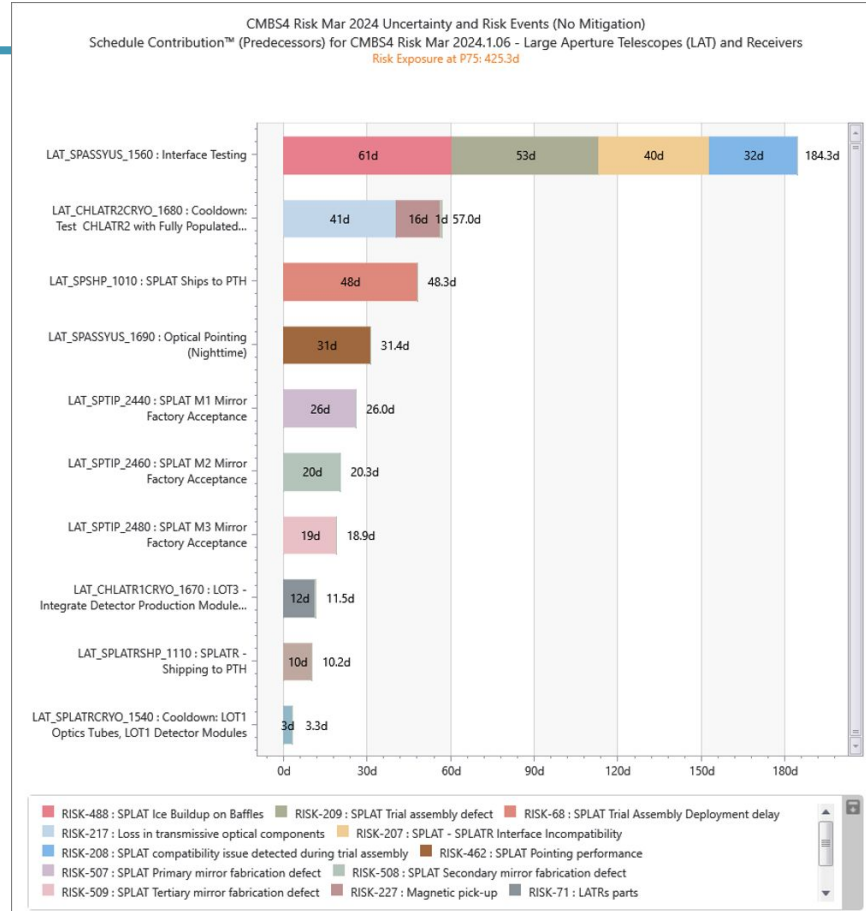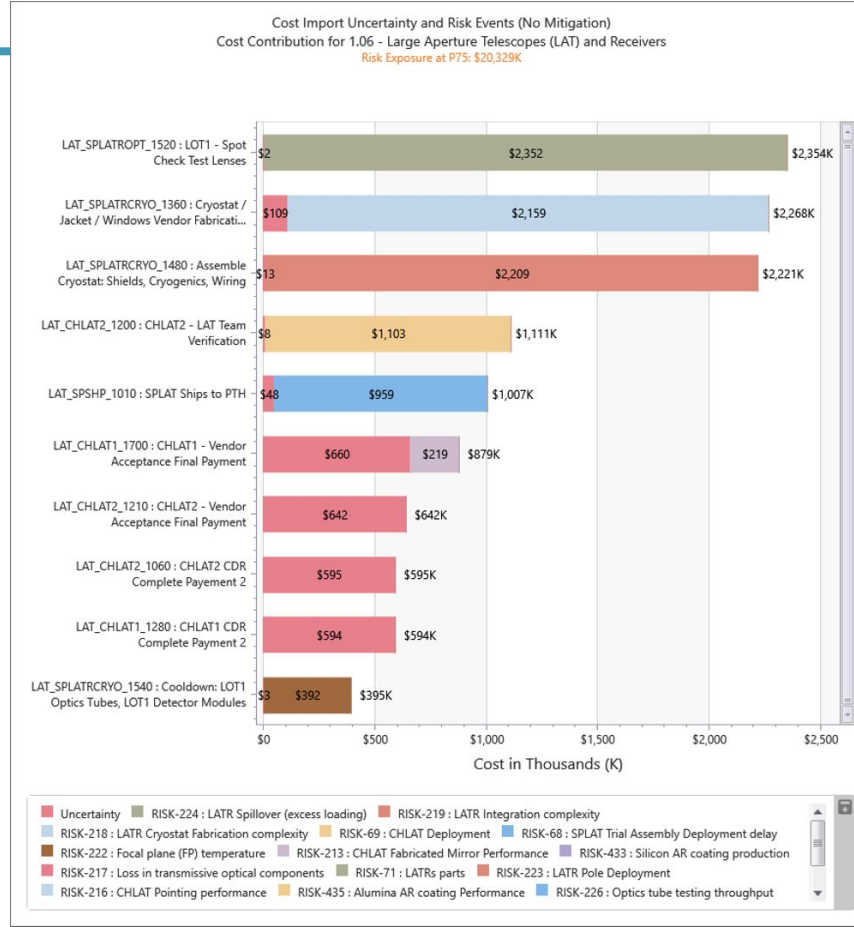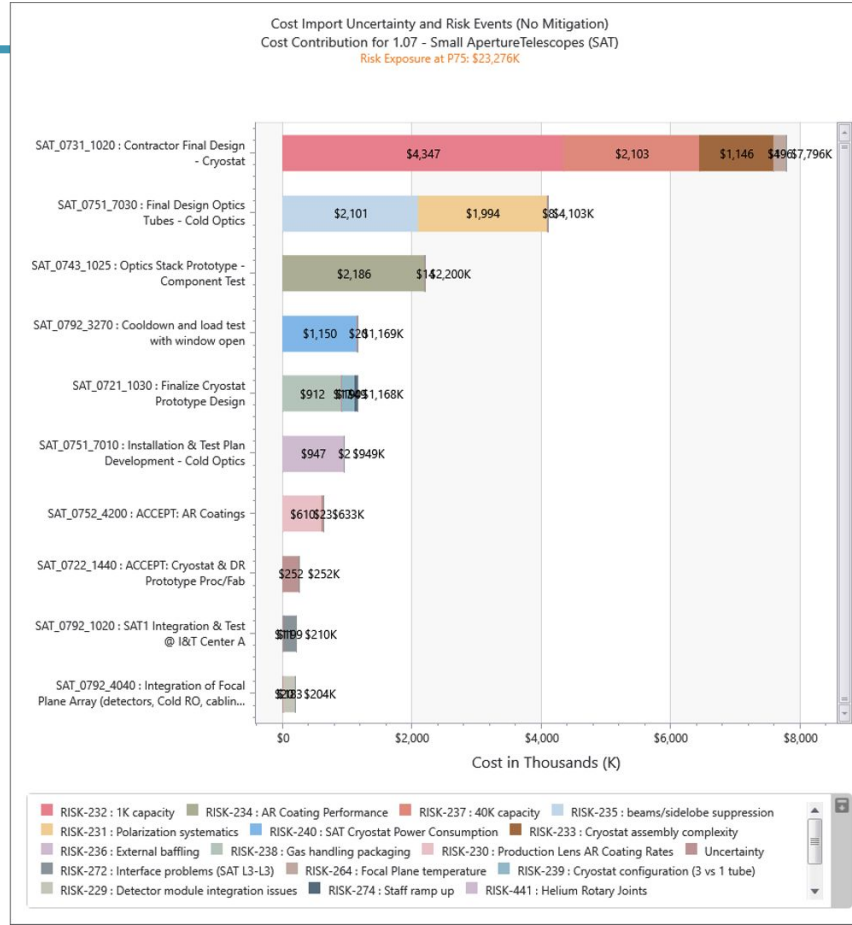
1.06 LAT Pre-Construction Risks

