Science Ready Data Products

Stakeholder Requirements
Project 530
Draft

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Change Record

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1.1	5/2/2018	Treacy	Changed UC01-0003 to reflect an Observatory proposal submission vs SRDP Proposal submission, changed NRAO Coop Agreement to AUI Coop Agreement
1.2	6/28/2018	Kern	Added minimum viable product section and designated related requirements in the table.

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1. Introduction

1.1 Background

The Science Ready Data Products (SRDP) project is an initiative designed to remove a significant amount of burden and overhead from the user that is associated with data calibration and imaging, allowing NRAO users to focus much less on data reduction and much more on the cutting-edge science enabled by the VLA and ALMA. As such, SRDPs are an important means of expanding the NRAO user base. Development of SRDPs is a key deliverable under AUI's Cooperative Agreement with the NSF and the Program Operating Plan, supported by internal funding.

The SRDP Requirements Committee is established to first capture a broad definition of Use Cases, translate them to concepts and stakeholder requirements, and decompose them to lower level requirements. The committee works under direction of the SRDP Project Scientist with support from the Project Manager to provide structure and traceability to the requirements hierarchy. The Requirements Management process is established during the project period under the SRDP Project Office, but will transition to operations at the close of the project period as the SRDP Project Office will eventually be disbanded. The Requirements Process and committee will continue through operations, remaining under the lead of the SRDP Scientist through the end of the SRDP lifecycle.

1.2 Scope of this Document

This SRDP Stakeholder Requirements document defines one level within the larger requirements hierarchy. The hierarchy is more fully described in the System Engineering Management Plan (SEMP) [AD2], summarized as follows:

- SRDP Concepts [AD03] – Describe high level use cases, operational modes and scenarios, constraints, and define the data products to be delivered
- Stakeholder Requirements (L0) – Concepts are translated into requirements language and prioritized within a Roadmap, reflecting the plan to progressively deliver the maturing capability
- System requirements (L1) – Stakeholder requirements are decomposed to the L1 level to convey the functional and non-functional requirements needed to achieve the capability defied in higher level requirements
- System Elements Requirements - Task Level Requirements (L2) are decomposed from the L1 requirements to the task or work package level to provide the functionality defined in the L1 requirement.
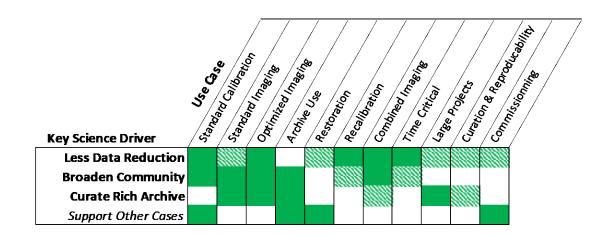
This document concludes with a definition statement for each stakeholder requirement, a unique identification (ID) code, Measures of Effectiveness (MOE), Key Performance Parameters (KPP), validation criteria, parent/child traceability, and other attributes that more clearly articulate the intent of the requirement.

Scope which is excluded from SRDP is identified in AD3 and will not be repeated here.

1.3 Verification and Validation

Verification, Validation, and Commissioning are described in detail in AD2. SRDP capability is described at the highest level as key science drivers and use cases in the SRDP System Concept Document [AD3], is defined in the L0 requirements, and will be progressively delivered over the life of the project.   Validation is performed under direction of the SRDP Scientist.   A comprehensive validation of L0 requirements is not possible until the entire capability has been delivered. The following table illustrates how the use cases map to the key science drivers:

Key Science Driver \ Use Case	Standard Calibration	Standard Imaging	Optimized Imaging	Archive Use	Restoration	Recalibration	Combined Imaging	Time Critical	Large Projects	Curation & Reproducability	Commissionning
Less Data Reduction	■	▨	■		▨	■	■	■	▨	▨	▨
Broaden Community	■	■	■	■		▨	■	▨			
Curate Rich Archive		■	■	■		▨		■	▨		
Support Other Cases	■			■						■	

As the capability will be delivered over time, so too the validation will be incrementally performed as the capability is delivered.   Each L0 requirement is decomposed to L1 requirements, where the L1 requirements will be verified against the L0s as they are delivered. The cumulative verification of L1 requirements will be the metric against which the L0 requirement to which they map has been satisfied.   The verification of L1 requirements will be tracked and incrementally credited to the L0 requirements until such time as a full validation of the L0s can be performed.   Verification of SRDP functionality at the L2 level is performed within DMS in the context of their internal processes.

1.4 **Applicable Documents**

Applicable documents contain information that shall be applied in the current document. Examples are the proposal, programmatic/science requirements documents, standards, rules and regulations.

AD1 – SRDP Project Charter 530-SRDP-001-MGMT

AD2 – SRDP System Engineering Management Plan 530-SRDP-010-MGMT

AD3 – SRDP System Concept 530-SRDP-014-MGMT Version (1.0)

1.5 **Reference Documents**

Reference documents are any documents containing information complementing, explaining, detailing, or otherwise supporting the information included herein.

RD1 – SRDP Project Management Plan 530-SRDP-003-MGMT

2. Stakeholder Needs

2.1 **Programmatic Needs**

Programmatic needs include a clear definition of the metrics against which test and verification plans can be developed and end-to-end, parent-child traceability within the requirements hierarchy to ensure the needs defined in the User Cases are delivered.

