Large Synoptic Survey Telescope Camera System Plan	Document # **LCA-29-F**		Status LSST Camera APPROVED Effective Date: 31 July 2015
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Document Title

LSST Camera Risk Management Plan

1. Change History Log

Revision	Effective Date	Description of Change
F	31 July 2015	Remove "ability to target risk" category and modify the meaning of a probability rating of 5. Editorial changes. Release per LCN-1391.
E	29 June 2015	Revised definition of "ability to target risk". Release per LCN-1366.
D	21 Oct 2014	Pre-CD-2 update
C	3 Oct 2011	Pre CD-1 update; added post-mitigation contingency analysis. See notice LCN-003
B	5 May 2011	Pre-Director's Review update; synchronized impact levels with LSST project risk plan

2. Contents

3. Applicable Documents

The following documents are applicable to the use of this Plan

[1] LCA-225, “Camera Project Management Plan”
[2] LCA-38, “Camera System Engineering Management Plan”
[3] LCA-138, “Camera Performance and Safety Assurance Plan”
[4] LSE-17, “LSST System Engineering Management Plan”
[5] LPM-20, “LSST Risk Management Plan”
[6] LCA-30, “Camera Risk Registry”
[7] SLAC-I-PMO-005-R000, “SLAC Risk Management Plan”
[8] DOE G 413.3-7A, “Risk Management Guide”

4. Acronyms

CCB	Change Control Board
CD	Critical Decision
CPM	Camera Project Manager
CRM	Continuous Risk Management
CSEM	Camera System Engineering Manager
CPRC	Camera Project Risk Coordinator
FMEA	Failure Modes and Effects Analysis
I&T	Integration and Test
LSST	Large Synoptic Survey Telescope
LSSTC	Large Synoptic Survey Telescope Corporation
QAM	Quality Assurance Manager
RM	Risk Manager
RMP	Risk Management Plan
RRB	Risk Review Board
SM	Safety Manager
WBS	Work Breakdown Structure
PMOG	Project Management Oversight Group

5. Purpose and Scope

This Risk Management Plan (RMP) describes the continuous risk management (CRM) process implemented by the Large Synoptic Survey Telescope (LSST) Camera system. CRM is a disciplined approach to managing project risks throughout the life cycle of the project. This plan is consistent with DOE O413.3A, "Project Management for the Acquisition of Capital Assets," and [Ref. 8], DOE G 413.3-7A, "Risk Management Guide," the associated Risk Guide and strives to incorporate "best practices" from other large-scale, first-of-a-kind science projects. The plan establishes the methods of assessing Camera project risk down to the subsystem level. Risk at the Camera system and subsystem level is assessed and managed using the methods described herein. Project risk is managed throughout the life of the project, from development through construction and early commissioning phases.

There are three goals to implementing this system.

First, the CRM process described in this Plan is intended to manage the risks associated with the development and construction of the Camera. Project risks are centrally managed, but are the result of project-wide risk assessment. Thus, relative risk is assessed across the project in a coherent fashion.

Second, project-wide risk assessment supports management decision-making by providing integrated and quantitative assessments of risk. Current and comprehensive risk updates provide management with additional information in preparing for and reacting to contingent events and adverse outcomes to planned events.

Third, the CRM process provides a uniform language for tracking risk elements and communicating that information both within the project and its subsystems, as well as to project sponsors and reviewers.

The Camera risk management approach is aligned with the LSSTC Risk Management Plan [Ref 5]. Camera Risks that have a likelihood of impacting the Observatory system cost, schedule or performance are promoted to the Observatory Risk Registry as described in [Ref 5].

6. Overview

Risk management is the on-going process of comprehensively *assessing project risks*, developing and *implementing plans to manage* those risks, and *tracking and communicating* those risks as they evolve over the life of the project. Here, risk is defined as the likelihood of an undesirable event occurring that results in not meeting a specified technical or programmatic requirement. The goal of this program is to provide assessments of relative risk to the project early enough that pro-active steps can be taken by project management to mitigate the risks. Since risks and mitigation strategies change over the life cycle of the project, risk management is a continuous and iterative process. This ensures that risk information is suitably up-to-date to allow management to be responsive to the dynamic internal and external environments.