7 of 29 risks occur prior to construction

22 risks occur after start of construction

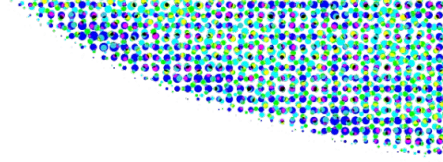| Key	T	WBS L2	Summary	Status	Risk Retirement Date ⬆
RISK-488	🟥	1.06 – LAT	SPLAT Far sidelobe contamination	PROPOSE ACTIVE RISK AFTER UPDATE	Mar 31, 2026
RISK-226	🟥	1.06 – LAT	Optics tube testing throughput	ACTIVE RISK/OPPORTUNITY	Sep 30, 2027
RISK-208	🟥	1.06 – LAT	SPLAT compatibility issue detected during trial assembly	UPDATE RISK	Nov 15, 2027
RISK-224	🟥	1.06 – LAT	LATR Spillover (excess loading)	UPDATE RISK	Jun 01, 2028
RISK-539	🟥	1.06 – LAT	CHLAT Vendor bids exceed budget estimate	ACTIVE RISK/OPPORTUNITY	Jul 10, 2028
RISK-227	🟥	1.06 – LAT	Magnetic pick-up	ACTIVE RISK/OPPORTUNITY	Sep 29, 2028
RISK-433	🟥	1.06 – LAT	Silicon AR coating production	UPDATE RISK	Dec 01, 2028

