Rubin Observatory Operations: Enabling collaborative ground-up budget planning across a multi-team organization

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ABSTRACT

Change is inevitable in large big budget operational programs. Embracing, rather than resisting, change is key to being proactive. It also keeps teams motivated as it's another avenue for leadership to "listen" to what is going on at the team level. At Rubin Observatory an agile approach to budgeting has been implemented. Annually a bottom up review, called a scrub, is carried out across all departments of the Rubin Operations organization providing an opportunity to adapt and be nimble to changing situations that can affect resources and budgets. This paper will provide details on the importance for an annual budget scrub, processes followed, tools used and how the cycle continues year on year.

Keywords: Vera C. Rubin Observatory, budget, planning, funding

1. INTRODUCTION

Vera C. Rubin Observatory[1] is currently under construction, once complete the observatory will consist not only of the physical Chile based mountain top summit facility housing an 8.5m telescope and a 3200 megapixel camera but also includes systems such as those for data management and public engagement. Naturally this means the observatory is distributed across a number of locations. The operations program is due to start full operations in 2025, the survey will be carried out over a period of ten years and a post-operations phase will follow. The operation of Rubin observatory is fairly unique in being funded in equal shares by two US government agencies. Budgets are usually set at high levels years in advance but things rarely stay the same. This paper describes an annual bottom up budgeting process adapted from the one used by the ATLAS Experiment. The aim of the annual exercise is to enable change within the budget envelope. The paper provides the reader with details of all the tools that are used and describes the process that is followed annually.

2. PROCESS

Throughout the Rubin pre-operations and operations phases, annually in May each team will look back at what was planned, what was achieved, do a full review of its activities, and propose a high level plan for the following (US fiscal) year.

This is standard practice in other high energy physics experiments as well, the scrub allows the facility to continuously evolve its operating plan, taking critical input from the people that understand best what is really needed, in Rubin's case that is the Team Leaders.

Following the National Science Foundation and Department of Energy joint annual review of Rubin Operations the Rubin Operations Directors office together with department heads sets the major milestones for the next US fiscal year (FY) starting 1st October. This includes looking at the status of major milestones for the current year and ascertaining whether any of those need to carry over into the next FY.

With the major milestones set, the Director's office kicks off the month long annual scrub process, see Figure 1 in which the department heads start down stream planning with their teams. This is the "homework" phase of the scrub where teams are looking at:

- status of minor milestones for the current FY
- setting minor milestones that would contribute to accomplishing the new major milestones for the next FY
- based on activities needed to achieve the minor milestones and risk mitigation plans the teams review planned resources both labor and non-labor
- if there is a mismatch between resources needed and the resources available the team will propose changes during this scrub period through the tool (described in the next section).

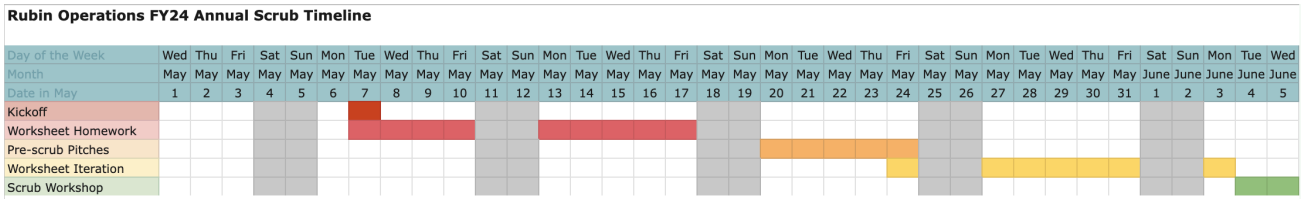


Figure 1. Scrub timeline

Having completed the above homework, in the tool provided, the scrub moves into the "pitches" phase. Department heads and team leads prepare short presentations, for which a template is provided, to pitch the needed changes to the Director's office. As additional resource requests from one department could impact another, all department leads and team leads are invited and encouraged to attend all pitches. Currently in Rubin the 15-30 minutes team level pitches are carried out per department in virtual format. This is in contrast to the ATLAS Experiment where the teams come together for an in-person gathering to present pitches.

After the pitches phase is complete a period of iteration takes place between the director's office and department/team to reach an agreement on the changes.