7. Risk Management Roles and Responsibilities

The Camera Project Manager (CPM) has overall responsibility for controlling project risk, as one of many elements to be used in managing the project over its lifecycle. The CPM is supported by Camera subsystem managers in assessing and managing project risk at all levels of the project, by the Camera Project Risk Coordinator (CPRC) in the execution, and coordination of risk management activities and by the Risk Manager (RM) who provides risk management expertise, including Monte Carlo Analysis.

Risk identification and assessment is carried out at the subsystem level. Subsystem managers are responsible for identifying risk elements within their subsystem, assessing the risk, and developing mitigation options. These risks are maintained in subsystem specific risk lists, which are collected by the CPRC for compilation and review. The CPRC is responsible for collecting and maintaining the centralized Risk Registry [Ref 6] for the entire project, tracking the registry, and communicating risk information as needed. This database includes information about all identified risks within the project.

The Camera Risk Review Board (RRB) is responsible for reviewing the Risk Registry, assessing the risk mitigation options, and developing implementation recommendations, which are forwarded to the CPM.

The Camera RRB consists of the following:

- Camera Project Manager (chair)—approves/disapproves recommendations of the Board.
- Camera Project Director (alternate chair)—provides senior management insight and supports Observatory level impact assessments.
- Camera PMCS Manager—provides assessment of impacts to cost, schedule or contracts.
- Camera Scientist—evaluates impacts to system performance and science requirements.
- Camera Systems Integration Manager reviews risk assessments for technical veracity and works with the camera scientist and subsystem managers to provide additional risk information, as needed..
- Camera Project Risk Coordinator —maintains up-to-date Risk Registry for the RRB, tracks changes, and records RRB decisions.
- Risk Manager-provides risk management expertise and advise, performs quantitative analysis using Monte Carlo models and related tools.
- Safety Manager (SM)—assesses risks associated with safety
- Quality Assurance Manager (QAM)- assesses risks associated with process control issues and evaluates reliability studies in light of identified risks.

Key advisors to the board are:

- Subsystem Managers—collect subsystem risks in a subsystem risk list for submission to the CPRC. Represents the subsystem in evaluating risk trade-offs, proposing mitigation alternatives and mitigation recommendations.
- Integration and Test (I&T) Manager—analyzes I&T risks and records those risks in a subsystem risk list for submission to the CPRC. Evaluates risk trade-offs proposing mitigation alternatives and recommendations.
- Chief Electrical Engineer—reviews risk assessments for technical veracity and works with subsystem managers to provide additional risk information, as needed.
- Chief Mechanical Engineer—reviews risk assessments for technical veracity and works with subsystem managers to provide additional risk information, as needed.

The RRB meets at least quarterly (with a goal of monthly) to review and update the current Risk Registry and evaluate the project's technical and programmatic performance, as well as the effectiveness

of the risk mitigation actions being taken. Should corrective action be deemed necessary, the RRB makes recommendations to the CPM. Note that implementation of risk-reduction activities requires review by the RRB and consent of the CPM. The RRB will:

- Review changes to the Risk Registry
    - Changes to risk exposure
    - Proposals for adding new risks or closing risks
- Review the top 10 risks in detail
- Review unfunded risks
- Review risk related action items (maintained in JIRA)

8. Risk Assessment

8.1. General

Project risks are assessed at the subsystem level by the subsystem manager, working with his/her engineers and product developers. Project risks are also assessed at the Camera level by project management, system engineering and integration and test management through analysis of the overall camera performance and integration activities throughout the project life cycle. Elements of risk include programmatic, hardware, and software items, with time horizons that could be very localized or stretching out over long periods of the project.

There are five aspects to assessing the state of risk within a subsystem:

- Identification: identifying elements of risk in the subsystem or project.
- Establishing time frame: determining the likely time that a risk event would come to pass.
- Assessing probability: estimating the probability that an undesirable event may occur.
- Assessing severity: gauging the severity of the impact that such an event would have on the status of the project if the event were to occur.
- Developing mitigation options: developing plans to reduce either the likelihood or severity of the risk.
- Post-mitigation and impact modeling: ongoing assessment of residual risk post-mitigation and assessment on contingency through the use of Risk Impact Models.

The following sections detail the process to be used in identifying and analyzing elements of risk.

8.2. Risk Identification

Risk Identification is the process of determining which events, if they occur, will adversely affect the project, then documenting the characteristics of the events that may happen to delineate why the event is considered a risk. Risks should typically be described with “If…then” statements, to clearly identify the triggering event and the possible outcome.