1.07 SAT Risk Drivers for Schedule Contingency

1.07 SAT Risk Drivers for Budget Contingency

Cost Import Uncertainty and Risk Events (No Mitigation)
Cost Contribution for 1.07 – Small ApertureTelescopes (SAT)
Risk Exposure at P75: $23,276K
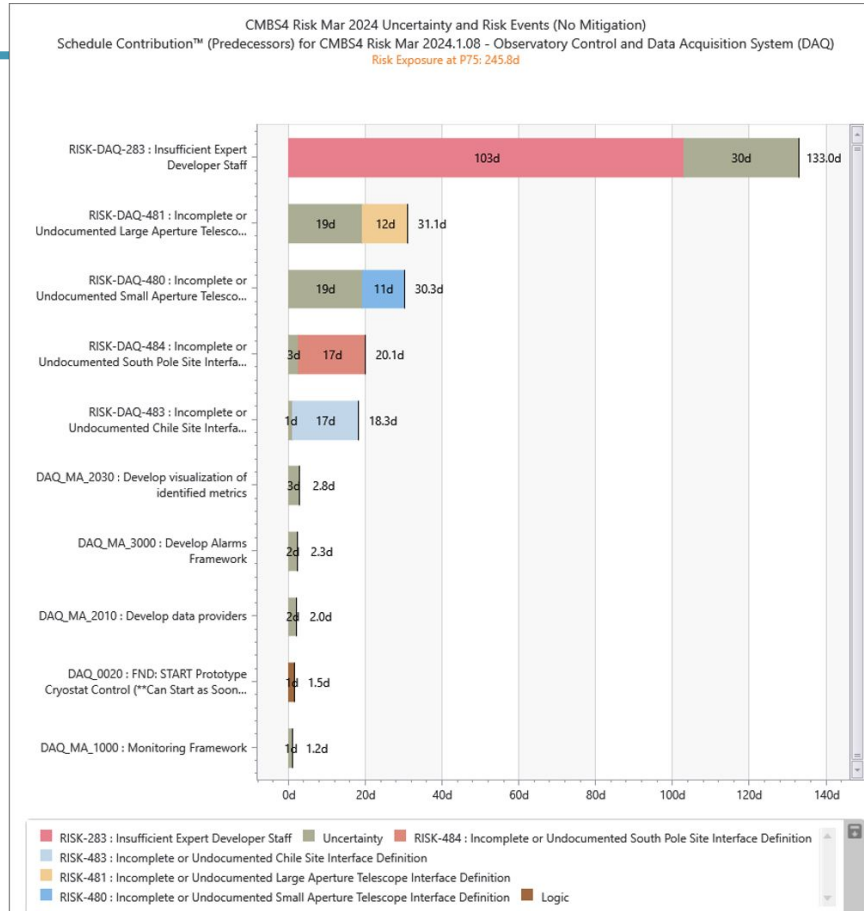
1.07 SAT Pre-Construction Risks

12 of 25 risks occur prior to start of construction

13 risks occur after start of construction

Key	T	WBS L2	Summary	Status	Risk Retirement Date ⬆
RISK-234	🟥	1.07 – SAT	AR Coating Performance	UPDATE RISK	Oct 27, 2027
RISK-235	🟥	1.07 – SAT	beams/sidelobe suppression	UPDATE RISK	Jul 24, 2028
RISK-231	🟥	1.07 – SAT	Polarization systematics	UPDATE RISK	Jul 24, 2028
RISK-264	🟥	1.07 – SAT	Focal Plane temperature	UPDATE RISK	Sep 22, 2028
RISK-241	🟥	1.07 – SAT	Cooldown time	UPDATE RISK	Sep 22, 2028
RISK-240	🟥	1.07 – SAT	SAT Cryostat Power Consumption	UPDATE RISK	Sep 22, 2028
RISK-239	🟥	1.07 – SAT	Cryostat configuration (3 vs 1 tube)	UPDATE RISK	Sep 22, 2028
RISK-238	🟥	1.07 – SAT	Gas handling packaging	UPDATE RISK	Sep 22, 2028
RISK-237	🟥	1.07 – SAT	40K capacity	UPDATE RISK	Sep 22, 2028
RISK-233	🟥	1.07 – SAT	Cryostat assembly complexity	UPDATE RISK	Sep 22, 2028
RISK-232	🟥	1.07 – SAT	1K capacity	UPDATE RISK	Sep 22, 2028
RISK-236	🟥	1.07 – SAT	External baffling	UPDATE RISK	Nov 13, 2028

1.08 DAQ Risk Drivers for Schedule Contingency

CMBS4 Risk Mar 2024 Uncertainty and Risk Events (No Mitigation)
Schedule Contribution™ (Predecessors) for CMBS4 Risk Mar 2024.1.08 - Observatory Control and Data Acquisition System (DAQ)
Risk Exposure at P75: 245.8d