The directors office is aggregating the labor and non-labor baseline vs proposed changes across the Rubin departments to ensure the program remains overall within the defined financial envelope. This is one of the reasons for the back and forth iterations and negotiations as priorities have to drive this process.

After agreement the changes are implemented by propagating them throughout the Rubin planning tools culminating in the spending plan for the next FY and definition of Statements of Work for the contracts enabling requisitions to be input in time for contracts to be placed.

With the resources now updated across all the tools teams can start realistically planning for the coming FY by defining the tasks and activities that will lead to completion of the defined minor milestones within the boundaries of the available resources. Work then commences at the start of the FY. The activity planning is done in an Atlassian tool called Jira where the milestones are defined enabling downstream and upstream traceability between milestones to tasks.The Jira tool is outside the scope of this paper.

From the start of the FY the Director's office takes inputs, such as overhead rates, escalation rates etc, as defined by the managing organization and preps the tools for the next annual scrub and so the cycle continues, see see Figure 2.

3. TOOLS

This section of the paper describes the tools used for the scrub process. With the requirement for agility, collaborative working and ease of linking to existing tools, google suite is the chosen platform onto which the scrub tools have been developed. The tool, called the Scrub Sandbox, need to facilitate the following:

1. Capturing the current state.
2. Capturing what the the desired change is.

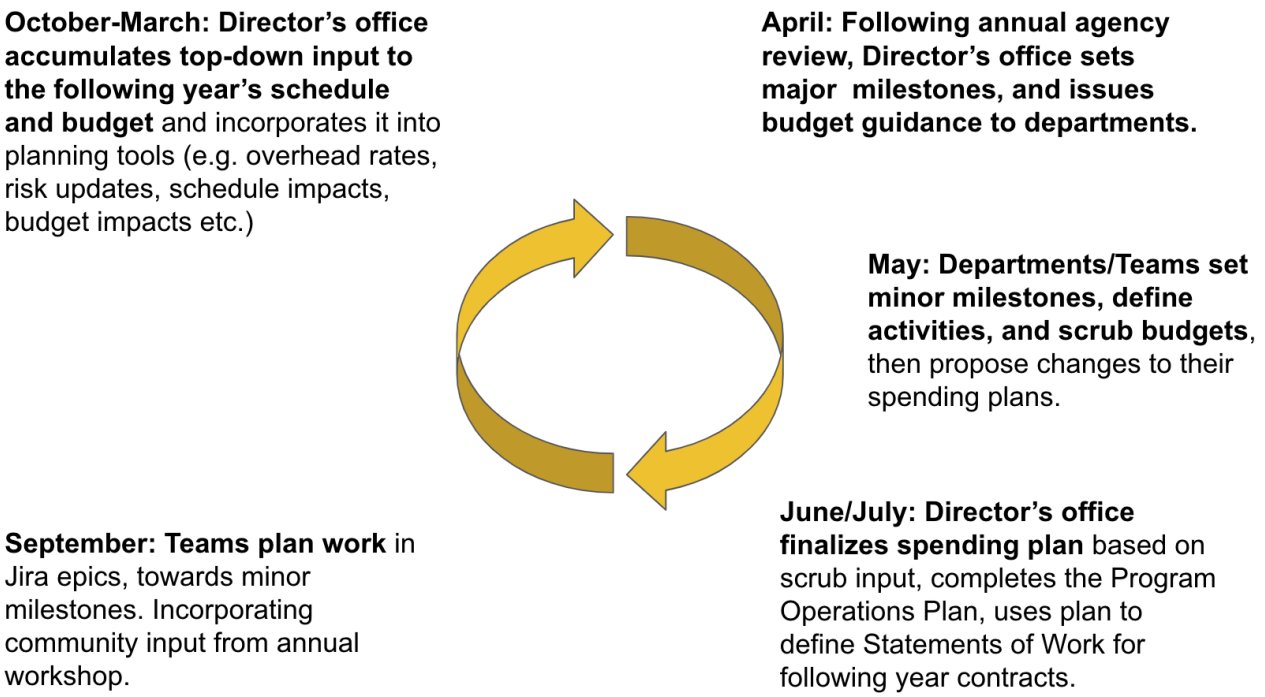


Figure 2. The annual planning and scrub cycle

3. Inputting flow down milestones for the upcoming FY based on higher level milestones defined by the Director's office
4. Standardized inputs
5. Easily seeing the impact of the desired change on labor and non-labor budget.