Risks can be performance-related or programmatic in nature. Performance risk is the possibility that a performance requirement of the system may not be achieved in the system life cycle. Examples of adverse outcomes to performance risks include the failure to meet performance or operability requirements, the inability to procure a product to specification, or under-performance of a development prototype. Programmatic risk is the possibility that an activity or cost element incurs schedule delays or cost over-runs which are detrimental to the sub-system.

Four methods may be used in identifying elements of risk, listed here in increasing order of involvement and complexity. First, project team assessments are performed by the technical and program leads for the subsystem, based on their experiences. Second, identification may require expert interviews or involvement by third-parties who have specific expertise or directly-related experience. Third, lessons-learned from other projects may be used to identify risks that resulted in adverse impacts on past projects. Once risks have been identified, they are classified in two ways:

- Work Breakdown Structure (WBS) category: the subsystem that "owns" the risk and is responsible for its mitigation.

- Appearance timeframe: the point in the project schedule at which the event would likely occur.
    - Design: phase
    - Development (Dev): development phase
    - Engineering Test Unit (ETU): during production of engineering test units
    - Fabrication (Fab): post CD-3 phase, during fabrication or subsystem assembly
    - Integration and Test (I&T): camera or observatory system integration
    - Management (Mng): determined during management phases, reviews
    - Procurement (Procure): procurement phase of project
    - Comissioning (Comm): during camera integration on telescope or commissioning
    - Operations (Ops); During observatory operations after commissioning is complete

8.3. Risk Analysis

Once a risk has been identified, it is then analyzed. Risk analysis considers two risk characteristics for establishing the magnitude of identified risks and subsequently prioritizing them. These are:

Probability of Risk: the likelihood of an undesirable event actually occurring.
Impact of Risk: the severity of the result with respect to cost, schedule and performance, if the event were to occur.

Analysis occurs for two states:

"Current Assessment" is an assessment of the risk as it stands today; this assessment is used to assist the project in prioritization of focus on project risks. The assessment is to take into account current mitigations and current state of the risk, it does not assume success or failure of future mitigating activities.

"Residual Risk Post-Mitigation Assessment" is an assessment of the potential impact to the project assuming that the documented mitigation actions are taken, and there is still some impact from the risk. The focus of the post-mitigation risk assessment is to monitor the expected effectiveness of the mitigation activity. This assessment provides project management early insight to the need for additional mitigation to reduce the residual risk or allows termination of a mitigation activity should the residual risk be deemed acceptable at any time during the mitigation activity.

Each of these characteristics is discussed in the following sub-sections, along with the grading process to be used in analyzing the risk.

8.3.1. Probability Analysis

The probability of an undesirable event coming to pass is the likelihood that the event will actually occur, assuming no mitigation action is taken. On a five-point scale, the higher the probability, the more likely the event will occur if no advance action is taken to avoid it. Table 1 lists the probabilities. Note that this is understood to be an estimate only, based on the perceived performance or programmatic factors that have been identified to make this a risk. Probability is assessed at the "Current Assessment" level and at the "Residual Risk" level.

8.3.2. Impact Analysis

The impact of a risk is the end consequence on the program baseline if an adverse event should come to pass with no mitigating action taken. Risk impact severity is graded on a five-point scale for each of the three areas of impact: cost, schedule, and performance. This is shown in Table 2. Note that risk impact could include all three impact types. However, impacts should be limited to those that directly result from the adverse event occurring. .

Impact is assessed at the "Current Assessment" level and at the "Residual Risk" level. At the "Residual Risk" level, possible impact outcomes for cost and schedule elements are projected across a range (Minimum, Expected, Maximum) for used in quantitative analysis models. The minimum and maximum values for cost and schedule can be wider (or narrower) than the expected range as identified in the "Impact of Risk" column, and should reflect a realistic estimate of potential cost or schedule impact ranges.

8.3.3. Risk Score and Exposure

After the three characteristics of a risk are analyzed, the risk is scored using a standardized method. First, "Total Risk Impact" and an overall "Risk Score" are calculated for each risk element:

Total Impact = (0.33 * Technical Impact) + (0.5 * Cost Impact) + (0.33 * Schedule Impact)
Risk Score = Probability of Risk Score*Total Impact (with a maximum of 25)

Note that the risk rankings were coordinated with the Observatory level. The cost impact rankings are thus set for a project value higher than the camera. To compensate, the cost impact is weighted higher than the technical and schedule impacts.

