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Sandia National Laboratories Advanced Simulation and Computing (ASC) Appraisal Method for the Implementation of the ASC Software Quality Engineering Practices

Version 2.0

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ABSTRACT

This document provides a guide to the process of conducting software appraisals under the Sandia National Laboratories (SNL) ASC Program. The goal of this document is to describe a common methodology for planning, conducting, and reporting results of software appraisals thereby enabling

- identification of improvements in implementation of the software quality engineering (SQE) practices identified in the ASC Software Quality Plan across the ASC Program against objective baselines
- feedback from project teams on SQE opportunities for improvement
- identification of strengths and opportunities for improvement for individual project teams
- guidance to the ASC Program on the focus of future SQE activities

Document contents include process descriptions, templates to promote consistent conduct of appraisals, and an explanation of the relationship of this procedure to the SNL ASC software program.

The activities described by this document are under the oversight of SNL ASC Program Director and SNL ASC Program Manager.

CHANGE LOG

All changes made to this document will be noted in this change log.

Date	Change Description	Change Approval
3/26/2007	Made sponsor-requested updates to the document.	J. Turgeon
4/30/2007	Updated the characterization and rating scales to reflect changes made by the appraisal team members during the pilot appraisals. Changes were made to allow for more objective results.	J. Turgeon
7/25/2007	General editing and formatting for consistency.	P. Hackney
8/30/2007	General editing and updating to reflect change in follow-up process.	J. Turgeon
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1/4/2008	General review with editing changes.	J. Turgeon
9/20/2018	General review with editing to reflect updates to appraisal process.	J. Turgeon C. Lujan J. Schneider

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EXECUTIVE SUMMARY

This document is the Sandia National Laboratories (SNL) Advanced Simulation and Computing (ASC) Program deployment process of the software appraisal method. This process, which utilizes an interview intensive format, was developed to elicit information from SNL ASC project teams regarding their implementation of the software quality engineering (SQE) practices identified in the Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. The appraisal method gleans best practices from previous SNL ASC site assessments as well as industry-recognized appraisal practices, such as the Standard CMMI Appraisal Method for Process Improvement (SCAMPI) B and C methods as presented in the Handbook for Conducting Standard CMMI Appraisal Method for Process Improvement (SCAMPI) B and C Appraisals, Version 1.1. Development of the current ASC software appraisal method was conducted under the direction of SNL ASC Program Director.

This document builds on the assessment strategy for conformance to ASC practices and the associated assessment checklist found in the Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan. Software appraisal activities described in this document include scope of an appraisal, associated conduct, and reporting requirements as well as the roles and responsibilities of participants.

COMMITMENT

The SNL ASC Internal Software Appraisal program will follow the processes described in this document and will be guided by the processes, practices, and activities as specified in its companion document *Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan*. The goal of this document is to foster organizational consistency in ASC SQE through the identification of best practices and opportunities for improvement via the appraisal process. SNL ASC Program management is committed to oversight of the SNL ASC internal software appraisal program.

Approved By

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SNL ASC Program Director

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SNL ASC Program Manager

Date

ACRONYMS AND DEFINITIONS

Abbreviation	Definition
AC	Appraisal Coordinator
APL	Appraisal Project Lead
ASC	Advanced Simulation and Computing
ASCI	Accelerated Strategic Computing Initiative
ATL	Appraisal Team Lead
ATM	Appraisal Team Member
ATP	Appraisal Team Pool
CMMI	Capability Maturity Model Integration
FTE	Full time equivalent
FY	Fiscal year
HQ	Headquarters
PI	Principal Investigator
POC	Point of Contact
NNSA	National Nuclear Security Agency
SCAMPI	Standard CMMI Appraisal Method for Process Improvement
SE	Software Engineering
SNL	Sandia National Laboratories
SQE	Software Quality Engineering
SQUIG	Software Quality Implementation Group
SSMP	Stockpile Stewardship Management Program

1. INTRODUCTION

1.1. Background

The National Nuclear Security Agency (NNSA) oversees the Stockpile Stewardship Management Program (SSMP) to provide and ensure confidence in the safety, performance, and reliability of the U.S. nuclear stockpile in the absence of underground testing. To this end, NNSA established the Accelerated Strategic Computing Initiative (ASCI) to support the SSMP in transitioning from using test-based methods to using more computational and simulation-based methods. The program is now managed by the Office of Advanced Simulation and Computing (ASC) at NNSA Headquarters. Maintaining the stockpile program is one of four “core missions” of the NNSA.

The SNL ASC appraisal program adheres to the specifications for software quality assurance as defined in the SNL site specific tailoring guidelines for software quality engineering practices (henceforth referred to as the *ASC SQE Practices*) identified in the *Sandia National Laboratories Advanced Simulation and Computing (ASC) Software Quality Plan* [1].

1.2. Purpose and Scope

The purpose of this document, the Sandia National Laboratories Advanced Simulation and Computing (ASC) Appraisal Method for the Implementation of the ASC Software Quality Engineering Practices (henceforth referred to as the ASC Appraisal Method), is to describe the SNL ASC software appraisal process. This document is organized to provide a clear definition of appraisal types and scope with a description of the planning, conduct, and reporting of software appraisals.

In addition, this document explains the various roles and responsibilities of SNL ASC personnel as they pertain to the appraisal process. These include the oversight by the SNL ASC Program Director and SNL ASC Program management, the responsibilities of ASC appraisal team members, and the participation of ASC project teams being appraised.

Appendix A provides information regarding past and current appraisal activities.

1.3. Roles and Responsibilities

The following table provides a brief description of the roles and responsibilities associated with the appraisal methodology discussed in this document.

Table 1. Appraisal Roles and Responsibilities

Role	Responsibilities
ASC Program Director and ASC Program Manager	Set policy and strategy for the ASC program.
Appraisal Sponsor	Approves and manages the internal software appraisal process and results. (ASC Program Manager)
Project Team	Provides objective evidence, participates in interviews and activities as requested, and acts on appraisal results. (Typically includes Program Element Manager, Project Managers, Project Principal Investigators, Project Team Members)
Appraisal Project Lead (APL)	Forms appraisal teams, provides training to Appraisal Team Members as needed, plans appraisal with ASC management, plans events for all Appraisal Teams, and reports results of appraisal to sponsor.
Appraisal Team Lead (ATL)	Attends required training, leads conduct of appraisal as described in this document, prepares written feedback delivered to project teams, and assists the Appraisal Project Lead in preparing the final report for the sponsor.
Appraisal Team Member (ATM)	Attends required training, reviews objective evidence, participates in interviews, assists Appraisal Team Lead, and provides information for written feedback delivered to project teams.
Appraisal Coordinator (AC)	Coordinates all logistics of the appraisal, assists the Appraisal Team Leads in all interface activities with the project teams, and schedules all events for appraisals.
Appraisal Team Pool (ATP)	Conducts appraisals during the appraisal period; is comprised of approximately 8-10 individuals, including the Appraisal Team Leads, all of whom are available throughout the appraisal period to assist with conducting appraisals.
Observer	Not an active participant. Possible responsibilities include observation of conduct of appraisal for evaluation or training purposes. Participation as an observer is an acceptable Appraisal Team Member training mechanism.

1.4. ASC Software Appraisal Method Overview

This document describes a gap analysis type of software appraisal to be used. The gap analysis will be performed by an appraisal team based upon the comparison of the objective evidence provided by the participating projects of their implementation of *ASC SQE Practices* and the actual guidelines of the *ASC SQE Practices*. The following table outlines the various aspects of a software gap analysis appraisal.

Table 2. Software Gap Analysis Appraisal

Characteristics	Intended Use
Reviews implementation of practices described in <i>ASC SQE Practices</i> document.	Provide the ASC Program with information to make program level resource allocation decisions.
Identifies organizational level and individual project team level issues.	Identify opportunities for improvement and possible best practices for individual project teams.
Utilizes interviews of project team members to identify implementation of <i>ASC SQE Practices</i> .	Provide the ASC Program with an objective baseline on implementation of the <i>ASC SQE Practices</i> across projects.
Examines both in-progress work products and completed work products, as appropriate.	Gather feedback from project teams regarding ASC Program-wide SQE activities that do (or could) provide value to teams.
Focuses upon both the approach project teams intend to take toward <i>ASC SQE Practices</i> implementation and actual deployment of the approach, where applicable.	Complete a gap analysis on the current state of <i>ASC SQE Practices</i> implemented across ASC projects.