1.08 DAQ Risk Drivers for Budget Contingency

Cost Import Uncertainty and Risk Events (No Mitigation)
Cost Contribution for 1.08 - Observatory Control and Data Acquisition System (DAQ)
Risk Exposure at P75: $10,617K
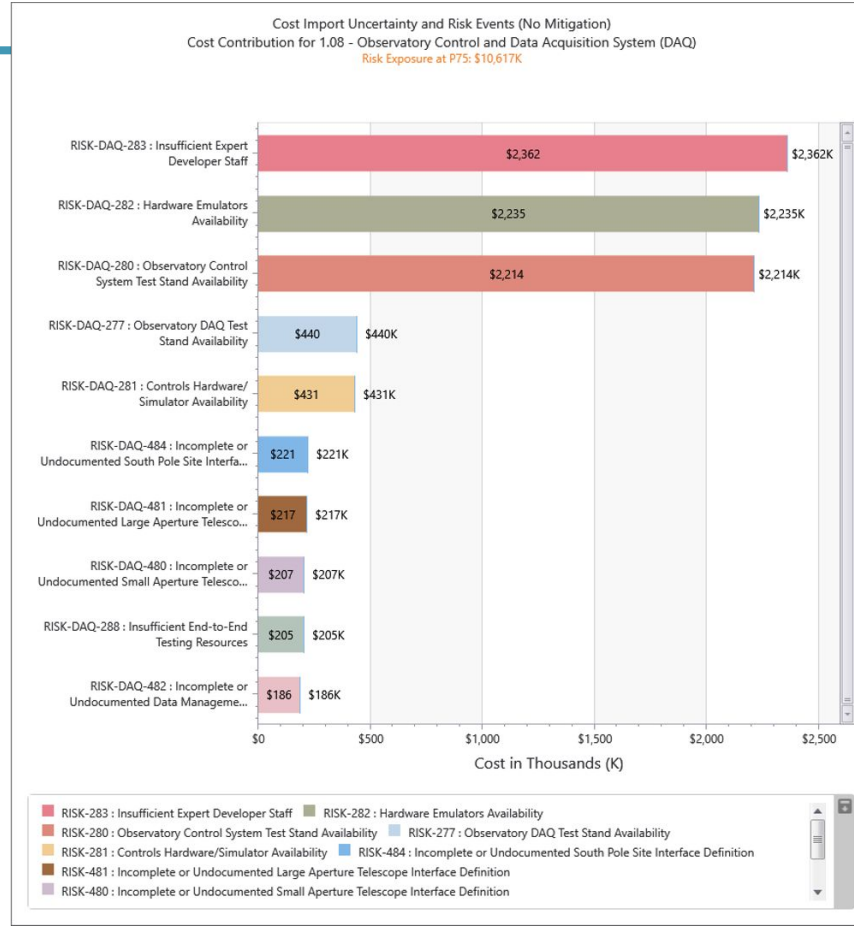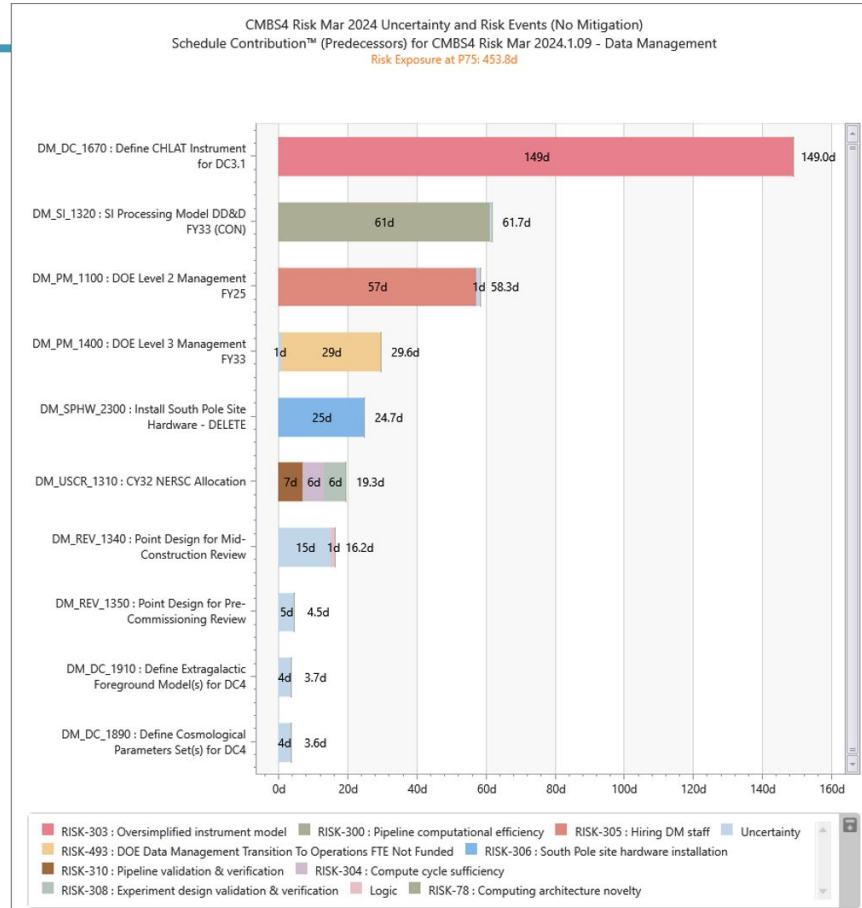
1.08 DAQ Pre-Construction Risks
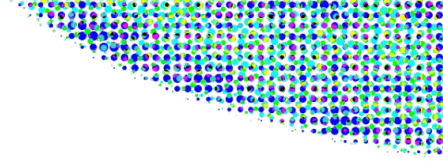
14 of 14 risks occur prior to start of construction

0 risks occur after start of construction

Key	T	WBS L2	Summary	Status	Risk Retirement Date
RISK-497	🟥	1.08 – DAQ	Delay in Fiscal Year 2025 Ramp Up	ACTIVE RISK/OPPORTUNITY	Sep 30, 2024
RISK-281	🟥	1.08 – DAQ	Controls Hardware/Simulator Availability	UPDATE RISK	Mar 23, 2026
RISK-280	🟥	1.08 – DAQ	Observatory Control System Test Stand Availability	UPDATE RISK	Mar 23, 2026
RISK-278	🟥	1.08 – DAQ	Incomplete or Undocumented Readout Interface Definitions	UPDATE RISK	Mar 23, 2026
RISK-484	🟥	1.08 – DAQ	Incomplete or Undocumented South Pole Site Interface Definition	UPDATE RISK	Mar 14, 2028
RISK-483	🟥	1.08 – DAQ	Incomplete or Undocumented Chile Site Interface Definition	UPDATE RISK	Mar 14, 2028
RISK-482	🟥	1.08 – DAQ	Incomplete or Undocumented Data Management Interface Definition	UPDATE RISK	Mar 14, 2028
RISK-481	🟥	1.08 – DAQ	Incomplete or Undocumented Large Aperture Telescope Interface Definition	UPDATE RISK	Mar 14, 2028
RISK-480	🟥	1.08 – DAQ	Incomplete or Undocumented Small Aperture Telescope Interface Definition	UPDATE RISK	Mar 14, 2028
RISK-288	🟥	1.08 – DAQ	Insufficient End-to-End Testing Resources	ACTIVE RISK/OPPORTUNITY	Mar 14, 2028
RISK-286	🟥	1.08 – DAQ	Early R&D DAQ Test Stand Availability	ACTIVE RISK/OPPORTUNITY	Mar 14, 2028
RISK-283	🟥	1.08 – DAQ	Insufficient Expert Developer Staff	UPDATE RISK	Mar 14, 2028
RISK-282	🟥	1.08 – DAQ	Hardware Emulators Availability	UPDATE RISK	Mar 14, 2028
RISK-277	🟥	1.08 – DAQ	Observatory DAQ Test Stand Availability	UPDATE RISK	Mar 14, 2028