The SRDP Program will continue into operations after the SRDP Project Office has been disbanded. Ownership of the processes established under the project will transition to operational processes. The programmatic needs also include delivery of a mature, well documented requirements management process that is suitable for routine use in operations, along with an initial operations plan that projects resources needed to sustain SRDP deliverables.

2.2 **Science Goals and Use Cases**

The SRDP project will define and deploy a set of tools to support users and SRDP operations staff in fulfilling the Science Goals described as Key Science Drivers and Use Cases in the SRDP System Concept Document [AD03]. The Use Cases frame the complete project scope, which is prioritized to inform the SRDP Roadmap, reflecting the long term plan for delivered capability. In some cases primitive functionality will be delivered early in the roadmap, building to full capability through multiple release cycles. The SRDP Requirements Committee, under direction of the SRDP Project Scientist, is responsible for elicitation and decomposition of the SRDP requirements. High level requirements establish the scope of the SRDP Project, are captured to AD3 the SRDP System Concept Document, and affirmed by the NRAO User Committee (UC) and the CASA User Committee (CUC).

The SRDP project is currently focused on the development of science-ready products for the VLA and ALMA. The National Science Foundation has requested a proposal for the re-integration of the Long Baseline Observatory (LBO) to the NRAO.

Use cases are the primary source for the Level-0 project requirements. The SRDP project is using a rolling wave approach to requirements management (see sections in AD2 and RD3 for structure and scheduling), to iteratively refine and address the requirements. This process provides the opportunity for feedback from the community throughout the project. The rolling wave approach precludes a detailed implementation plan at this stage, but a rough roadmap assuming a five-year project is described in AD3.

Most of the Use Cases have necessary pre-conditions and post conditions in order to fully enable the Use Case, satisfy inputs and outputs to adjoining interfaces, therefore completing processes with other sub systems. These pre and post conditions also contribute to stakeholder requirements and are traced to their definitions in the Use Cases. Requirements for Use Cases are directly traced to [AD3].

2.3 Observatory Assets and Constraints on Design

Stakeholder requirements typically do not identify particular solutions. However, SRDP is implemented within an existing framework, intending to leverage a number of resources already in regular use. Among these are a help desk system, a weblog, a data archive, computing resources, a proposal submission tool, the CASA software, workflow manager, the NRAO development and operations staff, and perhaps others.   Where known, these may constrain design options; but existing resources will be referenced directly and not treated agnostically or as ambiguous entities.

3. Minimum Viable Product

The SRDP Project is structured to deliver functionality throughout the implementation period, with capabilities made available to the user as they are validated. One of the objectives of defining MVP, early feedback, is therefore addressed by the rolling wave structure of the project. The purpose of defining a project level MVP is to ensure the project meets the highest level goals, and provide guidance when resource tradeoffs need to be made. The emphasis on MVP is on the **Minimum**, under no circumstances should the MVP be confused with the requirements or objectives of the project.

The minimum functionality required to address the primary objectives of the project are:

- Calibration and Imaging pipelines for the most common VLA observing modes.

- Download of calibrated MSs (restore use case)

- Minimum archive functionality to identify and access the products.

Requirements necessary to address this lowest level of functionality are denoted by bold font requirement id in the table in Section 4.

4. Identified Stakeholder Requirements

This section establishes the list of traceable L0 requirements. The source of requirements is provided, where Section and paragraph references are given to the SRDP System Concepts Document. The tight coupling between this document and the associated version of AD3 creates a dependency which must be recognized for accurately tracing and mapping requirements.

The legend used in the requirement identifiers:
ON - Operational Need
UC – Use Case

Origin of the Stakeholder Requirement	Requirement Id	Description	Rationale	Measure of Effectiveness Need	How to obtain Effectiveness Data
AD3 2.4.2 para 1	**ON01-001**	**Proprietary Period** The proprietary period shall be tied to the underlying data products.	The SRDP project must accommodate different proprietary data policies of ALMA and the other NRAO telescopes.	confirmation of proprietary data policies in place at time of data delivery	I
AD3 2.4.3 para 2	**ON01-002**	**Archive Contents Policy** Products generated through the SRDP processes shall have undergone a standard process and shall be designated with a QA approval, as appropriate.	All products in the archive must have undergone a quality assurance process.	Confirmation of QA approval designations assigned to the data records	I
AD3 2.4.3 para 3	ON01-003	**Archive Contents Policy** Large projects going through the NRAO submission process shall submit a data management plan as part of the observing proposal.	The data management plan for large projects shall include a quality assurance plan as well as definition of what products will be submitted to the archive and estimates of product size.	Confirm that Large project proposal submissions include a QA plan, a data management plan which identifies data products targeted for archiving, and estimates on data product size	I
AD3 2.4.3 para 3	ON01-004	**Archive Contents Policy** The QA approval flag shall cite the project as the authority for the quality assurance.	An Archive Contents Policy ensures quality of all archive contents	Demonstrate QA approval flag is set when criteria is met and QA flag is not set for invalid criteria	D/T

AD3 2.4.3 para 4	ON01-005	**Archive Contents Policy** User generated products shall only be ingested into the archive if compliant with provisions in the large projects use case.	An Archive Contents Policy will constrain the scope of effort required for SRDP operations and to ensure the quality of products is known., therefore ingestion of user generated products outside of the large user case is disallowed		
AD3 2.5 para 3	**ON02-001**	**Computing Resource Management** For any usage of the SRDP system, the user shall have a valid NRAO account, and to be properly authenticated through the *myNRAO* portal. download of existing products from the archive	The only exception to this is support for anonymous download of existing products from the archive.		D
AD3 2.5 para 3	ON02-002	**Computing Resource Management** The SRDP systems shall develop metrics to provide an accurate picture of usage patterns, with a provision to enforce storage quota and other processing constraints.	In order to manage resource allocation, a clear understanding of usage requirements and patterns must be developed.		D/I
	ON02-003	The requirement set ON02-003.1-ON02-003.6 shall be considered as deemed necessary to provide sufficient flexibility to balance resources.	To balance and project competing demands from pipelines, large projects, NRAO staff, and the NRAO user community and mitigate the risk of oversubscribing computing external resources (AWS, XSEDE) may be necessary.		