1.4.1. Method Context

Minimal preparation on the part of project teams is expected for the appraisals. The intent is to get an accurate status of *ASC SQE Practices* implementation across projects and to identify issues related to implementation. Because there is no expectation that any particular project team has fully implemented all *ASC SQE Practices*, the appraisals will be interview intensive. Interviews will be conducted to allow for the gathering of intended or planned approaches to meeting *ASC SQE Practices* where evidence of deployment is not yet available.

Preceding appraisals have provided an objective review of the implementation status of the *ASC SQE Practices* by the ASC project teams. The appraisals also identify strengths and opportunities for improvement for each project team with respect to their SQE practices. Finally, appraisals will be used to obtain project team feedback regarding ASC Program Office software quality engineering activities. Unlike general assessments that are conducted for audit purposes, these appraisals will allow for open communication between the ASC Program and ASC project teams regarding the current status of software engineering and the types of support activities that would be helpful to move the ASC Program forward in its implementation of the *ASC SQE Practices*. The appraisals assist project teams to demonstrate objective improvements in their practice implementations as well as improve preparedness for external appraisals.

There are four core concepts to the *ASC Appraisal Method*: objective evidence, ratings, appraisal outputs, and appraisal follow-up. These concepts are described in detail in the following sections.

Note: Several tools and templates pertaining to the execution of these concepts are also described in these sections but are not shown within the text due to space limitations. However, Appendix A contains useful links to resources and training to enable quick access and review.

1.4.2. Objective Evidence

Objective evidence shall be provided by the participating project teams primarily using the *Evidence Collection Instrument*, a tool created for this purpose. The *Evidence Collection Instrument* (ECI) was derived from the Assessment Checklist and summary of the practices and artifacts described in the *ASC SQE Practices*. The ECI is similar to the tool used by ASC projects for self-assessments.

Three different types of evidence will be reviewed during the appraisals; direct evidence, indirect evidence, and affirmations. Evidence, as defined in the *Handbook for Conducting Standard CMMI Appraisal Method for Process Improvement (SCAMPI) B and C Appraisals, Version 1.1* (henceforth referred to as the *SCAMPI B&C Handbook*) [2] and the *Software Quality Implementation Group (SQUIG) Self-Assessment Instrument for Software Quality Version 2.5* [3], will be reviewed for each ASC project team on varying levels depending upon the extent of the *ASC SQE Practices* implementation. Objective evidence may be presented as follows:

Direct: A primary reference to tangible output that results directly from the implementation of a documented process pertaining to the given process area. Direct evidence is often explicitly stated or implied by the question asked. [SQUIG Self-Assessment Instrument, Instructions]

Indirect: A secondary reference that is a consequence of performing a specific process or that substantiates its implementation, but which is not the purpose for which the process was performed. Often when indirect evidence exists, there is no indication of where it came from, who worked to develop it, or how it is used. [SQUIG Self-Assessment Instrument, Instructions]

Affirmations: An oral or written statement that confirms or supports the implementation of a practice. Interview responses are examples of face-to-face affirmations. Alternative forms of affirmations could include presentations or demonstrations of a tool or mechanism as it relates to implementation of a practice. [SCAMPI B&C Handbook, Glossary]

All three types of objective evidence will be examined during the appraisals as they relate to the *ASC SQE Practices*, implementation, and traceability between the evidence from the appraised project team and the practices will be verified. An ECI will be provided to project teams to manage evidence collection and traceability during the appraisal.

1.4.3. Appraisal Ratings

The *ASC SQE Practices* includes 30 practices that should be implemented to a designated level of formality for each project team in the form of 26 specific artifacts. The implementation of these practices and their resulting artifacts is unique to the needs of a project team. It is important to note that in some situations a project team may have consolidated artifacts to meet a particular set of practices. This is an acceptable method for implementation when done appropriately, and the appraisal team will take this into consideration when rating individual practice areas.

Ratings will be provided for every practice in the *ASC SQE Practices*. Ratings reflect the level of *ASC SQE Practices* implementation within a particular project team based upon review of objective evidence. Appraisal team members will provide statements of strengths and weakness in appraisal results to support ratings. Results can be used to identify individual project team improvements from one appraisal to the next. Ratings will also allow for comparison across both the projects and

program elements for the ASC Program. The guide in Table 3 will be used to evaluate the level of practice implementation on a project team.

Appraisal ratings are intended to support planning and future SQE activities for the ASC Program; however, they are not necessarily indicators of future success. Success is dependent upon proper implementation of *ASC SQE Practices* within project teams. In addition, high ratings for a particular practice implemented on one project team may or may not be an indication that those highly rated practices will be successful on another project team. Success is dependent upon the context of the implementation.

1.4.4. Appraisal Outputs

Each project team will receive appraisal results in a report that includes an appraisal summary, a description of observed strengths and opportunities for improvement, and appraisal practice ratings. Results will be structured in the same format as the *ASC SQE Practices* with the length determined by the amount of information gleaned from the project team appraisal. The completed ECI will be returned to the project team with the appraisal results report.

Appraisal results will be statements of fact based upon evidence reviewed and collected during the appraisal by the appraisal team. Statements of observed weakness must be noted for reviewed evidence. Such statements will generally be annotated in the ECI and will be specific to reviewed artifacts. Appraisal results will also include, when applicable, project team related recommendations and suggestions for improvement. In addition to appraisal results, project teams will also be provided a set of questions to review for discussion during the appraisal follow-up phase. (Information regarding the appraisal follow-up is detailed in the next section of this document.)

Appraisal results will be reviewed with project teams at the conclusion of the appraisal. The method of delivery for this review will generally be a brief one-hour meeting between the ATL and members of the project team. Other members of the appraisal team may attend; however, any other individuals outside the appraisal team and the appraised project team may only be present at the invitation of the appraised project team. Other methods of delivery (e.g., email, teleconference, and videoconference) are reasonable and based upon project team request.

Table 3. Appraisal Rating Descriptions

Rating	Rating Description <i>(NOTE: Descriptions below provide further clarification on typical expectations at each rating level. These are not intended to be all-inclusive; thus projects may or may not exhibit all characteristics identified in the following descriptions.)</i> <ul style="list-style-type: none"> • ASC SQE Plan Requirements Met (RM) • Implementation Level of ASC SQE Plan Requirements (IL) 	Appraisal Team Observations of Evidence
5	Outstanding – the software project team has fully implemented this practice; meaning that a documented process exists for the practice, all team members are fully trained on the process, work products have been produced and managed, and practice plans and results have been shared with all appropriate stakeholders.	RM = S and IL = S <i>(see Tables 8 and 9 for the definitions of these values)</i>
4	Complete – the software project team has implemented a final (not draft) process for conducting the practice and work products are in place supporting this practice. However, there are still a few activities that need to be addressed (e.g., training, finalizing work products, etc.). Most project team members have been trained in the process implementation. Practice results have been shared with some stakeholders.	RM = S and IL = OK
3	Good – the software project team has partially implemented this practice. For example, a draft of the process for conducting the practice exists or a completed documented process exists with most of the team (but not all) complying with the process. The team has made significant progress in rolling-out an implementation for the process and draft work products that contain significant content exist.	RM = S and IL = W RM = OK and IL = S, OK, or W RM = W and IL = S
2	Fair – the software project team has a preliminary process (e.g., a detailed outline; a well-understood ad hoc team process that is not documented, etc.) for implementing this practice. There may be a preliminary plan about how to proceed with the process and implementation and preliminary work products exist.	RM = OK or S and IL = NC RM = W and IL = OK, W, or NC
1	Limited – the software project team has proposed that this practice be implemented and activities and resources for the practice are in the planning stages. It is evident that the project is committed to implementing this practice. At this level, it is typical that resources have not yet been allocated for fulfillment of the practice.	RM = NC and IL = S, OK, or W
0	Absent – the software project team has not yet addressed the implementation of this practice.	RM = NC and IL = NC
NA	Not Applicable – the software project team determined that this practice is not applicable to its code development environment. A value of NA must be accompanied by an explanation and waiver from the team describing why the practice will not be followed.	NA

Appraisal results will be aggregated across the program and reported to the ASC Program management and appraisal participants. Ratings from project team appraisals will be evaluated at the Program Element level and the ASC Program as a whole to identify strengths and opportunities for

improvements. The overall appraisal report will address items listed in the “Intended Use” section of Table 2 above.