1.09 DM Risk Drivers for Schedule Contingency

CMBS4 Risk Mar 2024 Uncertainty and Risk Events (No Mitigation)
Schedule Contribution™ (Predecessors) for CMBS4 Risk Mar 2024.1.09 - Data Management
Risk Exposure at P75: 453.8d

1.09 DM Risk Drivers for Budget Contingency

Cost Import Uncertainty and Risk Events (No Mitigation)
Cost Contribution for 1.09 - Data Management
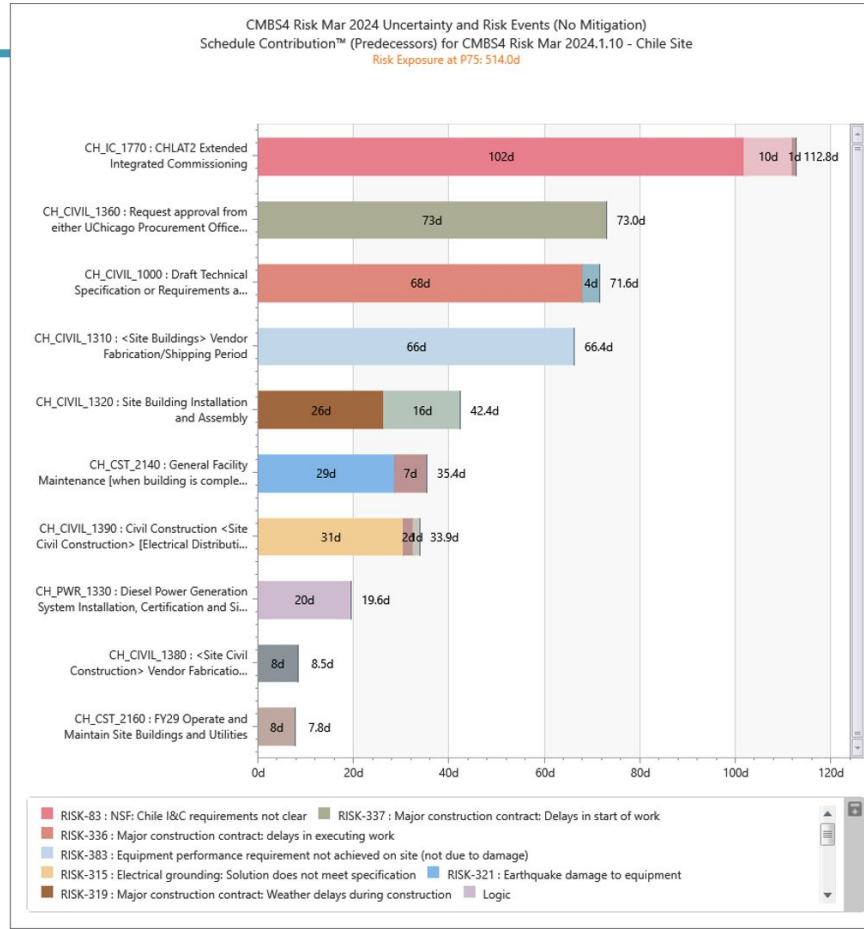Risk Exposure at P75: $11,303K
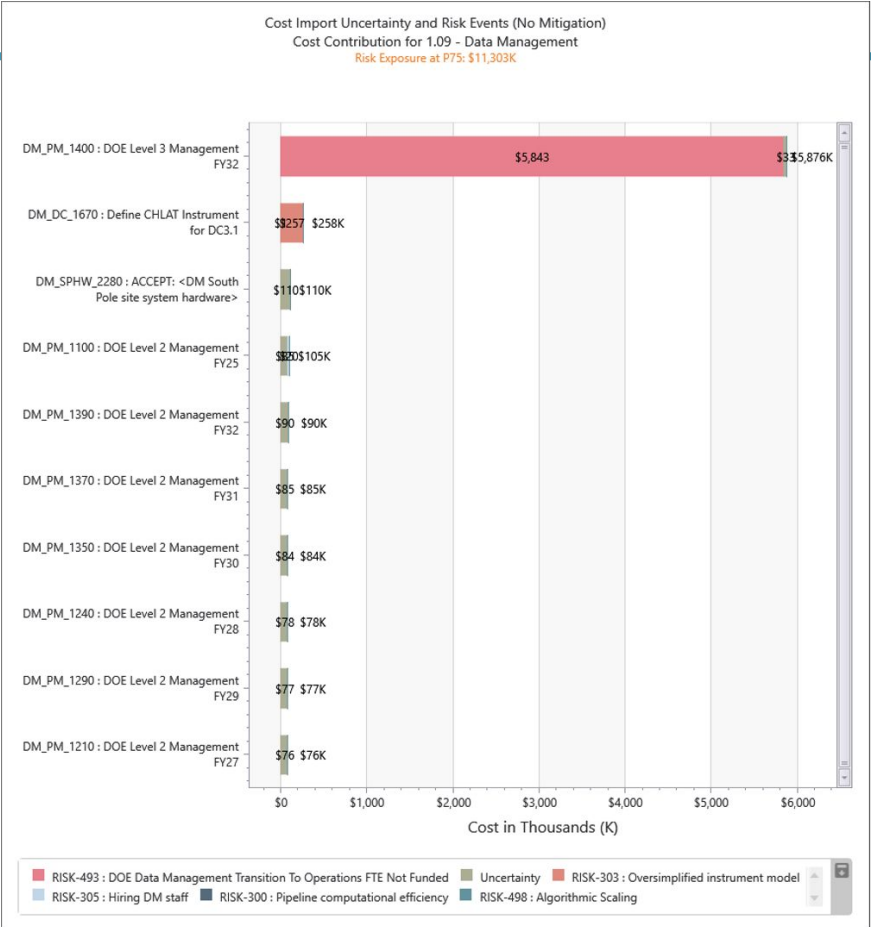
1.09 DM Pre-Construction Risks