AD3 2.5 para 6	ON02-003.1	**Pipeline Processing** The pipeline processing model shall incorporate a special overflow queue on the existing clusters where jobs routed to this queue shall trigger remote processing.	Standard pipelines will be executed on external facilities by NRAO as part of normal operations when demand exceeds existing internal resources, AWS resources are more attractive than XSEDE, which must be scheduled in advance	Confirmation that overflow queue has been implemented and triggers remote processing upon receipt of an overflow job	D/T
AD3 2.5 para 8	ON02-003.2	**Special requirement processing** For imaging cases outside of the resource profiles supported by the NRAO cluster environment, alternate processing and temporary storage shall be provided and automatically triggered by SRDP compliant projects.	AWS shall be a more attractive alternative than acquiring dedicated hardware.		
AD3 2.5 para 9	ON02-003.3	**Large project processing** Large project shall be processed on AWS when speed of processing is necessary and automatically triggered by SRDP compliant projects.	Concurrent processing on external resources could be achieved by submission to AWS to meet project throughput goals.		
AD3 2.5 para 10	ON02-003.4	**Charged User Processing** When processing load levels exceed the NRAO computing capacity, charges incurred shall be passed back to the requesting user, where the SRDP workflows can quantify the use of external resources and make associations with unique users for the purpose of assigning those charges.	When observation load levels extend beyond NRAO's ability to respond, alternatives may be identified to augment internal resources by submission to AWS or block grants of XSEDE time administered by NRAO		T
AD3 2.5 para 11	ON02-003.5	**Product Storage** The SRDP design shall allow for the automatic trigger of temporary storage on external resources to manage fluctuations in resource demand when a predefined threshold is reached,	A temporary buffer in AWS or XSEDE should be provided to manage fluctuations in storage demand which may be present due to other periodic and irregular resource demand from VLASS and other large projects.	Test for redirection of storage if threshold (TBD) is exceeded	D/T

AD3 2.5 para 12	ON02-003.6	**Data Archive** DMS shall continue to evaluate convenient and cost effective alternatives for the storage of the ALMA and JVLA data archive, where data transport could be simplified if the external storage facility is also a processing facility.	A copy of the ALMA or VLA data archive could be placed at an external facility rather than kept at a quiescent local mirror.	Confirm by	
AD3 2.2.1 para 2	ON03-001	**Telescope Users** The SRDP proposal submission process shall capture an estimation of storage needed for data products as well as an estimate of computational requirements provided by telescope users.	Telescope users design observations to address specific scientific questions and envision the data products that will allow them to address those concerns.	Confirm by evaluation of the PST and associated processes	D/T
AD3 2.2.1 para 3	**ON03-002**	**Archive users** SRDP shall provide archive users well-defined anonymous access to the archive. Archive users requesting additional computational resources shall register with *myNRAO*. Automated processes will be in place to monitor usage per user and large or expensive requests will be referred for manual evaluation on a case-by-case basis.	Archive users seek to re-use existing data (and products) to answer scientific questions, which may be unrelated to the initial science case.	Confirm by evaluation of the PST and associated processes	D/T
AD3 2.2.1 para 4	ON03-003	**Large Projects** The SRDP project shall seek to maximize the return on investment for large projects.	Large projects (both telescope and archive based) represent a limited number of large investments.		
AD3 2.2.1 para 5	ON03-004	**Operations Staff** The system shall provide the tools for members of the NRAO staff, data analysts and scientific staff members, shall operate the SRDP processes,	NRAO staff with functional effort are allocated to supporting the operations of the SRDP processes.		

		through the execution of workflows and quality assurance.			
AD3 2.2.1 para 6	ON03-005	**General Public** The SRDP shall support the amateur astronomer, educator, or other member of the public interested in astronomy by providing the produced images in familiar formats (TBD), which will be available for anonymous download.	As part of NRAO's commitment to education and public outreach	Test anonymous access to archive and demonstrate availability of specified formats	D/T
AD3 2.2.1 para 6	ON03-006	**Casual/Novice** SRDP shall allow for download of a pre-existing image, to produce an image from previously obtained data, or desire a simple path to obtaining new data from which an image can be built using the archive interface.	Casual Users/Novice Astronomers: These users may want to use SRDP to get an image quickly without having to know much about radio astronomy.	Test image processes established (TBD) for this level of user	D/T
AD3 2.2.1 para 7	ON03-007	**Future Power Users** SRDP shall provide support for a continuum of expertise, not just novice and expert modes.	Future power users would typically start with a simpler access level, but over time will interact more deeply with the data.	Demonstrate required flexibility in access to archive at various levels of complexity	D/T
AD3 2.2.1 para 1	ON03-008	**Experienced Radio Astronomers** The SRDP project shall seek to provide interfaces to engage these experts in the generation and quality assessment of science-ready products.	Collaboration with experienced radio astronomers allows the project to benefit from their expertise in reduction heuristics and quality assessment, also earning their trust in the integrity of SRDP.	Demonstrate the interface provides tools and quality to satisfy the most discriminating users	D/T
AD3 2.2.2 para 1	**ON04-001**	**Workflow Management System** This non-human actor shall perform the automatic and autonomous functions necessary to support the operation of the SRDP.	Use cases described in the System Concept Document require automated behavior	Inspect architecture and test functionality	I/T