Non-attribution practices will be followed to the extent possible to avoid attributing data directly to project team individuals. The appraisal report will not intentionally create linkages between raw data (e.g., actual affirmations, issues identified in evidence reviews) and an individual project team member, although it is understood that some inferences may be made regarding sources of such data, especially with smaller sized teams.

1.4.5. Appraisal Follow-Up

Approximately one to two weeks following the delivery of appraisal results to project teams, a representative from the appraisal team will contact the Principal Investigator (PI) of the appraised project team to schedule a follow-up interview. The purpose of the appraisal follow-up is to collect feedback from a project team after the team has had time to reflect on questions regarding the appraisal process, the project’s individual appraisal results, and how the ASC Program as a whole can improve ASC SQE activities.

Appraisal follow-up will also give the project teams the opportunity to ask additional questions regarding recommendations for process improvement. One-on-one consulting to any great extent is not within the scope of this appraisal effort. However, if a project team would like to pursue this, appraisal team members will help secure this type of assistance.

2. APPRAISAL PHASES

The *ASC Appraisal Method* has four distinct phases; plan the appraisal, conduct the appraisal, report appraisal results, and conduct appraisal follow-up. Each phase is comprised of several practices that clearly define activities within a phase. While phases are generally performed consecutively, completion of one phase and its associated practices is not dependent upon entry into the next phase. Initiating these appraisal phases as defined in this method should provide repeatable results regardless of the individuals selected for a particular appraisal team.

Planning is conducted before the appraisal begins; although the evaluation of planning continues throughout the appraisal to ensure appraisal activities are completed in a timely manner. While not typical, additional or reduced amounts of time may be necessary to examine appraisal evidence as additional information is discovered during the appraisal. Proper use of the ECI should mitigate this situation in most cases. Analysis of the evidence will provide the data necessary to generate appraisal results that are documented and delivered to project teams.

Table 4. Appraisal Phases

Phase	Phase Practices
2.1 Plan the Appraisal	2.1.1 Analyze Requirements 2.1.2 Develop Appraisal Plan 2.1.3 Develop Appraisal Schedule 2.1.4 Select and Prepare Appraisal Team Pool 2.1.5 Prepare Project Teams 2.1.6 Conduct Readiness Review
2.2 Conduct the Appraisal	2.2.1 Examine Objective Evidence 2.2.2 Document Objective Evidence 2.2.3 Verify Objective Evidence 2.2.4 Generate Appraisal Results
2.3 Report Appraisal Results	2.3.1 Deliver Appraisal Results 2.3.2 Contribute to the Appraisal Report 2.3.3 Deliver the Final Appraisal Report 2.3.4 Archive All Appraisal Results
2.4 Conduct Appraisal Follow-up	2.4.1 Follow-up with Appraised Teams 2.4.2 Document Follow-up Responses and Issues 2.4.3 Conduct Lessons Learned

2.1. Plan the Appraisal Phase

The planning phase has two levels of planning that must be managed. The high-level planning pertains to overall program planning to ensure projects are identified by ASC Program Element Managers, appraisal teams are assimilated to appraise scheduled projects, and logistics are managed to secure locations to conduct appraisal. This high-level planning is generally conducted by the Appraisal Coordinator (AC) with input from the Appraisal Project Lead (APL) and the Appraisal Team Leads (ATL). Project team appraisal planning pertains to logistics required to conduct an appraisal for a particular project team. This planning is generally conducted by the AC with review by the ATL assigned to the project team. High-level planning directly impacts project team planning; therefore, coordination in both planning areas is essential.

In the planning phase, project teams within the scope of the high-level appraisal are identified, appraisal schedules are developed, and readiness reviews are conducted with individual project teams

to evaluate preparedness for appraisal conduct. In addition, the Appraisal Sponsor input is secured before appraisals begin.

Planning phase practices are identified below. “Responsibility” indicates the role with primary responsibility for ensuring the practice is initiated and completed; however, others will very likely be supporting these efforts as well. Practice elaborations are provided in the sections that follow the table.

Table 5. Plan the Appraisal Phase Practices

Plan Phase Practice	High Level Practice Description	Responsibility
2.1.1 Analyze Requirements	<ul style="list-style-type: none"> Meet with the Appraisal Sponsor to develop the appraisal method requirements Gather input from the Appraisal Sponsor for the appraisal 	APL
2.1.2 Develop Appraisal Plan	<ul style="list-style-type: none"> Develop the appraisal plan based upon the input gathered from analyzing requirements Obtain Appraisal Sponsor approval for the plan Document plan details in the appraisal method and other associated project documents 	APL
2.1.3 Develop Appraisal Schedule	<ul style="list-style-type: none"> Develop and maintain the high-level appraisal schedule Develop detailed schedule information for ATLS, ATMs, and project teams Notify appraisal team members and project teams of all dates related to the appraisal period Initiate the <i>Project Team Appraisal Plan</i> 	AC
2.1.4 Select and Prepare Appraisal Team Pool (ATP)	<ul style="list-style-type: none"> Identify qualified individuals to serve in the ATP and solicit their involvement Ensure ATP members meet qualification requirements or are adequately trained to serve in the ATP Train members of the ATP, if applicable 	APL
2.1.5 Prepare Project Teams	<ul style="list-style-type: none"> Train project teams on appraisal preparation and the overall appraisal process, if applicable Communicate frequently with project teams to ensure that appraisal preparation is conducted efficiently 	APL, ATLS
2.1.6 Conduct Readiness Review	<ul style="list-style-type: none"> Schedule the Readiness Review with the project team Ensure that the <i>Evidence Collection Instrument</i> is completed Complete the <i>Project Team Appraisal Plan</i> with the project team point of contact (POC) 	ATLS

2.1.1 Analyze Requirements

Requirements are gathered and analyzed continuously between the Appraisal Sponsor and the APL. This process will occur through meetings, telephone conversations, and written correspondence. This input will then be documented and maintained in the *ASC Appraisal Method*. The input gathered for planning purposes will, at a minimum, include the following

- appraisal method definition
- appraisal standard to be used and the scope of that standard
- organizational objectives for the appraisal

- appraisal activity scope for the organization
- projects to be appraised
- appraisal constraints
- identification of the pool of appraisers that will form the appraisal team
- follow-on activities planned

Appraisal information that is not included in this *ASC Appraisal Method* and other supporting information regarding budget, cost, and appraisal risks and associated mitigations are planned and managed by the APL.

2.1.2 Develop the Appraisal Plan

The *ASC Appraisal Plan* for the ASC Program Office will consist of supporting information currently in the *SNL ASC Program Implementation Plan*. These documents will be used by the sponsor and the APL to establish agreement regarding the conduct of the ASC appraisals. The plan documents will be maintained and updated as needed. The Appraisal Sponsor must approve the *ASC Appraisal Plan* documents before appraisals may begin. The *ASC Appraisal Plan* will include all input gathered during the requirements stage. The plan will also include

- a description of the activities to be performed during the appraisal beyond what is already identified in the *ASC Appraisal Method*
- resources and the overall high-level appraisal schedule
- necessary appraisal logistics
- risks and mitigations, where appropriate, to the appraisal planning and conduct

Individual *Project Team Appraisal Plans* will also be developed, as described in Sections 2.1.3 and 2.1.6.

2.1.3 Develop the Appraisal Schedule

Two levels of appraisal scheduling are coordinated by the AC, the high-level *Code Appraisal Cycle* and individual project team appraisal schedules. The AC will develop the *Code Appraisal Cycle* concurrently with the Analyze Requirements Section 2.1.1 and Develop the Appraisal Plan Section 2.1.2 practices above. Scheduling the availability of ATLS will be critical to ensure coverage for all project teams to be included for each fiscal year. The AC will be responsible for coordination of ATL and ATM scheduling and for communicating with ASC Program Element Managers regarding availability of ASC project teams. Once project team availability is provided, the AC will ensure that appraisal teams are available for each project team. Finally, the AC will initiate the *Project Team Appraisal Plan* by identifying the scope of the project team and the overall appraisal schedule for the project team. The *Project Team Appraisal Plan* documents project team characteristics, software development methods, and tailoring of this *ASC Appraisal Method* to individual project teams. The *Project Team Appraisal Plan* will be completed by the ATL and project team POC during the Readiness Review discussed in Section 2.1.6.