The CPM has the authority to approve override of exposure scoring with a "Maximum" of formula for the "Total Impact" score for reasons including, but not limited to LSST Project priorities, safety/environmental considerations, other project priorities. CPM will provide justification in these cases.

Next, a Risk Exposure level is assigned as-follows and shown in Table 3

Table 1: Definition of Risk Probability

Pts	Likelihood of	Approximate Probability	Description of Probability

	Occurrence		
1	Rare	<1%	Likelihood of occurrence is not credible
2	Unlikely	1-5%	Not reasonably expected to occur
3	Possible	5-25%	Possible, or difficult to assess the chance of occurrence
4	Likely	25-67%	Very likely that an adverse event will occur
5	Highly Probable	>67%	High probability that an adverse event will come to pass

Table 2: Definition of Risk Impact

Pts	Severity of Impact	Description of Impact
Cost Impact		
1	Insignificant	Overrun of cost of < $30K, recoverable with project contingency
2	Minor	Overrun of cost of $30k - $200K, recoverable with project contingency
3	Moderate	Overrun of cost of 200k - $1.5M, with significant impact on contingency
4	High	Overrun of baseline cost of $1.5M - $10M, with re-baseline required
5	Critical	Overrun of baseline cost of >$10M, with project in jeopardy
Schedule Impact		
1	Insignificant	Degradation of schedule margin to project critical path by < 2 wks
2	Minor	Degradation of schedule margin to project critical path by 2 wks to 1.5 months
3	Moderate	Degradation of schedule margin to project critical path by 1.5 to 3 months
4	High	Degradation of schedule margin to project critical path by 3 to 6 months
5	Critical	Degradation of schedule margin to project critical path by > 6 months
Performance Impact		
1	Insignificant	No effect on ability to meet requirements; minor design changes needed
2	Minor	Minor excursion from subsystem requirement, but compensated elsewhere
3	Moderate	Level 2 and/or SRD design specification exceeded
4	High	Level 1 and/or SRD minimum specification exceeded
5	Critical	Unable to achieve any of the primary science missions

Table 3: Risk Score and Risk Level Assignment

Risk Exposure Level						Risk Level
Total Impact	5	5	10	15	20	25	Critical
	4	4	8	12	16	20	High
	3	3	6	9	12	15	Moderate
	2	2	4	6	8	10	Minor
	1	1	2	3	4	5	Insignificant
		1	2	3	4	5	
		Risk Probability					

Insignificant Risk: $0 < \text{Risk Score} \leq 5$
Minor Risk: $5 < \text{Risk Score} \leq 10$
Moderate Risk: $10 < \text{Risk Score} \leq 15$
High Risk: $15 < \text{Risk Score} \leq 20$
Critical Risk: $20 < \text{Risk Score} \leq 25$

8.4. Mitigation Planning

The final step in the process of assessing a risk element is the development of risk mitigation (reduction) options. There are four general types of risk mitigation action that can be taken

Take preventative **action** to avoid or reduce the risk.
Share the risk by trading off reduced risk for increased risk or reduced margins elsewhere.
Plan for contingent action to be taken later, and watch for identified "triggers."
Accept the risk as stated and do nothing about it for the time being.

Mitigation planning is started at the subsystem level by identifying plausible mitigation strategies for the risk element. For most risks, one or two of the four types of mitigations may prove plausible, while the others options are not viable. In particular, early in the project lifecycle many risks likely have mitigation strategies that include preventative action in the form of analysis or prototyping activities. However, these options become increasingly unavailable as the project progresses. Because the timing of mitigation action is important, mitigation options need to include the time at which action must be taken to avoid the risk coming to pass or to reduce the impact of the risk if it were to occur.

Mitigation can be loosely categorized into the following forms:

- Analysis: Design analysis to assess the expected performance and thus the likelihood of the risk.
- ETU: Develop a targeted test to assess performance or functionality
- Prototype: Develop a larger scale hardware prototype to demonstrate performance or functionality and/or qualify the design
- Study: Design and development efforts to eliminate or characterize the risk

8.5. Risk Impact Modeling

In addition to assessing the current view of risk and impacts, an ongoing assessment of residual risk post-mitigation is maintained through the use of Risk Impact Models.