		It shall also interface with all subsystems necessary to perform these functions.			
AD3 2.3.1 para 1/2	**ON05-001**	**Proposal Submission and Observation Planning.** SRDP shall provide requirements for the PST and OT interfaces, which shall capture the scientific intent of the user, ensuring the intent is preserved in all downstream processing so that correct products are generated.	SRDP depends upon accurate capture of user intent via the ALMA and VLA interfaces (PST/OT) Phase I tools. This may require modifications to the Phase I and Phase II ALMA tools (OPT and OT), potentially delayed or prevented by ALMA policy and governance.	Inspect requirements provided to ALMA and VLA and validate results.	I/T
AD3 2.3.2 para 1	**ON06-001**	**Archive Interface.** SRDP shall provide an archive interface to serve as a user's primary means of finding, creating and accessing science-ready products. The archive interface shall provide data and product discovery capabilities, product inspection facilities, and an interface through which custom products may requested.	Archive access is a fundamental provision of SRDP project objectives.	Demonstrate the breadth and usefulness of archive access, testing for accurate delivery of requested products.	D/T
AD3 2.3.3 para 1	ON07-001	**Weblog** The Weblog interface shall be refined and augmented by the SRDP project to provide utility and usability.	The weblog interface provides the primary record of the process that generated a set of science products. The interface exists and was well developed for the ALMA and VLA pipelines.	Demonstrate and test weblog for stated utility and usability (Metric TBD)	D/T
AD3 2.3.4 para 1	ON08-001	**Helpdesk** The Helpdesk shall be updated to allow for automatic updating and simplification of SRDP workflows.	The helpdesk already provides a conduit through which the user communicates with the operations staff.	Create help desk tickets which exercise all of the triggers and branches required by the SRDP workflows	T

AD3 2.3.5 para 1	**ON09-001**	**Workflow Management Interface** The workflow management interface shall be used by operations staff to monitor and control the flow of SRDP generation throughout the workflow lifecycle.	The workflow management interface focuses on mediating the quality assurance process, ensuring products do not become "stuck", and tracking delivery status.	Demonstrate all associated interfaces and triggers with the workflow manager, assuring all the logic in all paths is robust and workflows complete as designated	D/I/T
AD3 2.6 para 3	**ON10-001**	**Quality Assurance** The SRDP Project shall determine the [scientific quality] limits of the product and ensure that unwanted artifacts are not present. In cases where the user is working directly with the operations staff on a particular product, the user shall be involved in the QA process to determine if the product is suitable for their needs.	The quality assurance process is a central component to the SRDP project. The objective of the process is to help users understand the limitations of the products and discourage over- or mis-interpretation.	Review the QA product criteria and process definition to ensure that communication with the user is incorporated	D/I
Use case 1 3.1 para 1 2.4.1 para 1	**UC01-0001**	**Standard Calibration** The SRDP shall provide standard science-quality calibration only for observations that conform to SRDP validated proposals submitted to NRAO telescopes.	The SRDP project will not address the standard calibration process for ALMA data. Most observations should be able to conform to SRDP requirements.		D
Use case 1 3.1 para 1	UC01-0002	**Standard Calibration** The SRDP project shall have, through representatives at the NAASC, the ability to insert requirements to the ALMA process.	Modifications to ALMA processes may be needed to support SRDP deliverables.		I
Use case 1 2.4.1 para 2 3.1 para 2	**UC01-0003**	**Standard Calibration** The Observatory proposal process shall allow the user to "opt out" of the standard calibration process required for an SRDP compliant proposal, with documentation to justify the decision for non-compliance with SRDP guidelines. Such proposals shall inhibit	The intention of the telescope user to conform to Observatory calibration strategies so that SRDP products can be generated should be captured as part of the proposal process.		

		automatic trigger of the Standard calibration pipeline.	Justification for opting out of a standard calibration should be captured as part of the proposal process and an alternative calibration strategy proposed. Modifications to the Proposal Submission Tool (PST) and Observation Preparation Tool (OPT) will be required to support this type of templated observation (TBD).		
Use case 1 3.1 2.4.1 para 2	UC01-0004	**Standard Calibration** SRDP compliant proposals shall include adequate information for creation of scheduling blocks and observing scripts.	By default, projects should be assumed to conform and sufficient information captured at this stage to allow the creation of the scheduling blocks and observing scripts by the observatory, to be reviewed and approved by the telescope user*.	SRDP Proposals are to be screened for adequate information to create scheduling blocks and observing scripts.	I
Use case 1 3.1 para 1	**UC01-0005**	**Standard Calibration** Data processing effort managed by the SRPD project shall continue to meet the NAASC commitments for quality assurance of the ALMA products.			D
Use case 1 3.1 para 2	UC01-0006	**Standard Calibration** When a conforming observation is complete, and necessary meta-data for successful calibration is available, the observation shall be automatically triggered for calibration (as opposed to waiting for a request from the user).	Automatic trigger of the standard calibration pipeline supports SRDP goals for automation of processes		D/T
Use case 1 3.1 para 2	**UC01-0007**	**Standard Calibration** Auxiliary data such as calibrator fluxes, antenna positions, and known defective equipment shall be automatically considered as part of the calibration			D