In general, the sequential steps toward implementing this practice are described in the list below. Many steps will be conducted concurrently, although a step will often be a prerequisite to the following step. All scheduling information will be maintained in the *Code Appraisal Cycle*, which may be accessed by the AC, APL, ATLS, and the ASC Support Team webmaster. The *ASC Appraisal Team Process and Checklist* (see Appendix A, Resource 8) provides further detail on appraisal scheduling and the overall appraisal process.

Table 6. Appraisal Scheduling Step Descriptions

Step	Step Description
1. Identify availability of ATLS for the FY	<ul style="list-style-type: none"> • Note dates when ATLS will be unavailable within a FY • Develop the <i>Code Appraisal Cycle</i>
2. Develop high-level appraisal schedule plan	<ul style="list-style-type: none"> • Allow four business days for each project team “appraisal period”, generally a Monday – Thursday time frame • Spread appraisals across a calendar month to allow for an even distribution of appraisals during a month, preferably no more than two appraisals conducted in any given appraisal period • Tentatively assign ATLS to each appraisal period in the <i>ASC Appraisal Schedule</i> • Contact Program Element Managers to identify available project teams and to gather any other scheduling details
3. Identify availability of appraisal team members	<ul style="list-style-type: none"> • Provide members of the ATP the dates of appraisal periods scheduled in step 2 • Request pool members to indicate appraisal periods when they will be available as team members
4. Coordinate tentative assignments for appraisal teams	<ul style="list-style-type: none"> • Begin reserving conference rooms/equipment for appraisal periods <ul style="list-style-type: none"> ○ Appraisal team work room (preference to building/location near the project teams) for two consecutive days ○ At least one projector available in the conference room ○ Internet accessibility, either wireless or LAN, for at least two laptops • Provide logistical information to ATMs <ul style="list-style-type: none"> ○ ATL and ATM assignments ○ Appraisal period date range ○ Conference room locations and reservation reference numbers
5. Confirm tentative schedule with appraisal teams	<ul style="list-style-type: none"> • Confirm appraisal team assignments and schedule with members of the appraisal pool • Update the <i>ASC Appraisal Schedule</i> and notify the appraisal team pool of any changes • As changes are made to the schedule, provide notifications of changes
6. Obtain project team names from Program Element Leads	<ul style="list-style-type: none"> • Contact Program Element Managers at the beginning of the appraisal year to confirm the list of project teams and their POCs that will be appraised • Create a tentative schedule of when each project team will be appraised based upon the availability of appraisal team pool members from the <i>ASC Appraisal Schedule</i> • Update the <i>Code Appraisal Cycle</i> and <i>ASC Appraisal Schedule</i> with the project team names • Notify project team POCs of their tentatively scheduled appraisals approximately two months in advance; make schedule adjustments, if necessary and if available, in the <i>ASC Appraisal Schedule</i>
7. Notify project teams of appraisal period and prepare appraisal artifacts for ATLS	<ul style="list-style-type: none"> • Notify project team POC at least two weeks in advance to confirm appraisal period dates • Contact project team POC to coordinate interview schedules and to complete Section I of the <i>Project Team Appraisal Plan</i> (see Appendix A, Resource 2) • Email the following information to the project team POC preferably no later than two weeks prior to scheduled appraisal

Step	Step Description
	<ul style="list-style-type: none"> • Link to the ECI with notification of due date for evidence to be sent to ATL (see Appendix A, Resource 1) • Copy the email confirmation to the ATL, ATM(s), APL • Add the project team to the ongoing <i>ASC Appraisal Schedule</i>

2.1.4. Select and Prepare Appraisal Team Pool

An appraisal team is required for the *ASC Appraisal Method*. The minimum number of individuals on a team is two, although additional team members may be added depending upon appraisal team member experience, scope of the project team, and any other issues that may arise requiring the need for additional team members. The appraisal team pool is comprised of subject matter experts, including the ATLS, who will be responsible for conducting project team appraisals. The intent of the pool is to have an ample number of qualified individuals available to serve on appraisal teams to alleviate scheduling problems that could arise during appraisal planning.

Appraisal pool candidates should meet the following qualification criteria:

- Five years' experience in software development (engineering and/or software project management; experience in either discipline may be combined)
- Introduction to CMMI course
- Experience on past software appraisals (either as an appraisal team member or as an appraised project team)

In the absence of all the above criteria, an ATM may still be added to the appraisal team pool on a case-by-case basis. In such situations, these individuals will need to observe at least one appraisal and participate on a three-member appraisal team before serving on a two-member appraisal team. ATLS must meet all criteria and must have experience as lead appraisers.

While the CMMI is not the model to which project teams will be appraised, training in this area is ideal to ensure the appraisal team pool has a common understanding of industry standard software engineering principles. A common understanding of these principles is a desired attribute of appraisal team members in order to facilitate the appraisal process and reduce time spent discussing rationale and theory behind these principles.

All ATMs must attend appraisal team training before serving on an appraisal team. Team training may be delivered by the APL or the ATLS using the *ASC Appraisal Team Training* materials (see Appendix A, Training 1). Appraisal team training will include the following information

- ASC Appraisal Method overview
- ASC SQE Practices overview
- Project team appraisal planning and the Project Team Appraisal Plan
- Objective evidence collection and analysis
- Interviewing process and the review of objective evidence with project teams
- Team decision making
- Team roles and responsibilities
- Appraisal confidentiality and non-attribution
- Assignment of practice ratings

- Appraisal output requirements, including the project team appraisal report and follow-up phase procedures

ATLs are responsible for assigning roles and responsibilities for the conduct of each project team appraisal to balance workloads and complete appraisal activities within the allotted appraisal period.

2.1.5 Prepare Project Teams

To facilitate the appraisal process, project teams will be required to assemble objective evidence for appraisal team review prior to the scheduled appraisal. This should cause minimal impact to project teams. Teams are only required to provide existing team evidence; it is understood that in some cases evidence will be incomplete, lacking in detail, or non-existent. Project teams will be required to attend training that covers the appraisal preparation and the overall appraisal process.

All project teams must obtain project team training before their scheduled appraisal period. Project team training may be delivered by the APL or the ATLs using the *ASC Project Team Training* materials (see Appendix A, Training 2) either in person or through project team self-study. Project team training is intended to function as both an overview briefing on the appraisal as well as an instructional setting to assist project teams with appraisal preparation and will include the following information

- Purpose and scope of the appraisal
- Appraisal approach
- Roles and responsibilities of the appraisal team and the project teams
- Schedule of appraisal activities
- Process for completing the *Evidence Collection Instrument*

Multiple group training sessions may be provided for project teams. At a minimum, at least one team member must be present at a training session. If a project team is unable to attend one of the scheduled group training sessions, individual training sessions will be arranged on an as-needed basis.

Use of the ECI is required and will be used to organize the 26 artifacts identified in the *ASC SQE Practices*. Project teams will receive training on completing the ECI and guidance regarding the types of objective evidence and the appropriate number of artifacts to provide as evidence for each practice. Quality over quantity will be emphasized when placing evidence in the ECI to reduce the misconception that teams must provide every possible piece of evidence to support a particular practice.

ATLs are responsible for ensuring that project teams are prepared for the actual appraisal by conducting a Readiness Review prior to the appraisal. Project teams will receive frequent communications from the AC and their assigned ATL prior to their appraisal period to allow time for answers to questions that may arise. General information regarding the appraisals will be available during the appraisal period on the ASC SQE website.

2.1.6 Conduct Readiness Review

Readiness Reviews will be conducted with all project teams to mitigate risks that could occur due to lack of proper appraisal preparation. Most importantly, it is necessary to ensure that objective evidence has been collected and identified in advance of the actual appraisal. The timely completion

of appraisals during their scheduled appraisal period will be contingent upon thorough project team preparation.