Risk items with residual severity level of "Minor" or greater must be entered in the Risk Impact Model for further assessment. For cost analysis, the Palisade "@RISK6" software package is used to create probability simulations to determine the most likely risk cost expenditure. The model uses simulation ranges taken from the expected cost risk impact (the product of probability and cost) for the "Optimistic", "Pessimistic", and "Most Likely" cost risk estimates, using a pert cost model. The Monte Carlo Simulated Risk Cost is established at the 80% confidence level to validate the experts' analysis of risk cost for the project, and projected level of discrete risks based project contingency.

Schedule impact is evaluated in a similar fashion, using the expected schedule impact to determine overall risk impact to the project's critical path along the established baseline schedule. Oracle "Risk Analysis" Software is used with the Primavera scheduling software system to create and evaluate the schedule risk impact.

Monte Carlo cost models of initial, unmitigated risk assessment can also be used for comparison against current and mitigated residual risk levels.

At all times, the project's available cost contingency should be greater than the statistical calculation of residual cost risk.

Sensitivity analysis of cost and schedule impact is performed to monitor interaction between risks that may cause unforeseen interactions that may increase (or decrease) impact to the project.

9. Risk Management

Risk assessment occurs largely at the subsystem level, since it requires a detailed understanding of the systems and their risk elements. However, once risks have been assessed, they are managed at the project level to ensure that the limited budget, schedule, and technical resources are used efficiently to mitigate the right set of risks in cost-efficient and timely ways.

The risk scoring system provides the starting point for managing risks across the entire project. All risks are compiled into the project Risk Registry [Ref 6] in order of decreasing risk score. The Risk Registry is then reviewed and re-ordered as needed to factor in other aspects not included in the risk assessment. Additional factors include the breadth of the impact on the project, the timeframe available for instituting mitigation plans, and the relative cost of the mitigation plans. Such additional assessments of the project-level impacts of subsystem risks are made by the Risk Review Board, and results in a final risk ranking.

The second step in managing project risks is to evaluate the options for mitigating the risks. Here, mitigation options are evaluated for overall impact on the project, and mitigations that cross subsystem and project boundaries are assessed for overall risk level. For many of the lower-risk elements, the risk may well be accepted as-is and tracked for future changes.

Finally, for elements with higher risk levels, project resources may be brought to bear to take mitigating action. Mitigating actions such as prototyping may already be included in the project baseline, so such

action is handled in the normal course of business. Other actions may required Change Control Board (CCB) action and re-allocation of project resources.

All risk management actions are carried out by the CPM, under advisement of the RRB. Some actions may be pushed down to the subsystem level, if the scope of action allows for it. However, all actions on identified risks are tracked for follow-up and future re-direction as needed.

As risks are identified and mitigation plans implemented, the RRB maintains the Risk Registry and reviews mitigation actions to ensure that risks are being handled appropriately. In particular, the RRB tracks risk elements to review if the risk level has changed for any risks such that it warrants a change in mitigation strategy. This is particularly important as the timeframe for risk events to occur approaches. Also, as additional risk elements are identified they need to be folded into the overall management plans.

Finally, the RRB retires risks as they either come to pass and action is taken, or after the timeframe for them to come to pass expires. This is essentially an administrative task, but is an acknowledgement that risks have a limited life, and as the project progresses the integrated "risk-to-complete" should decrease.

10. Risk Tracking and Communication

10.1. Risk Data Compilation

Risk elements are compiled, maintained, documented, tracked, and reported by the CPRC, who works with project and subsystem managers to ensure that all risk information is current and reflects the status of the project.

Table 4 lists all information collected for a risk element and maintained in the Risk Registry. This is initially compiled from subsystem managers, then periodically updated by the CPRC. Risk elements are reviewed and updated by managers at least once per quarter, with a goal of maintaining the Risk Registry once a month.