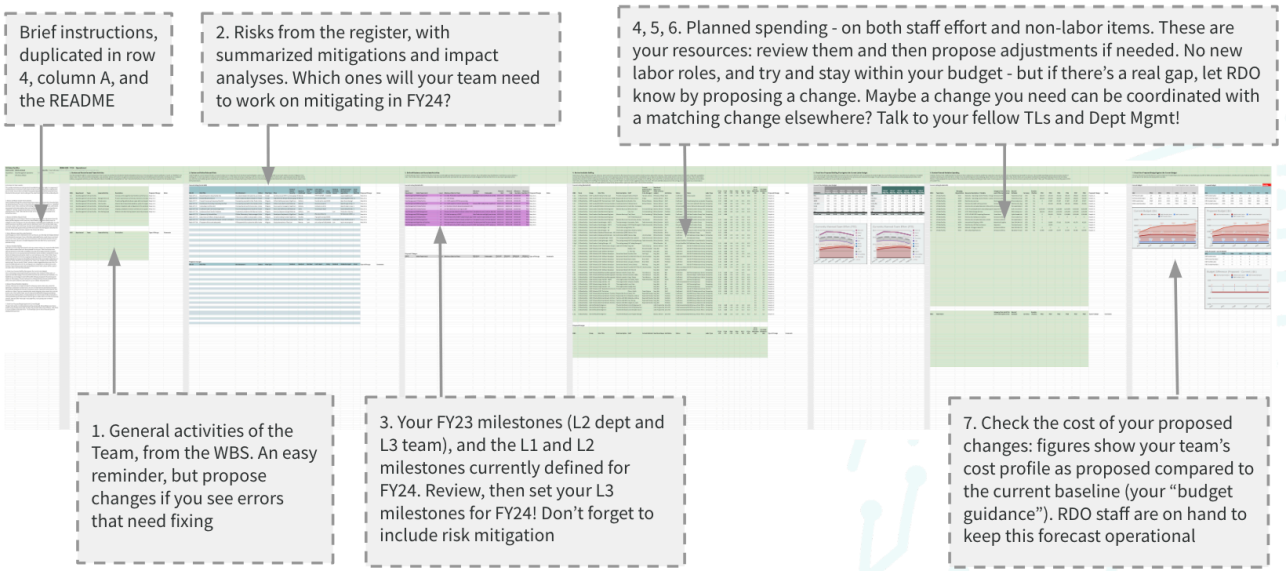
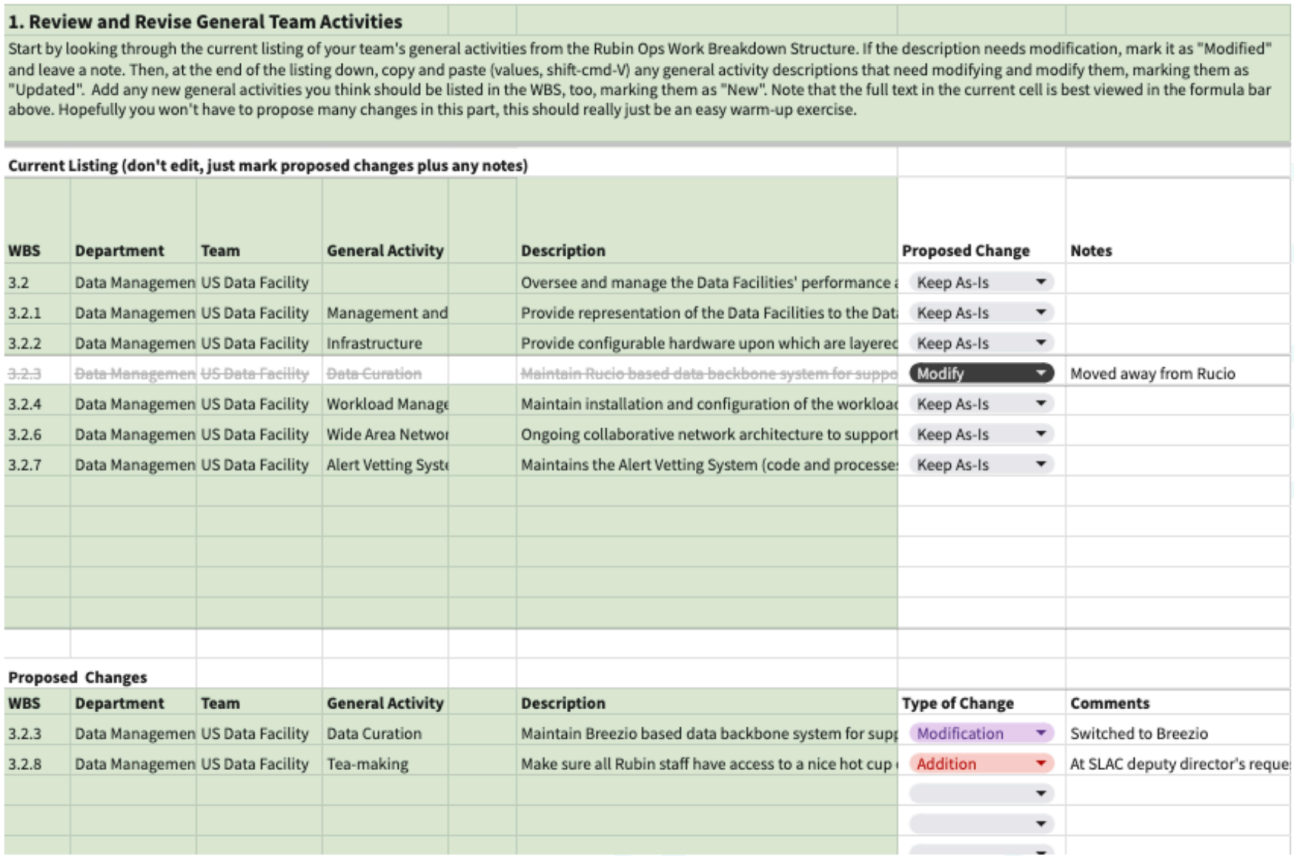