		and should not require any additional effort on the part of the telescope user.			
Use Case 1 3.1 para 3	**UC01-0008**	**Standard Calibration** Calibrations shall represent observatory recommended best practices at the time of execution (and thus will evolve over time).			D
Use Case 1 3.1 para 3	**UC01-0009**	**Standard Calibration** SRDP Calibrations shall be congruent to calibrations which could be performed by an individual user.			D
Use Case 1 3.1 para 3	**UC01-0010**	**Standard Calibration** Every calibration shall be assessed for quality, and those projects for which the initial calibration are not judged to be of science quality should be identified for further intervention.	The predominant intervention is the introduction of additional flags, either through automated or manual means		D/T
Use Case 1 3.1 para 3	UC01-0011	**Standard Calibration** Any flags applied shall be captured in such a manner that the flags can be re-used by subsequent recalibrations (see section 3.6).			D/T
Use Case 1 3.1 para 3	UC01-0012	**Standard Calibration** The system shall maximize the utility of interventions in recalibration by facilitating the reuse of manually generated information.			D/T
Use Case 1 3.1 para 4	**UC01-0013**	**Standard Calibration** Once a science-quality calibration has been generated for a particular observation, the calibration products, flagging information, and logs shall be ingested to the archive and the telescope user notified via help desk.			D/T
Use Case 1 3.1	**UC01-0014**	**Standard Calibration**			D

para 4		The archive shall store sufficient meta-data to provide provenance for the calibrated products, and to promote identification of suspect products based on defects found at later times.			
Use Case 1 3.1 para 4	UC01-0015	**Standard Calibration** Products for which a science quality calibration is not possible shall be designated as such in the archive to prevent repeated attempts to calibrate such observations.			D
Use Case 1 3.1 para 4	UC01-0016	**Standard Calibration** Categories for failure shall be identified and metrics derived in order to allow the Observatory to address common failure modes.			I
Use Case 1 3.1 para 4	UC01-0017	**Standard Calibration** The latency between the completion of the observation and the delivery of products shall be measured.	The goal is to deliver science quality products within 30 days of the completion of observations.		D/T
Use Case 1 3.1 para 5	**UC01-0018**	**Standard Calibration** The user shall be able to access the calibration and quality assessment results through the archive interface.			D
Use Case 1 3.1 para 5	**UC01-0019**	**Standard Calibration** The calibration record shall be hierarchical in nature to support both summary and detailed views in order to support a wide range of expertise in the user community.			I
Use Case 1 3.1 para 5	UC01-0020	**Standard Calibration** To facilitate remote exploration of data within the archive interface, the calibration record shall make use of "Data Driven Documents" or other similar visualization technology where possible.			D

Use Case 1 3.1 para 5	UC01-0021	**Standard Calibration** Quality metrics shall be clearly identified and scores derived to simplify comprehension.			D/I
Use Case 1 3.1 para 5	UC01-0022	**Standard Calibration** Where possible, physical quantities shall be displayed in the Weblog as well as the normalized scores.			D/I
Use Case 1 3.1 para 6	UC01-0023	**Standard Calibration** The helpdesk interface shall allow the PI to provide feedback on the calibration for a particular observation and request an improved calibration be performed.	The re-calibration is to allow a modified set of flags or other parameters specified by the PI.		D/T
Use Case 1 3.1 para 6	UC01-0024	**Standard Calibration** Processes to simplify improved calibration when required, both for the PI and the Observatory shall be in place, as well as a mechanism for designating the resulting calibration as the primary calibration for the observation.			D/T
Use Case 2 3.2 para 1	**UC02-0001**	**Standard Imaging** The standard imaging process shall automatically be triggered for observations supported by SRDP once the standard calibration has passed quality assurance.			D/T
Use Case 2 3.2 para 1	**UC02-0002**	**Standard Imaging** The observing proposal shall define specifically the product desired.			I
Use Case 2 3.2 para 1	**UC02-0003**	**Standard Imaging** Combined imaging of multiple executions of the same scheduling block in the same configuration shall be supported, provided that the desire for			D/T

Use Case 2 3.2 para 1	UC02-0004	**Standard Imaging** When combined imaging of multiple executions is requested the SRDP project shall provide the capability to omit the imaging of the individual executions.ee	Standard Imaging is already defined for the ALMA telescope, so SRDP Standard Imaging describes the process for VLA observations.		I
Use Case 2 3.2 para 2	**UC02-0005**	**Standard Imaging** The standard imaging use case shall be designed to populate the archive with consistent high-quality images that can be used for science research.	For many telescope users, the products may be used directly for science.		I
Use Case 2 3.2 para 2	**UC02-0006**	**Standard Imaging** For the telescope user, standard imaging products shall provide at a minimum a quick check of the calibration quality and default image.			D/I
Use Case 2 3.2 para 3	**UC02-0007**	**Standard Imaging** To support Archive users, the standard products shall be quality assured, with a well understood flux scale and enough information to determine if an optimized image generated from the same data would be useful for their application.			D/I
Use Case 2 3.2 para 4	**UC02-0008**	**Standard Imaging** The definition of standard image products shall balance the requirements of the telescope use, the desire for a rich and homogenous archive, and resource constraints both in the generation and storage of products.			D
Use Case 2 3.2 para 4	**UC02-0009**	**Standard Imaging** For all projects, a full bandwidth Stokes I continuum image shall be produced			D