4 of 7 risks occur prior to start of construction

3 risks occur after start of construction

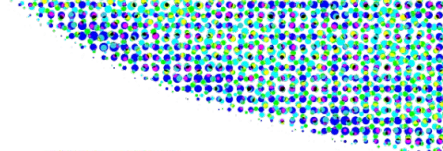| Key	T	WBS L2	Summary	Status	Risk Retirement Date ⬆
RISK-305	🟥	1.09 – DM	Hiring DM staff	ACTIVE RISK/OPPORTUNITY	Oct 02, 2023
RISK-78	🟥	1.09 – DM	Computing architecture novelty	ACTIVE RISK/OPPORTUNITY	Sep 30, 2028
RISK-498	🟥	1.09 – DM	Algorithmic Scaling	ACTIVE RISK/OPPORTUNITY	Oct 02, 2028
RISK-303	🟥	1.09 – DM	Oversimplified instrument model	ACTIVE RISK/OPPORTUNITY	Oct 02, 2028

1.10 Chile Risk Drivers for Schedule Contingency

CMBS4 Risk Mar 2024 Uncertainty and Risk Events (No Mitigation)
Schedule Contribution™ (Predecessors) for CMBS4 Risk Mar 2024.1.10 - Chile Site
Risk Exposure at P75: 514.0d

1.10 Chile Risk Drivers for Budget Contingency

Cost Import Uncertainty and Risk Events (No Mitigation)
Cost Contribution for 1.10 - Chile Site
Risk Exposure at P75: $9,945K