To ensure that project teams are prepared for scheduled appraisals, the assigned ATL will

- Review Section I of the *Project Team Appraisal Plan* for completeness (received from the AC approximately three weeks before the beginning of the appraisal period) and complete Section II (Readiness Review) and Section III (Agreement) with the project team POC
- Conduct at least one Readiness Review to evaluate feasibility of the scheduled appraisal period and document the review in the *Project Team Appraisal Plan*
- Ensure that the ECI has been completed correctly
 - ECI appropriately tailored to the project team
 - Amount and type of evidence provided are adequate to begin the appraisal
 - Data are appropriately identified in the ECI
- Make adjustments to the *Code Appraisal Cycle* and *ASC Appraisal Schedule* and communicate these adjustments with the APL and AC as needed

Once the AC notifies the project team and its assigned ATL of the confirmed appraisal period, the ATL will contact the project team POC to schedule the Readiness Review. The Readiness Review should occur the week prior to the appraisal period to allow for general issues to be addressed before the scheduled appraisal period.

Evidence provided in the Readiness Review will be analyzed by the appraisal team during the appraisal period to determine adequacy of the evidence as it applies to the implementation of each ASC SQE practice by the project team. Project teams will be directed to provide a minimal amount of evidence for each ASC SQE practice. The intent is for teams to focus on the quality of evidence rather than quantity. This will allow for appraisals to be conducted in the scheduled appraisal period, as agreed upon with the Appraisal Sponsor.

Project teams will also be directed to provide only evidence that they are currently using for their projects. To ensure a minimal amount of project team time is required to prepare for appraisals, the expectation is that a project will provide only existing evidence in its current state. The intent of these appraisals is not to have a project team spend immense amounts of time “cleaning up” documentation or creating new documentation to satisfy practices that the project is not currently using. These appraisals seek honest reflections of work actually being done on project teams. It is hoped that this review will allow the ASC Program Office to identify value-added practices, as well as any practices with opportunities for improvement.

The level of formality for the Readiness Review is at the discretion of the ATL and the project team POC. For some project teams experienced with appraisals, the Readiness Review may be conducted via email or telephone conversations to review the ECI and complete the *Project Team Appraisal Plan*. For less experienced project teams, a face-to-face meeting may be more appropriate to further communicate appraisal expectations and to facilitate questions and answers. Similarly, scheduling of the Readiness Review should also be dependent upon a project team’s appraisal experience. For example, the ATL may request that the Readiness Review occur more than one week prior to an appraisal period to allow for additional preparation activities.

2.2. Conduct the Appraisal Phase

The conduct phase of the appraisal process includes several phase practices, starting with the review of evidence and concluding with the generation of the project team appraisal results.

In the conduct phase, appraisal teams will examine objective evidence provided by project teams. Examination includes review of evidence to understand how project teams have deployed *ASC SQE Practices*. Evidence will include direct and indirect artifacts as well as affirmations from project teams. During project team interviews, the appraisal team will validate to the extent possible assumptions made by the ATMs regarding direct and indirect evidence provided by the project team. Project teams are encouraged to spend time up-front preparing their evidence correctly to avoid misinterpretations of the evidence provided in their ECI. The final conduct phase practice is generating the appraisal results, which includes assigning ratings to each *ASC SQE Practice*, completing the ECI with feedback regarding reviewed evidence, and creating a brief results report.

Observers, especially individuals from ASC, are encouraged to attend appraisals to increase awareness of *ASC SQE Practices* implementation across the Program. However, several conditions must exist to allow observers in an appraisal

- The project team being appraised must not have an objection to observers being present
- Observers cannot be managers of the project team being appraised and they cannot be in the direct supervisory chain of any project team members participating in the interviews
- Observers may not provide any input on behalf of the project team or the appraisal team during the conduct of the appraisal

The conduct phase practices are identified below. While the ATL has primary responsibility for ensuring a practice is initiated and completed, ATMs play an integral role in completing a practice as well. Conduct phase practice elaborations are provided in the sections that follow the table below.

Table 7. Conduct the Appraisal Phase Practices

Conduct Phase Practice	High Level Practice Description	Responsibility
2.2.1 Examine Objective Evidence	<ul style="list-style-type: none"> • Examine both oral statements and written information related to the implementation of <i>ASC SQE Practices</i> • Identify relevant project team evidence and analyze evidence to determine implementation and management of <i>ASC SQE Practices</i> 	ATL, ATM(s)
2.2.2 Document Objective Evidence	<ul style="list-style-type: none"> • Use all required appraisal tools and templates to support consistent appraisal processes across project teams • Document affirmations heard during project team interviews • Annotate reviewed evidence to indicate sufficiency, strengths and weaknesses throughout the appraisal period • Document any gaps in <i>ASC SQE Practices</i> implementation in reviewed evidence 	ATL, ATM(s)
2.2.3 Verify Objective Evidence	<ul style="list-style-type: none"> • Verify that evidence is reviewed for each of the <i>ASC SQE Practices</i> where the project team provided evidence • Verify that evidence reviewed is sufficient to generate the corresponding rating that will be assigned to each practice • Verify that all statements in appraisal outputs can be 	ATL, ATM(s)

Conduct Phase Practice	High Level Practice Description	Responsibility
	supported by objective evidence reviewed or heard during the appraisal period	
2.2.4 Generate Appraisal Results	<ul style="list-style-type: none"> • Finalize the ECI • Rate each practice area • Generate a Project Appraisal Results Report 	ATL, ATM(s)

2.2.1. Examine Objective Evidence

Objective evidence that will be analyzed during the appraisal period includes direct artifacts, indirect artifacts, and affirmations. Approximately one week prior to the appraisal period, the project team will provide the ATL with the ECI that maps *ASC SQE Practices* to existing project team direct and indirect artifacts. This instrument will be reviewed and approved for use in the appraisal during the Readiness Review conducted by the ATL with a project team POC.

The ECI will be used in multiple ways during the appraisal to provide

- The ATL with mapped artifacts for the Readiness Review
- The appraisal teams with an instrument to consistently review artifacts for each project team
- The appraisal teams with an instrument for providing appraisal results to the project team
- The appraisal teams with an appropriately tailored review of practices relevant to their phase of software development

2.2.1.1. Document Review

During the appraisal period, the appraisal team will conduct document reviews by examining links to documents in the ECI provided by the project team. The appraisal team will read documents identified in the instrument to understand the implementation of *ASC SQE Practices* by a project team. As the ATMs review documents, they will note gaps and plan interview questions associated with these gaps. In rare instances, the appraisal team may review a document not supplied in the ECI; however, this will be performed on a case-by-case basis as determined by the ATL. In special circumstances, document attributes (e.g., document creation dates and frequency of use) may be reviewed, although this practice will be conducted on an as-needed basis based upon ATL request.

When project teams choose to provide evidence beyond what can be reasonably reviewed during the appraisal period, the ATL will determine what evidence is most relevant to the appraisal and the appraisal team will review only that evidence. Thus, the appraisal team is not required to review all supplied evidence but only those documents that are deemed relevant to indicate *ASC SQE Practice* implementation.

Documents will generally be either organizational-level documents or project-specific documents. Organizational-level documents are those types that might define processes for the entire organization that all project teams utilize. Examples of these types of documents might be organizational training requirements, Program Element determinations of level of formality (LOF), or Program Element processes for version control and issue tracking. Project-specific documents are those that reflect actual work being conducted by the project team. Examples of these types of documents might be testing results, a project plan, or detailed project requirement specifications.

2.2.1.2. Interviews

The appraisal team will also conduct interviews with project teams. Interview discussions serve as part of the collection of evidence to be analyzed along with evidence provided in the ECI. Interviews will typically be face-to-face discussions or presentations by individuals from the project team. Questions will initially focus upon gaps identified in the links to evidence provided in the ECI; however, as time permits, additional questions may be added for further elaboration on evidence.

Interviewees are identified by the project team POC and scheduled by the AC or ATL. This information will be documented in Section I of the *Project Team Appraisal Plan* (see Appendix A, Resource 2). Interviewees will be selected based upon expertise in particular practice areas. Generally, practice areas will be broken down into “Project Management/Training” and “Software Engineering/Software Verification” categories. The project team POC will identify team members appropriate for each category to allow the AC or ATL to schedule appropriate individuals.