Figure 3. Overview of Scrub Sandbox

Furthermore, the tool needs to enable the following areas to be scrubbed:

1. Work Breakdown Structure (WBS)
2. Risks.
3. Milestones.
4. Labor expenditure.
5. Non-labor expenditure.

In all the above cases a standard approach is applied to propose changes See Figure 4. Beside the current activity in the Proposed Change column during the scrub review a value is chosen from the drop down choices which are Keep As-Is, Modify, Remove/Replace. There is space to enter a note if explanation is needed. A Modify proposal will require a corresponding entry in the Proposed Changes table directly below the current status table as will proposed Additions. Proposed changes to the labor and non-labor plan are visualized in monetary terms in real-time with baseline comparison charts such as those shown in Figure 5.



1. Review and Revise General Team Activities

Start by looking through the current listing of your team's general activities from the Rubin Ops Work Breakdown Structure. If the description needs modification, mark it as "Modified" and leave a note. Then, at the end of the listing down, copy and paste (values, shift-cmd-V) any general activity descriptions that need modifying and modify them, marking them as "Updated". Add any new general activities you think should be listed in the WBS, too, marking them as "New". Note that the full text in the current cell is best viewed in the formula bar above. Hopefully you won't have to propose many changes in this part, this should really just be an easy warm-up exercise.

Current Listing (don't edit, just mark proposed changes plus any notes)

WBS	Department	Team	General Activity	Description	Proposed Change	Notes
3.2	Data Managemen	US Data Facility		Oversee and manage the Data Facilities' performance	Keep As-Is	
3.2.1	Data Managemen	US Data Facility	Management and	Provide representation of the Data Facilities to the Dat	Keep As-Is	
3.2.2	Data Managemen	US Data Facility	Infrastructure	Provide configurable hardware upon which are layered	Keep As-Is	
~~3.2.3~~	~~Data Managemen~~	~~US Data Facility~~	~~Data Curation~~	~~Maintain Rucio based data backbone system for suppo~~	Modify	Moved away from Rucio
3.2.4	Data Managemen	US Data Facility	Workload Manage	Maintain installation and configuration of the workloa	Keep As-Is	
3.2.6	Data Managemen	US Data Facility	Wide Area Networ	Ongoing collaborative network architecture to support	Keep As-Is	
3.2.7	Data Managemen	US Data Facility	Alert Vetting Syst	Maintains the Alert Vetting System (code and processes	Keep As-Is	