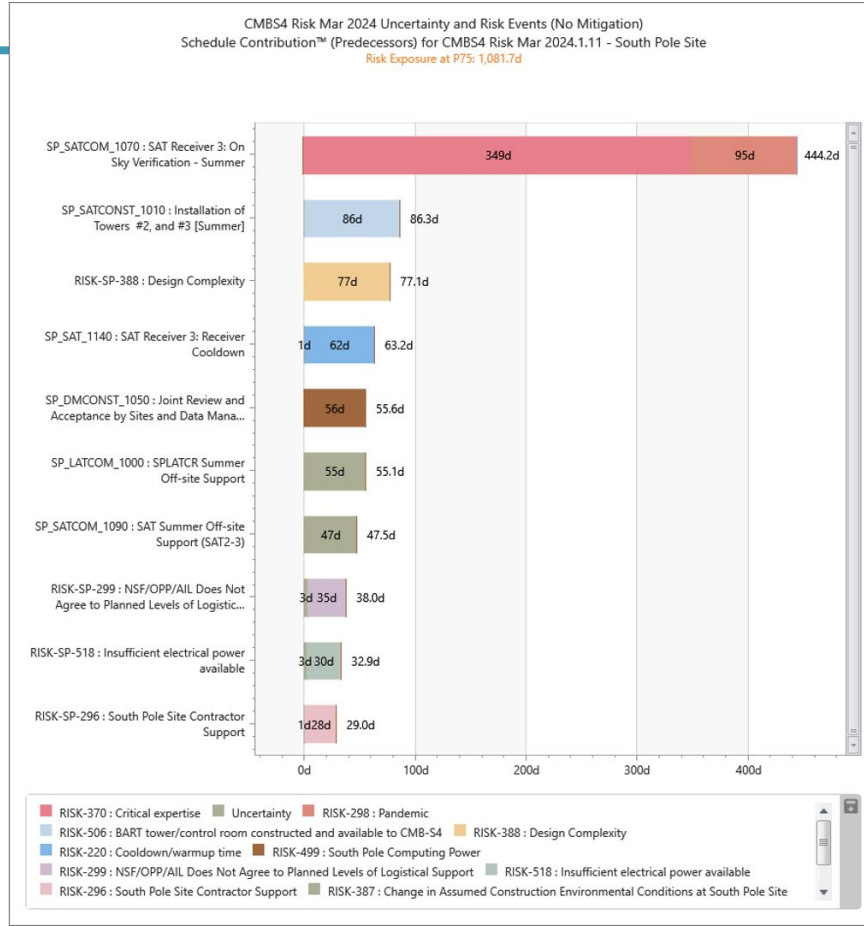# 1.10 Chile Pre-Construction Risks

19 of 52 risks occur prior to start of construction

1 risk retires in 2020 - needs checking

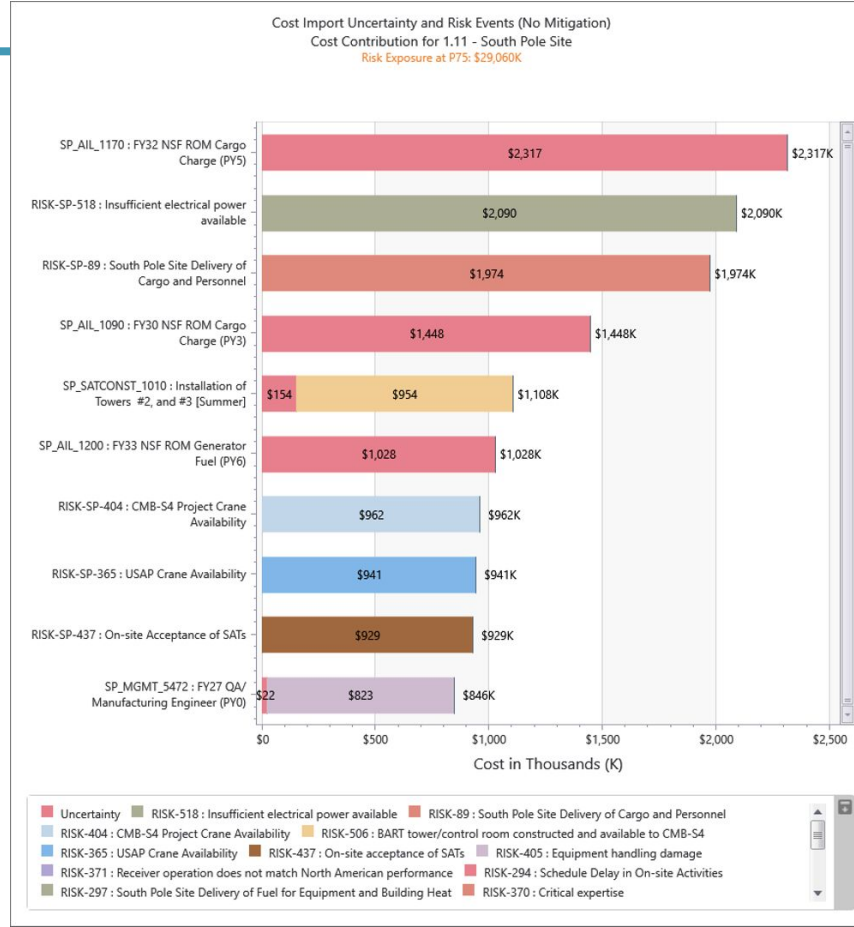33 risks occur after start of construction

Key	T	WBS L2	Summary	Status	Risk Retirement Date
RISK-320	🔲	1.10 - Chile Site	Site access: Access road degrades	PROPOSE ACTIVE RISK AFTER UPDATE	Jun 30, 2020
RISK-382	🔲	1.10 - Chile Site	Weather conditions stop I&C work	UPDATE RISK	Mar 22, 2023
RISK-348	🔲	1.10 - Chile Site	High-bandwidth communication infrastructure not installed	ACTIVE RISK/OPPORTUNITY	Sep 30, 2024
RISK-344	🔲	1.10 - Chile Site	High-bandwidth communication fees increase	ACTIVE RISK/OPPORTUNITY	Sep 30, 2024
RISK-335	🔲	1.10 - Chile Site	Site layout: Geotechnical problem	ACTIVE RISK/OPPORTUNITY	Sep 30, 2024
RISK-333	🔲	1.10 - Chile Site	Agency payments: "10% rule" costs increase	UPDATE RISK	Sep 30, 2024
RISK-332	🔲	1.10 - Chile Site	Land use fees increase	ACTIVE RISK/OPPORTUNITY	Sep 30, 2024
RISK-322	🔲	1.10 - Chile Site	Land use permit: late in establishing any permit	ACTIVE RISK/OPPORTUNITY	Sep 30, 2024
RISK-314	🔲	1.10 - Chile Site	ICDs not ready	UPDATE RISK	Sep 30, 2024
RISK-324	🔲	1.10 - Chile Site	Legal entity in Chile not established in time to prepare for construction	PROPOSE ACTIVE RISK AFTER UPDATE	Mar 31, 2025
RISK-338	🔲	1.10 - Chile Site	Electrical grounding: Solution is more expensive then planned	UPDATE RISK	Sep 29, 2025
RISK-331	🔲	1.10 - Chile Site	Delays establishing legal entity in Chile put it on critical path	UPDATE RISK	Sep 30, 2025
RISK-317	🔲	1.10 - Chile Site	Site access: no access after snowstorms	UPDATE RISK	Sep 30, 2025
RISK-346	🔲	1.10 - Chile Site	Land use permit: cannot be established with PAA for full period required	ACTIVE RISK/OPPORTUNITY	Apr 05, 2027
RISK-373	🔲	1.10 - Chile Site	Failure of concrete validation for major pour	ACTIVE RISK/OPPORTUNITY	Jul 05, 2028
RISK-340	🔲	1.10 - Chile Site	Concrete pour during austral winter	ACTIVE RISK/OPPORTUNITY	Jul 05, 2028
RISK-337	🔲	1.10 - Chile Site	Major construction contract: Delays in start of work	UPDATE RISK	Jul 05, 2028
RISK-336	🔲	1.10 - Chile Site	Major construction contract: delays in executing work	UPDATE RISK	Jul 05, 2028
RISK-319	🔲	1.10 - Chile Site	Major construction contract: Weather delays during construction	UPDATE RISK	Jul 05, 2028