Interviews will be used to gather corroborating evidence to indicate implementation of *ASC SQE Practices* by the project team, when applicable. In some situations, affirmations gathered from interviews may be the only supporting evidence for practice implementation. These situations should be noted by a lack of any evidence links in the ECI. The appraisal team will note in the comments section of the ECI the affirmations that indicate what the team is currently doing toward practice implementation. Interviews will also be used to gather information from project teams that indicate strengths and opportunities for improvement across the ASC Program. *Sample Interview Questions* (see Appendix A, Resource 4) may be used to identify interview question areas and to document affirmations.

Multiple modes of communication are permissible to allow for flexibility. In addition to traditional interview formats where both ATMs and project team member(s) are physically present, interviews may also utilize teleconferencing and video conferencing capabilities.

A variety of interview formats are also allowed within this method. Traditional interviews occur most often and consist of pre-scheduled times to interview (determined before the appraisal period), designation of attendees, and a description of topics to be included in the interview. Another format that may be used is the “on-call” interview that is similar to a traditional interview but is scheduled during the appraisal period and typically covers follow-up topics. A third format that may be used is the “office hours” interview, which is typically a quick discussion in the interviewee’s office or on the telephone to review a follow-up topic.

2.2.2. Document Objective Evidence

To ensure the consistent approach to conducting and reporting appraisal activities across all project teams, appraisal team tools and templates will be used to the greatest extent possible. Appraisal artifacts related to project team appraisal conduct include

- *Evidence Collection Instrument* (see Appendix A, Resource 1)
- *Project Appraisal Results Report Template* (see Appendix A, Resource 3)
- *Appraisal Team Review Worksheet* (see Appendix A, Resource 5)

Using the appraisal tools and templates allows for traceability of appraisal report statements to evidence reviewed during the appraisal. Project teams will receive the ECI, complete with annotations made by the appraisal team, along with the final appraisal report that elaborates on certain areas of the instrument and summarizes appraisal team results as they relate to overall *ASC*

SQE Practices implementation. *Appraisal Team Interview Worksheets* will not be delivered as appraisal outputs in order to comply with appraisal non-attribution rules. If used, the worksheets are intended to be appraisal team artifacts only and will be destroyed once the final *Project Appraisal Results Report* is completed.

As evidence is reviewed in the ECI, the appraisal team will characterize sufficiency of the evidence in the appropriate section of the instrument. If evidence is sufficient for a project team's level of formality (LOF), at least 80% of ASC SQE Plan practice requirements exist, simply marking **"OK"** will be acceptable. In cases where the evidence is lacking in some manner, at least 40% of ASC SQE Plan practice requirements exist, the appraisal team will note this using a **"W"** accompanied by a description of what weakness was observed and how the weakness relates to *ASC SQE Practice* implementation. In situations where an affirmation is used in place of indirect evidence, the highest characterization that may be earned is a **"W."** Project team strengths, at least 90% of ASC SQE Plan practice requirements exist, will also be noted using an **"S"** and a comment should be added to describe the observed strength. Strengths are considered to be those activities, practices, or other project team behaviors observed during the appraisal that propagate unique, efficient, or exemplary implementation of *ASC SQE Practices*. Strengths might also include a particular method for tailoring *ASC SQE Practices* to address team characteristics that might otherwise cause complications if not addressed (e.g., team size, project scope, funding). If evidence is not complete, less than 40% of ASC SQE Plan practice requirements exist, **"NC"** will be annotated beside the artifact. If an artifact is not reviewed, **"NR"** will be annotated beside the artifact. The evidence characterizations for requirements met and implementation level requirements are summarized in the following tables below.

Table 8. Evidence Characterization Descriptions for Requirements Met (RM)

Evidence Characterization	Characterization Description	Comment Requirement in ECI
S	Strength in observed evidence – At least 90% of <i>ASC SQE Plan</i> practice requirements exist	No comment necessary; best practice, if it exists, should be noted
OK	Sufficiency in observed evidence – At least 80% of <i>ASC SQE Plan</i> practice requirements exist	No comment necessary
W	Weakness in observed evidence – At least 40% of <i>ASC SQE Plan</i> practice requirements exist	Comment should address weakness and method for addressing the weakness
NC	Evidence is not complete – Less than 40% of <i>ASC SQE Plan</i> practice requirements exist	Comment should address weakness and method for addressing the weakness
NR	<i>ASC SQE Plan</i> practice not reviewed	Indicate why practice was not reviewed

Table 9. Evidence Characterization Descriptions for Implementation Level (IL) of Requirements

Evidence Characterization	Characterization Description	Comment Requirement
S	All 4 implementation elements met: <ul style="list-style-type: none"> • Appropriate LOF documentation • intent of <i>ASC SQE Plan</i> practice met (implementation of practices reflects <i>ASC SQE Plan</i> intent and general SQE best practices) • appropriate artifact management • appropriate artifact usage by the team 	No comment necessary; best practice, if it exists, should be noted
OK	One of the 4 implementation elements for “S” needs improvement	No comment necessary
W	Two of the 4 implementation elements for “S” needs improvement	Comment should address weakness and method for addressing the weakness
NC	Three or more of the 4 implementation elements for “S” needs improvement	Comment should address weakness and method for addressing the weakness
NR	<i>ASC SQE Plan</i> practice not reviewed	Indicate why practice was not reviewed

In some situations, affirmations gathered from interviews may be the only supporting evidence for practice implementation. These situations should be indicated by a lack of any evidence links in the ECI. The appraisal team will note in the comments section of the ECI the affirmations that indicate what the team is currently doing, if anything, toward practice implementation.

During interviews, if the ATM chooses to use the *Appraisal Team Review Worksheet* (see Appendix A, Resource 5), the appraisal team will record affirmations that relate to *ASC SQE Practices* implementation and the overall intent of the appraisal from the perspective of the ASC Program Office. Each ATM will have an interview worksheet during the interviews and will write (or type, if the worksheet is used electronically) relevant affirmation statements on the worksheet. General

affirmations related to ASC Program Office or other organizational level issues will be recorded in the interview worksheets as well. The interview worksheet will be used to identify areas where affirmation must be gathered, especially those related to lack of direct or indirect evidence in the ECI. These gap areas will take priority during interview sessions.

2.2.3. Verify Objective Evidence

Using the ECI for appraisal team comments and observations from document reviews and for recording affirmations from the interview process that correspond to *ASC SQE Practices* will support the verification process. Verification is an ongoing process conducted as the appraisal team completes the ECI during the appraisal period.

In most cases, non-attributable affirmations heard during the appraisal period will be noted in the ECI. When affirmations are in conflict with associated documents reviewed by the appraisal team, an affirmation may also be reported in the ECI to indicate this conflicting information. The appraisal team must verify that statements in the appraisal report reflect affirmations heard and recorded during interviews and that discussion of those statements in the final appraisal results report and ECI are non-attributable to project team members. This may be an ongoing process as the appraisal team generates the project's appraisal results report.

At least one piece of objective evidence must be reviewed or discussed for each *ASC SQE Practice* in order to generate a rating for an individual practice. Objective evidence may be a direct artifact, an indirect artifact, or an affirmation. Affirmations indicating that the project team has not implemented a particular practice on the team are sufficient for this requirement and for assigning a rating.

In preparation for generating the appraisal report, the ECI should be reviewed as well to ensure that there are no conflicts in appraisal team statements made in the instrument. Conflicts between what was observed in the ECI versus what was heard during project team interviews must also be addressed. Such conflicts should be noted in the ECI or the final appraisal report. On-call or office-hours interviews may be conducted in order to address such situations to ensure that the appraisal team correctly verified evidence and the associated conflict.

This appraisal method does not include the validation of report contents or comments made in the ECI. However, project teams who have objections to any final appraisal results may submit their issues in writing directly to the Appraisal Sponsor. This submitted feedback will be reviewed and maintained by the ASC Program Office to provide project teams the opportunity to have their concerns documented. Because validation is not part of this appraisal method, the appraisal team must meticulously practice confidentiality and non-attribution rules to the greatest extent possible.