		per receiver band, combining multiple pointings in a mosaic, when specified by the project.			
Use Case 2 3.2 para 4	**UC02-0010**	**Standard Imaging** For fractional bandwidths greater than a threshold value, spectral index maps shall be generated.			D/T
Use Case 2 3.2 para 4	**UC02-0011**	**Standard Imaging** For spectral imaging projects, cubes shall be generated and archived at the spectral resolution specified by the telescope user, provided that the products do not exceed reasonable limits on size and computation resources. In cases for which the requested spectral cube is determined to be "too large" the user shall be informed at proposal time and allowed to refine the requested product (e.g. spectral range or resolution) to conform to size and computational limits.			D/T
Use Case 2 3.2 para 5	**UC02-0012**	**Standard Imaging** Projects that cannot conform to the SRDP requirements, shall be able to opt out of SRDP Imaging at the proposal submission stage with a brief description of why SRDP imaging is not appropriate for the project.	Most projects shall be supported by the SRDP project, but should not limit scientific capabilities of the telescopes.		D
Use Case 2 3.2 para 5	**UC02-0013**	**Standard Imaging** For proposals conforming to SRDP criteria, sufficient information shall be provided at the proposal stage to capture the proposers' desired imaging product.			I
Use Case 2 3.2	**UC02-0014**	**Standard Imaging**			I

para 5		Parameters for SRDP observations shall specify image characteristics (as opposed to processing instructions) and shall include the desired spatial and spectral resolution (for non-continuum projects), as well as if multiple phase centers are to be imaged separately or are intended to be mosaicked.			
Use Case 2 3.2 para 6	**UC02-0015**	**Standard Imaging** Operations staff shall perform quality assurance on the products, and communicate with the telescope user through the helpdesk interface. The goal shall be to make standard SRDP images available to the telescope user within 30 days of the required data being acquired at the telescope.			
Use Case 3 3.3 para 1	UC03-0001	**Optimized Imaging** The Archive interface shall clearly identify data sets for which at least one validated calibration is available, and thus the data is available for generation of an optimized image.			
Use Case 3 3.3 para 1	UC03-0002	**Optimized Imaging** Generation of calibration for data sets lacking prior calibration shall be easily requested through Archive Interface and trigger the recalibration use case.			D
Use Case 3 3.3 para 1	UC03-0003	**Optimized Imaging** The workflow for optimized imaging shall start with validated, calibrated data located in a temporary area.			D
Use Case 3 3.3 para 2	UC03-0004	**Optimized Imaging** The archive interface shall allow the user to specify the desired scientific properties of the image (field of view, spectral extent, spectral and spatial			D/I

		resolution, and polarization). Reasonable defaults shall be presented to the user and invalid options hidden. In addition, imaging pipeline parameters shall be optionally specified through this interface.			
Use Case 3 3.3 para 2	UC03-0005	**Optimized Imaging** Parameters shall be scientific in nature and not tied to a specific implementation of the imaging process	(for instance specifying a desired RMS is appropriate, specifying the number of clean iterations to be used is not).		I
Use Case 3 3.3 para 3	UC03-0006	**Optimized Imaging** Validation on requests for optimized imaging shall be via an automatic validation process, including a check that the data is available, the request is well formed, and user has permission to access the data. In case of error a helpdesk ticket shall be generated and marked for manual follow-up, and the process will wait for manual resolution by operations staff.			D/T
Use Case 3 3.3 para 3	UC03-0007	**Optimized Imaging** The workflow management system shall initiate a check for identical reductions to ensure that duplicate images are not produced. If for any reason the request is deemed invalid, the reason shall be displayed clearly through the interface and the user shall be provided the opportunity to either modify the request or automatically transfer the issue to the associated helpdesk ticket.			D/T
Use Case 3 3.3 para 4	UC03-0008	**Optimized Imaging** Once the optimized imaging request has been submitted, a NRAO helpdesk ticket shall be automatically created to			D/T

		provide tracking and communication between the SRDP operations staff and the user. This ticket shall be automatically populated with the relevant request information.			
Use Case 3 3.3 para 5	UC03-0009	**Optimized Imaging** The workflow process for optimized imaging shall begin by restoring the data (see section 3.5) to the calibrated state, using the appropriate version of CASA and pipeline.			D/T
Use Case 3 3.3 para 5	UC03-0010	**Optimized Imaging** The workflow shall allow for optimized imaging to use a custom calibration created through the recalibration workflow (section 3.6), where the associated image product shall be ingested only if a validated calibration is in the archive.			D
Use Case 3 3.3 para 5	UC03-0011	**Optimized Imaging** The automated pipeline shall be used to produce optimized images and auxiliary meta-data (such as quality assurance plots and the weblog). When complete, an operations staff member shall be notified via helpdesk that the products are ready for quality assurance			D/T
Use Case 3 3.3 para 6	UC03-0012	**Optimized Imaging** Quality assurance processes for optimized images shall maintain the same minimum level of quality as the standard automated products. Any issues with the quality of the product images shall be corrected by the operations staff member, in			D