1.11 South Pole Risk Drivers for Schedule Contingency

CMBS4 Risk Mar 2024 Uncertainty and Risk Events (No Mitigation)
Schedule Contribution™ (Predecessors) for CMBS4 Risk Mar 2024.1.11 - South Pole Site
Risk Exposure at P75: 1,081.7d

1.11 South Pole Risk Drivers for Budget Contingency

Cost Import Uncertainty and Risk Events (No Mitigation)
Cost Contribution for 1.11 - South Pole Site
Risk Exposure at P75: $29,060K

1.11 South Pole Pre-Construction Risks

4 of 31 risks occur prior to start of construction

27 risks occur after start of construction

Key	T	WBS L2	Summary	Status	Risk Retirement Date ⬆
RISK-299	🟥	1.11 – South Pole Site	NSF/OPP/AIL Does Not Agree to Planned Levels of Logistical Support	UPDATE RISK	Sep 25, 2025
RISK-523	🟥	1.11 – South Pole Site	Design Updates for Changing Site Environmental Conditions	UPDATE RISK	Oct 22, 2026
RISK-388	🟥	1.11 – South Pole Site	Design Complexity	UPDATE RISK	Oct 22, 2026
RISK-506	🟥	1.11 – South Pole Site	BART tower/control room constructed and available to CMB-S4	UPDATE RISK	Oct 08, 2028

Next Risk Workshop: late June

- **Focus 1: Missing construction stage risks**
- **Focus 2: Review mapping from Jira to P6 activities**
- **Focus 3: Does risk description explicitly include cause**

Risk Description Guidance

From the DoD Risk, Issue, and Opportunity Management Guide

> A good risk statement will include two or, potentially, three elements: the potential event or condition (Risk), the consequences (Impact) and, if known, the cause of the event.

The risk statement should not include a potential risk mitigation strategy, other solution, or other extraneous information

Example

IF fabrication rates are slower than planned (RISK) <u>because facility maintenance is not performed</u> (CAUSE) then integration of the final assembly will be delayed (IMPACT)

Fishbone Tool for Root Cause Analysis
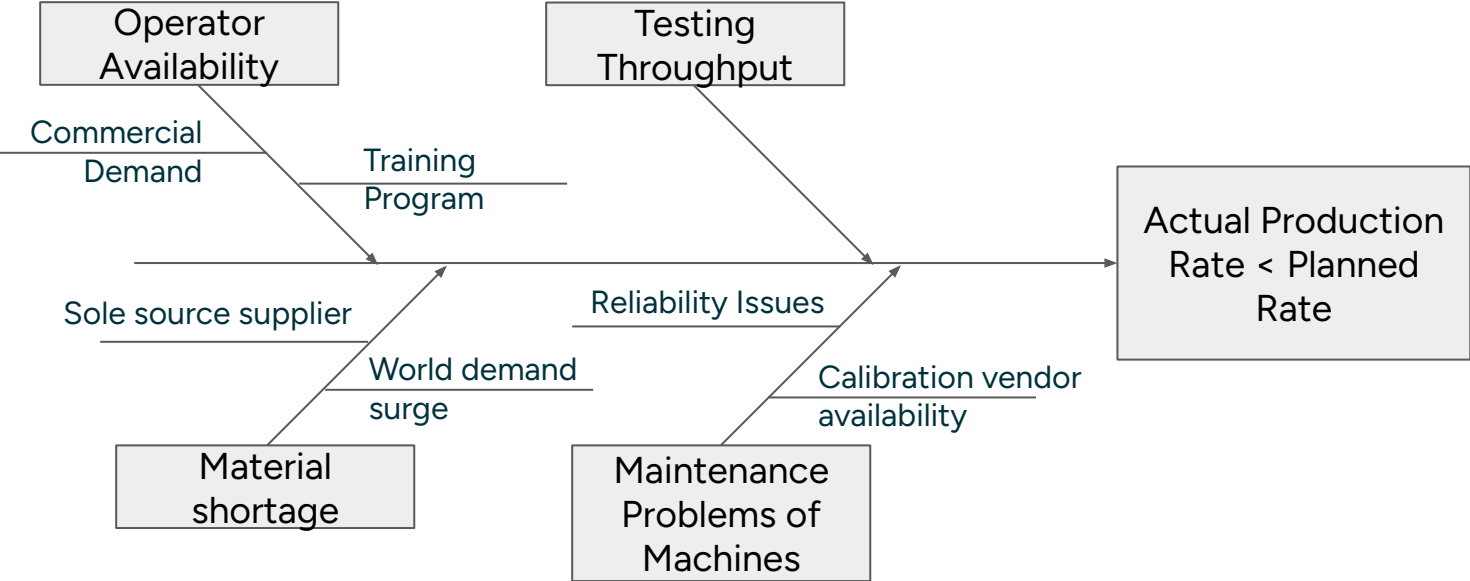
5 Whys Root Cause Analysis

Consequence/Effect

Actual Production Rate < Planned Rate

1) Why → Material Shortage

2) Why → Worldwide demand surge

3) Why → Market demand shift

4) Why → Low volume customer orders delayed

Root Cause

Insufficient lead time for procurement

5) Why →