2.2.4. Generate Appraisal Results

Once the appraisal team has verified all information collected during the appraisal, finalization of the ECI should begin. Finalization includes the following steps

- Ensuring all project team supplied evidence has been characterized using characterization guidance described in Section 2.2.3, Verify Objective Evidence
- Ensuring appraisal team comments made in the ECI are not in conflict with one another
- Removing any appraisal team annotations not intended to be delivered to the project team

After finalizing the ECI information, the appraisal team will assign ratings based upon evidence characterizations. Rating guidance is found in Section 1.4.4, Appraisal Outputs. While appraisal teams should strive for consensus, consultative decision making prevails in situations where consensus cannot be made. Given the qualifications of the ATLs and their level of involvement with the development and implementation aspects of the *ASC SQE Practices*, it is assumed that their judgment will ultimately be relied upon when issues arise with respect to evidence characterization and rating assignments.

2.3. Report Appraisal Results Phase

The reporting phase has two levels of reporting that must be managed. The high-level reporting pertains to the ASC Program Office final report summarizing all project team appraisals conducted over a fiscal year period. This high-level report will be developed by the APL and the ATLs. This report will include a general summary of project team appraisal results, as well as ASC Program strengths and opportunities for improving SQE activities.

The other level of reporting pertains to individual appraisal results delivered to each project team. These results will include a completed ECI with appraisal team comments and practice ratings. It will also include a brief summary that reflects strengths, weaknesses, and opportunities for improvement based upon appraisal observations. Information gleaned from individual project team appraisals will be summarized and compiled into the ASC Program Office high-level report.

Reporting phase practices are identified below. “Responsibility” indicates the role with primary responsibility for ensuring the practice is initiated and completed, but others will very likely be supporting these efforts as well. Practice elaborations are provided in the sections that follow the table below.

Table 10. Report Appraisal Results Phase Practices

Report Phase Practice	High Level Practice Description	Responsibility
2.3.1 Deliver Project Team Appraisal Results	<ul style="list-style-type: none"> Deliver completed ECI and <i>Project Appraisal Results Report</i> to Project Team Deliver a copy of the ECI and the <i>Project Appraisal Results Report</i> to the APL 	ATL(s)
2.3.2 Contribute to the ASC Appraisal Report	<ul style="list-style-type: none"> Contribute project team specific data to the <i>Project Appraisal Results Report</i> Conduct iterative reviews of the final <i>Project Appraisal Results Report</i> Verify report results with the ATLs 	APL, ATL(s)
2.3.3 Deliver the Final ASC Appraisal Report	<ul style="list-style-type: none"> Obtain approval to release final report from Appraisal Sponsor Ensure the report becomes a SAND report Deliver the final <i>Project Appraisal Results Report</i> to the Appraisal Sponsor 	APL
2.3.4 Archive All Appraisal Results	<ul style="list-style-type: none"> Ensure that all appraisal results, including those from the project teams, are properly archived 	APL

2.3.1. Deliver Project Team Appraisal Results

Appraisal results will be delivered to project teams at the conclusion of each appraisal. Delivery of the results will generally be in the form of a brief one-hour meeting between the ATL and the project team POC, usually the PI. Other members of the appraisal team may attend; however, any other individuals outside the appraisal team and the appraised project team may only be present at the invitation of the appraised project team.

Because it is intended that this appraisal involve minimal project team disruptions, other methods for delivery (e.g., email, teleconference, and videoconference) of appraisal results are allowed. Any method is appropriate based upon project team request.

Appraisal results are comprised of the completed, with evidence characterizations, appraisal team comments and practice ratings. In addition, appraisal teams will use the *Project Appraisal Results Report Template* (see Appendix A, Resource 3) to summarize appraisal team results and provide improvement recommendations to project teams.

A copy of the appraisal results must also be delivered to the APL. This information will be collected for future input into the fiscal year report, *ASC Appraisal Report* for the ASC Program Office.

2.3.2. Contribute to the ASC Appraisal Report

Appraisal results will be aggregated across the ASC Program and reported to the Appraisal Sponsor. Ratings from project team appraisals will be evaluated at the Program Element level and the ASC Program as a whole to identify strengths and opportunities for SQE improvements. This fiscal year appraisal report will include non-attributable ratings for all projects included in the appraisal; however, Program Element Managers will be given attributable ratings for each project within their Program Element. The overall appraisal report will address items listed in the “Intended Use” section of Table 2, Software Gap Analysis. Inputs from project teams that are collected during follow-up discussions and surveys (Section 2.4, Conduct Appraisal Follow-up) will also be summarized in the report. This information will provide the ASC Program Office with insight into the needs of project teams with respect to SQE activities that might best support their work.

The APL must create and manage the fiscal year report. ATLs will contribute to the appraisal report on an iterative basis. The appraisal report will commence at the beginning of the current fiscal year with a completion date at the end of the fiscal year. Supplementary to the appraisal report will be individual project team rating reports to the Program Element Managers for projects under their domain.

Before delivering the final *ASC Appraisal Report* to the Appraisal Sponsor, the APL will verify report results with all ATLs. Verification will include the review of reported data. ATLs must assist in ensuring information is non-attributable to individuals in the report provided to the Appraisal Sponsor and properly attributable (project names) in supplemental reports provided to the Program Element Managers. Roll up of information and identification of trends, strengths, and opportunities for improvement will also be verified since this information will be developed on a consensus basis with all ATLs.

2.3.3. Deliver the Final ASC Appraisal Report

The APL must obtain approval to release final report from Appraisal Sponsor. The final *ASC Appraisal Report* must be completed as a SAND Report.

The APL and at least one ATL will deliver the final *ASC Appraisal Report* for the current fiscal year to the Appraisal Sponsor. At the Appraisal Sponsor's request, the report may be delivered at an executive briefing, which may be a closed or open session forum where other attendees are present only at the request of the Appraisal Sponsor. This session will likely be followed up with additional planning sessions to prioritize opportunities for improvement and plan for future SQE activities based upon report guidance. Additional final report presentations may be delivered to different audiences (e.g., ASC Program Director, ASC Program management team meetings) at the request of the Appraisal Sponsor.

2.3.4. Archive All Appraisal Results

All appraisal artifacts must be placed in appropriate repositories for configuration management. Repository locations will be confirmed with the Appraisal Sponsor and designated access controls will be identified and established. Artifacts to be archived must include

- Individual project team results (including both the ECI and the *Project Appraisal Results Report*)
- Appraisal tools, instruments and summaries utilized by appraisal teams during the conduct of appraisals
- ASC Appraisal Report for current fiscal year
- ASC Summary Appraisal Report for each appraisal phase (as defined by the ASC Program Office)

All other appraisal artifacts will be maintained at APL discretion.

2.4. Conduct Appraisal Follow-up

The appraisal follow-up phase has two levels of follow-up that must be managed. The high-level follow-up pertains to the overall appraisal process and where improvements can be made to the process on an on-going basis. This follow-up, in the form of lessons learned, will be discussed by the ATP periodically throughout the conduct of project team appraisals. Improvements will be made as needed throughout the appraisal process while striving to maintain maximum uniformity in the appraisal process across the projects.

The other level of appraisal follow-up involves gathering additional feedback from project teams. Follow up from the project teams will be two-fold. First, they will be responding to a series of general questions related to ASC Program Office SQE activities that will focus on strengths and opportunities for improvement in ASC Program Office SQE efforts. Secondly, project teams will be requested to complete an online *Appraisal Survey* regarding the appraisal process.

Follow-up phase practices are identified below. Responsibility indicates the role with primary responsibility for ensuring the practice is initiated and completed; however, others will very likely be supporting these efforts as well. Practice elaborations are provided in the sections that follow the table below.