		communications with the requesting, user as necessary.			
Use Case 3 3.3 para 6	UC03-0013	**Optimized Imaging** When the requested image has passed quality assurance, the user shall be notified via helpdesk and the image as well as web-log shall be made available for inspection and download.			D/T/I
Use Case 3 3.3 para 7	UC03-0014	**Optimized Imaging** If the user is not satisfied with the product (for whatever reason), they shall have the ability to return to their request or helpdesk ticket through a provided link, modify as necessary and resubmit. A simple mechanism shall be provided to request more assistance through a linked helpdesk ticket mechanism.			D/T
Use Case 3 3.3 para 7	UC03-0015	**Optimized Imaging** Strategies shall be provided to limit, or curtail the use of observatory facilities as an open-ended resource commitment for the observatory, both in computing and staffing resources.	It is premature to specify these requirements at this time. This risk is identified in the project risk register and is discussed in section 2.4 above		D
Use Case 3 3.3 para 7	UC03-0016	**Optimized Imaging** If the user determines that a suitable image cannot be produced, this shall be noted in the helpdesk ticket and the request canceled, removing it from the list of pending projects			D
Use Case 3 3.3 para 8	UC03-0017	**Optimized Imaging** When the user is satisfied with the image a "validation button" shall be provided to trigger the ingest of the products to the archive (and optional creation of a DOI see 3.10), and the request closed.			D/T

Use Case 3 3.3 para 8	UC03-0018	**Optimized Imaging** Ingestion of products shall be subject to the same practical size and resource limits as standard products described in 3.2			D/T
Use Case 4 3.4 para 1	UC04-0001	**Archive Use** The Archive shall present a unified interface that supports all requirements pertaining to Use Case 4	This use case is comprised of many sub-cases which may be linked together in multiple ways. Presenting archive use cases together as a single use case emphasizes that there shall be seamless integration in the tools, such that a user is presented a single view encompassing all of these use cases		
Use Case 4 3.4 para 2	**UC04-0002**	**Archive Use** The archive interface shall present an interested user a dynamic form with fields that may be used to search and filter contents of the archive.	The user wishes to identify data objects in the NRAO collection that are useful for a particular objective.		D/I
Use Case 4 3.4 para 2	**UC04-0003**	**Archive Use – Data Discovery** Archive search results shall be returned in a table with an initial view of default fields, The fields shall be user configurable to a custom view for registered users that shall persist across searches. The interface shall also support sorting of results one each column.			D/T
Use Case 4 3.4 para 2	UC04-0004	**Archive Use – Data Discovery** The archive interface shall provide a scriptable interface to registered users to execute multiple searches with exportable search results to a CSV file or other file format.			D/T

Use Case 4 3.4 para 3	UC04-0005	**Archive Use – Data Product Visualization** The archive interface shall provide: 1. Image thumbnails displayed in context with other catalogs and survey results. 2. For image cubes, quick look spectra should be shown. 3. Provenance of the data product including links to the original data, other versions of the product as well as information on how the products were created, (processing job information, pipeline version, weblogs, etc.) 4. Related publications, abstract for the project, etc. 5. Online exploration of the data through a web enabled viewer (Such as CARTA or Aladin Lite).	In addition to the limited information available in the tabular display, additional information and visualizations shall be available through the archive interface.		D/I
Use Case 4 3.4 para 4	UC04-0006	**Archive Use – Data Product Visualization** The interface shall allow the user to explore data without needing to download large quantities of data, though scientific analysis through this interface may be considered depending on user feedback.			D
Use Case 4 3.4 para 5	UC04-0007	**Archive Use – Data Selection** The archive interface shall allow registered users to create a personal list of products that they want to investigate. These lists shall be persisted across login sessions and multiple lists shall be supported.	The user may select one or more data sets for retrieval, additional processing, or other type of follow up.		D/T

		Persistence shall either be specified at the level of the query (in which case the result may change each time the query is executed) or at the level of the results (in which case the result is fixed).			
Use Case 4 3.4 para 5	UC04-0008	**Archive Use – Data Selection** Lists of data sets generated within the archive shall be references to permanent objects already stored in the archive, and shall not point to temporary objects on disk.			
Use Case 4 3.4 para 6	UC04-0009	**Archive Use – Data Selection** The archive shall support annotation and tags assignments on data products. In general, the tags shall be free form, and only visible to the user that creates them.	It is up to the user to decide how they want to use them. A special enumerated set of tags may be used by institutional users that are globally accessible.		D/T
Use Case 4 3.4 para 7	**UC04-0010**	**Archive Use – Data Processing** For each selected data product, a set of relevant processing options shall be presented. There shall be options to begin other workflows described here (restore, re-calibration, optimized imaging).			D/T
Use Case 4 3.4 para 7	UC04-0011	**Archive Use – Data Processing** The archive shall provide a second class of lightweight product manipulation tasks such as generating a spatial or spectral cutout or providing a moment image, to be applied "on the fly" as part of the export process.			D/T
Use Case 4 3.4 para 8	**UC04-0012**	**Archive Use – Data Processing** Once a job is created on archived data, the archive interface shall provide the user an option to modify the input			D/T

		parameters and review the job prior to submission to the processing queue.			
Use Case 4 3.4 para 8	**UC04-0013**	**Archive Use – Data Processing** The archive interface shall provide status information for the user on each job, links to completed jobs, as well as the weblog for the job.			D/I
Use Case 4 3.4 para 9	**UC04-0014**	**Archive Use** Quality assurance on archive jobs and data products shall be performed by an operations staff member. Additional user review of the products shall be accommodated either through download of the data products or a temporary staging to the NRAO cluster.			D/T
Use Case 4 3.4 para 9	**UC04-0015**	**Archive Use – Data Processing** Once accepted, reprocessed data products meeting the requirements for archiving shall be ingested to the archive. Ingestion of products shall be subject to the same practical size and resource limits as standard products described in 3.2. To ensure the integrity of the product a checksum or other mechanism shall be used to ensure that the archived product matches the one produced by the processing both on ingest and on export			D/T
Use Case 4 3.4 para 10	UC04-0016	**Archive Use – Data Processing** Results of data processing on archive jobs shall be temporarily cached, such as caching the results of a custom re-calibration prior to imaging the data.			D/I
Use Case 4 3.4	UC04-0017	**Archive Use – Data Processing**			D/T