Table 4: Risk Element Data

Item	Information	Risk Element Information Description
Project Subsystem	description	subsystem in which the risk element resides
WBS	WBS Number	The lowest common WBS level for which the risk has impact
Risk ID	number	unique identifier, prefixed with a subsystem code
Risk Title	description	short title to identify the risk
Risk description	description	if/then description of the potential adverse event
Owner	description	primary individual responsible for risk & mitigation activity
Phase	Design/Dev/ETU/ Fab/I&T/ Mng/ Procure/Comm/Ops	time when the risk will most likely come to pass
Status date	date	date at which the risk element and mitigation work was most recently reviewed for status
Probability	1-5 scale	likelihood of an undesirable event actually occurring
Cost impact	1-5 scale	impact of an adverse event and recovery on subsystem budget
Schedule impact	1-5 scale	schedule slip due to the event occurring and subsequent recovery
Performance impact	1-5 scale	severity of the result on technical performance, if the event occurs
Risk Score	1-25 scale	combination of probability and impacts into a single risk score
Risk Exposure	Insignificant, Minor, Moderate, High, Critical	ranking of overall exposure of the project to the risk element
Mitigation type	Study, Anal, ETU, Prototype	type of mitigation action
Mitigation title	description	title of mitigation plan
Mitigation description	description	description of the plan on how risk is being mitigated including time-late or milestone by which mitigation needs to be implemented; include references to external documents, if applicable
Unfunded cost	cost	cost of mitigations that are not funded
Status	Hold, Not Started, Working, Complete, Obsolete	Classification of the status of mitigation work
Target retirement milestone	description	Milestone by which the risk is expected to be resolved
Target retirement date	description	Date by which risk is expected to be resolved
Status Description	Description	Narrative of status, kept as a running list, current and past, dated when possible.
Post Mitigation Assessment	Scale as above	Assessment of residual risk using same scale/entries as current risk assessment
Post -Mitigation Cost and Contingent Cost Estimate	Cost/Schedule Impact	Minimum/Expected/Maximum cost and schedule impact estimates, based on selected cost range from "Post Mitigation Assessment" above, with cross checks and expected impact calculations for reference.
Post mitigation contingency computations	Cost/Schedule impact	Computed fields using post mitigation cost and schedule estimates to provide expected values for contingencies under various combinations

10.2. Risk Documenting and Tracking

The projects uses a combination of Excel and Confluence to document and track project risks. The Excel files, including past versions, are stored in Confluence. The Risk Review Board meetings are also documented in Confluence. That documentation includes the agenda for the meeting, a summary of risk changes and actions taken during the meeting.

The Risk Registry is maintained as an Excel file. That file contains several relevant sheets

- The first sheet contains definitions and the change log. That log records the date of each update
- The second sheet is the Risk Registry. It contains all risks, including those that are completed or have been marked obsolete. The status description for each risk is a running log to support review of the risk history.
- The third sheet is summary metrics, which provides plots and tables of statistics to support presentations and summaries of the risk status for analysis
- The fourth sheet summarizes the risk analysis methodology as a reference
- The fifth sheet is the change log, which records details of the changes to the risk registry. This is used to identify all changes in preparations for each Risk Board meeting.

The subsystem risk sheets are working documents maintained by the subsystem manager. These risk sheets are merged into the Risk Registry in preparation for the Risk Board meetings. Each sheet contains:

- A subsystem specific risk registry set up to enable reliable consistent data entry
- A risk analysis methodology for reference
- A summary metrics page

10.3. Risk Reporting and Communication

Project lists are reported and communicated at multiple levels of detail and frequency. The Risk Registry is in Excel and designed to support the items below as well as hoc analysis.

An updated Risk Registry is compiled for each meeting of the RRB and any special project reviews.The Risk Registry contains a change report that documents the changes to the Risk Registry since the last update. The Risk Registry is drafted for the RRB, then finalized after the RRB meets and decisions are made regarding any changes. Any changes are updated in the subsystem risk sheets and re-merged into the Risk Registry. The Risk Registry is set up to take advantage of Excel tools to support a flexible analysis capability during each Risk Review Board. Routine analysis includes review of the top 10 risks using the current assessment rating (and those just below the top 10) and risks with unfunded mitigation.

The Risk Registry is delivered to the LSSTC project office for inclusion in the project risk registry

Significant current risks are transferred to the monthly Project Management Assurance Group (PMAG) presentation for “Issues and Mitigations" so that significant and currently working risks and mitigations can be brought to the attention of SLAC Lab management for additional oversight and assistance.

At CD-3 and beyond, The RM also produces a quarterly report showing expected timelines for risk retirement, including a residual risk model to show remaining expected impact.

Finally, risk analysis reporting is a key component of formal external reviews. This provides one measure of the health of the project and provides expert review committees with a better understanding of how project risks are being managed. Such reviews also serve as one of the primary means by which project risk information is communicated with funding agencies and other outside organizations.