Table 11. Appraisal Follow-up Phase Practices

Follow-up Phase Practice	High Level Practice Description	Responsibility
2.4.1 Follow-up with Appraised Teams	<ul style="list-style-type: none"> • Follow up with project teams at least one to two weeks following delivery of appraisal results • Gather input from the project teams 	APL
2.4.2 Document Follow-up Responses and Issues	<ul style="list-style-type: none"> • Document and maintain project team follow-up responses for inclusion in the <i>ASC Appraisal Report</i> delivered to the ASC Program Office 	APL
2.4.3 Conduct Lessons Learned	<ul style="list-style-type: none"> • Collect lessons learned throughout the appraisal period • Meet periodically with the ATP to discuss lessons learned and implement improvements where needed • Compile a master list of lessons learned and action items for use in current and future appraisals 	APL, ATLS

2.4.1. Follow-up with Appraised Teams

Approximately one to two weeks following the delivery of the appraisal results to a project team, an ATL will contact the PI for the appraised project team to schedule a meeting to discuss appraisal follow-up questions. A link to the follow-up questions will be provided (see Appendix A, Resource 5) to allow project teams time to review them. This activity will be conducted by either the APL or another ATL; this individual does not need to be the ATL who conducted the actual appraisal for the project team, although this is the preferential method for conducting follow-up.

The purpose of the appraisal follow-up is to collect feedback from project teams regarding the appraisal process, their individual appraisal results, and how the ASC Program can improve SQE activities. The intent is to give project teams time to review appraisal results and the follow-up questions before providing feedback; thus, allowing them the opportunity to reflect on questions and generate responses together as a team rather than having to provide immediate feedback to unexpected questions during an interview.

Appraisal follow-up will also give the project teams the opportunity to ask additional questions regarding process improvement for their team. While one-on-one consulting to any great extent is not within the scope of this appraisal, this is an opportunity a project team may want to pursue; appraisal team members will assist them in securing this type of assistance if it is desired.

Project teams will also be requested to complete an online *Appraisal Survey* (see Appendix A, Resource 6) to provide evaluation and feedback specifically about the appraisal process. Any team member who participated in appraisal activities is allowed to complete an evaluation. Evaluations will assist the appraisal teams in improving the appraisal process. The ATP will incorporate this information into lessons learned, as appropriate (see Section 2.4.3, Conduct Lessons Learned).

2.4.2. Document Follow-up Responses and Issues

As feedback is collected from project teams regarding appraisal follow-up questions and appraisal evaluation, the APL will document and maintain this information for use in the applicable project *ASC Appraisal Report*. Information from project teams will be summarized using non-attribution and confidentiality rules.

Feedback will be distributed appropriately throughout the appraisal process. Thus, feedback regarding issues that could immediately be addressed by the ASC Program Office or the ATP will be

incorporated before the end of the fiscal year appraisals. This information will be reviewed periodically by the APL, ATLS, and the ASC Program Office to determine areas and issues that should receive immediate attention.

2.4.3. Conduct Lessons Learned

Throughout the fiscal year appraisals, the ATP will convene periodically to discuss the appraisal process. It is expected that as appraisals are conducted, improvements will be identified. The intent of conducting lessons learned continuously throughout the appraisals rather than at the end is to address issues that can provide an immediate benefit to the appraisal process.

Approximately every three to four months during the appraisals, the ATP will meet to have updated training sessions, as necessary. This allows the ATP to refresh their appraisal process knowledge. In addition, lessons learned will be identified and discussed to enhance the overall appraisal process for both the project teams and the ATMs. At the end of the fiscal year appraisals, lessons learned and actions taken will be summarized and reported for use in future ASC appraisals. This information, will be documented in *ASC Appraisal Lessons Learned* and archived with other appraisal team resources.

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- [3] Durfee, G., P. Hackney, C. Harrison, A. Hodges, D. Knirk, M. Minana, D. Peercy, J. Schofield, J. Turgeon, M. Williamson, *The Software Quality Implementation (SQUIG) Self-Assessment Instrument for Software Quality, Version 2.5*, Sandia National Laboratories, Albuquerque, NM, December 2012.

APPENDIX A. LINKS TO APPRAISAL RESOURCES AND TRAINING

General information and resources and training regarding ASC appraisals are available on the ASC SQE website (<https://sharepoint.sandia.gov/sites/ASCSQE>). Questions can be submitted via email to wg-ASC-Appraisal-Team@sandia.gov.

A.1. Resources

1. ASC Evidence Collection Instrument (ECI) Template

<https://sharepoint.sandia.gov/sites/ASCSQE/Appraisals/Appraisal%20Resources/ASC%20Evidence%20Collection%20Instrument%20-%20Blank.doc>

2. ASC Project Team Appraisal Plan Template

<https://sharepoint.sandia.gov/sites/ASCSQE/Appraisals/Appraisal%20Resources/ASC%20Project%20Team%20Appraisal%20Plan%20-%20Blank.docx>

3. ASC Appraisal Results Report Template

<https://sharepoint.sandia.gov/sites/ASCSQE/Appraisals/AppraisalTeam/appraisalteamresources/Appraisal%20Team%20Resources/Results%20Report%20Template.doc>

4. ASC Sample Interview Questions

<https://sharepoint.sandia.gov/sites/ASCSQE/Appraisals/AppraisalTeam/appraisalteamresources/Appraisal%20Team%20Resources/Sample%20Interview%20Questions.xls>

5. Appraisal Team Review Worksheet

<https://sharepoint.sandia.gov/sites/ASCSQE/Appraisals/AppraisalTeam/appraisalteamresources/Appraisal%20Team%20Resources/Appraisal%20Team%20Review%20Worksheet%20Master%202-29-16.xlsx>

6. Appraisal Survey

<https://sharepoint.sandia.gov/sites/ascsqe/appraisals/sitepages/appraisal%20survey.aspx>

7. ASC Appraisal Schedule

<https://sharepoint.sandia.gov/sites/ASCSQE/Appraisals/AppraisalTeam/Appraisal%20Team%20Schedule/SitePages/Home.aspx>

8. Appraisal Team Process and Checklist

<https://sharepoint.sandia.gov/sites/ASCSQE/Appraisals/AppraisalTeam/appraisalteamresources/Appraisal%20Team%20Resources/Appraisal%20Team%20Process%20and%20Checklist.docx>

A.2. Training

1. ASC Appraisal Team Training

<https://sharepoint.sandia.gov/sites/ASCSQE/Appraisals/AppraisalTeam/appraisalteamresources/Appraisal%20Team%20Resources/ASC%20Appraisal%20Team%20Training.pptx>

2. ASC Project Team Training

<https://sharepoint.sandia.gov/sites/ASCSQE/Appraisals/Appraisal%20Resources/ASC%20Project%20Team%20Training.pptx>

APPENDIX B. GLOSSARY

Artifact: A documented process, deliverable or work product. A configuration-controlled artifact is stored in a corporate repository (library) and changes to it are controlled via reported issues. [ASC SQE Plan, Glossary and Acronyms]

Document: A collection of data, regardless of the medium on which it is recorded, that generally has permanence and can be read by humans or machines. This typically includes work products such as organizational policies, procedures, and implementation-level work products. Documents may be available in hardcopy, softcopy, or accessible via hyperlinks in a web-based environment. [SCAMPI B&C Handbook, Glossary]

Self-Assessment: A project team's appraisal of itself to determine the state of its current software process, to determine the high-priority software process-related issues facing the project team, and to obtain project team support for software process improvement. [Derived from ASC SQE Plan, Glossary and Acronyms]

Direct Evidence: A primary reference to tangible output resulting directly from the implementation of a documented process pertaining to the given process area. Oftentimes, direct evidence is explicitly stated or implied by the question asked. [SQUIG Self-Assessment Instrument, Instructions]

Indirect Evidence: A secondary reference that is a consequence of performing a specific process or that substantiates its implementation but which is not the purpose for which the process was performed. Oftentimes when indirect evidence exists there is no indication of where it came from, who worked to develop it, or how it is used. [SQUIG Self-Assessment Instrument, Instructions]

Affirmation: An oral or written statement confirming or supporting implementation of a practice. Interview responses are examples of face-to-face affirmations. Alternative forms of affirmations could include presentations or demonstrations of a tool or mechanism as it relates to implementation of a practice. [SCAMPI B&C Handbook, Glossary]

Objective Evidence: Qualitative or quantitative information, records, or statements of fact pertaining to the characteristics of an item or service or to the existence and implementation of a process element, which is based on observation, measurement, or test and which can be verified. [SCAMPI B&C Handbook, Glossary]

Software Appraisal: the process of examining the current level of ASC SQE Practices implementation by an independent, qualified team.

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