Proposed Changes

WBS	Department	Team	General Activity	Description	Type of Change	Comments
3.2.3	Data Managemen	US Data Facility	Data Curation	Maintain Breezio based data backbone system for supp	Modification	Switched to Breezio
3.2.8	Data Managemen	US Data Facility	Tea-making	Make sure all Rubin staff have access to a nice hot cup	Addition	At SLAC deputy director's reque

Figure 4. Work Breakdown Structure scrubbing

4. OUTCOMES AND CONCLUSIONS

This annual iterative process enables change to happen in a controlled and transparent manner enabling buy-in at all levels on what the upcoming FY priorities are and the reasons behind difficult decisions which are often inevitable. It should be noted that changes can still happen throughout the year through a process called Request Beyond Target (RBT). This process is outside of the scope of this paper but is mentioned here to stress the agile nature of planning on the Rubin Program.

7. Check Your Proposed Budget Against the Current Budget

This part rolls up the currently planned, and now proposed, US spending in your team, broken out by funding source (NSF or DOE) and cost type (labor and nonlabor), and shows it to you in tabular and graph form. This hsould give you an idea of how well you are staying within your box.

Current Budget				Cost Calculator Input:	Baseline			Proposed Budget				Cost Calculator Input:	Baseline	
($k)	FY23	FY24	FY25	FY26	FY27	FY28		($k)	FY23	FY24	FY25	FY26	FY27	FY28
NSF-funded Labor	27	28	0	0	0	0		NSF-funded Labor	27	28	0	0	0	0
NSF-funded Nonlabor	962	1084	1126	1099	1171	1335		NSF-funded Nonlabor	962	1084	1126	1099	1171	1335
DOE-funded Labor	5069	5875	5889	5984	5818	5376		DOE-funded Labor	5069	5875	5889	5984	5818	5376
DOE-funded Nonlabor	3143	5739	7494	7828	8208	9856		DOE-funded Nonlabor	3143	5739	7494	7828	8208	9856

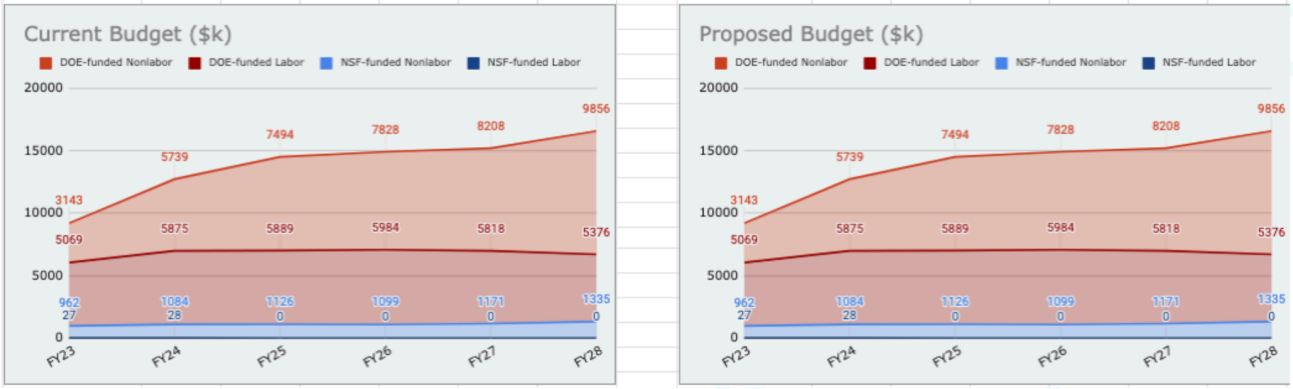


Figure 5. Baseline vs Proposed labor and non-labor comparison

Year on year, as this process takes place from now through to the end of the ten-year Legacy Survey of Space and Time, expected in 2037, the scrub process is envisaged to evolve as each iteration will reveal gaps and areas of improvement that can fed into the design of the process and the tools for the following fiscal year's scrub.

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Acronyms

Acronym	Description
AST	NSF Division of Astronomical Sciences
ATLAS	A Toroidal LHC Apparatus
AURA	Association of Universities for Research in Astronomy
DE	dark energy
FY	Financial Year
RBT	Requests Beyond Target
SLAC	SLAC National Accelerator Laboratory
US	United States
WBS	Work Breakdown Structure