para 10		To prevent resource exhaustion, results from reprocessing archive data must be temporary and the automated system shall have the ability to automatically enforce the data retention policy. Warnings shall be issued to the user two weeks prior to data removal with a reminder five days prior to the removal.			
Use Case 4 3.4 para 11	UC04-0018	**Archive Use – Data Delivery** Data products either generated by the data processing or otherwise selected through the interface shall be bound together for delivery. Similar to the shopping cart on most web pages, SRDP shall have the ability for one or more products can be added to the delivery "basket."			D/I
Use Case 4 3.4 para 12	**UC04-0019**	**Archive Use – Data Delivery** Several options shall be made available for delivery of archive data products: 1.A password protected URL that can be directly accessed A download manager capable of starting, pausing, and resuming download 2.Delivery via media shipping 3. Automated staging of data to the users work area either in Socorro or Charlottesville.			D/T
Use Case 4 3.4 para 13	UC04-0020	**Archive Use – Data Delivery** Additional modes of data product delivery such as insertion into Amazon S3, or through the XSEDE frameworks shall be considered as experience and user demand dictate.			D/T

Use Case 4 3.4 para 13	**UC04-0021**	**Archive Use – Data Delivery** The data product delivery process shall provide mechanisms to ensure that data corruption through the delivery process is detected.			D/T
Use Case 5 3.5 para 1	**UC05-0001**	**Restoration** The restoration process shall use the appropriate version of the pipeline (as defined by configuration control), retrieve raw data from the archive, restore the flagging state, and apply calibration tables based on the instruction stored with the calibration results.	The restoration use case automatically returns raw data to a previously calibrated state. The archive user selects one or more data sets and an archived calibration result for data set from the archive interface.		D/I
Use Case 5 3.5 para 2	UC05-0002	**Restoration** The restoration process shall support an option for the stand-alone case to only apply the flags and not apply the calibration.	The restoration use case has application both as a stand-alone process, and as the initial step of subsequent processing use cases.		D/I
Use Case 5 3.5 para 2	**UC05-0003**	**Restoration** In most cases, the stand-alone restore process shall be able to proceed without staff intervention (no quality assurance step is necessary), so no helpdesk ticket will be generated.			D/I
Use Case 5 3.5 para 2	**UC05-0004**	**Restoration** If an error occurs during the restoration case processing, a helpdesk ticket with the relevant information shall be generated for staff troubleshooting and follow-up.			D/T
Use Case 5 3.5 para 2	**UC05-0005**	**Restoration** Calibrated data from the restoration process shall be delivered to the user through the standard data delivery use case.			D/I

Use Case 5 3.5 para 3	UC05-0006	**Restoration** When the restoration process is used as the initial step of other processing use cases, helpdesk tickets shall be generated based on the parent use case and used for reporting of any erroneous conditions that occur during the restore process.			D/T
Use Case 6 3.6 para 3	UC06-0001	**Recalibration** The workflow for recalibration shall always starts with a user initiated request.	The objectives for recalibration are not independent, and reasonable combinations of the use cases shall be supported.		D/T
Use Case 6 3.6 para 4	UC06-0002	**Recalibration** A mechanism for the triggering of a recalibration based on search results shall be provided. For each request, the user shall specify: 1 Sufficient identifying information for the data to be located in the archive. 2. The pipeline version (including CASA versions if applicable) to be used. 3.The desired calibrated products (i.e. calibration tables, calibrated measurement set, flagging information) 4.Optional: Additional flagging specification 5.Optional: Calibration strategy modifications 6.Optional: Parameter modifications for the pipeline	The user requests recalibration of one or more data sets either through the archive interface tool or through the helpdesk.		D/T
Use Case 6 3.6 para 5	UC06-0003	**Recalibration** When none of the optional parameters for recalibration are specified, a check			D/T

		shall be performed to determine if a valid calibration is already available in the archive. If so, jump to the restore use case instead.			
Use Case 6 3.6 para 6	UC06-0004	**Recalibration** Once a recalibration request has been submitted, a NRAO helpdesk ticket shall be automatically created to provide tracking and communication between the SRDP operations staff and the user. This ticket shall be automatically populated with relevant the request information.			D/T
Use Case 6 3.6 para 6	UC06-0005	**Recalibration** The recalibration request shall be automatically validated, including a check that the data is available, request is well formed, and user has permission to access the data.			D/T
Use Case 6 3.6 para 6	UC06-0006	**Recalibration** If for any reason the recalibration request is deemed invalid, the reason shall be specified on the associated helpdesk ticket, helpdesk ticket marked for manual follow-up, and the process should wait for manual resolution by operations staff.			D/I
Use Case 6 3.6 para 6	UC06-0007	**Recalibration** If the recalibration job is large (either in number of data sets to be processed, or implied processing time), the request shall be flagged for manual review by the SRDP operations staff.			D/I
Use Case 6 3.6 para 7	UC06-0008	**Recalibration** When manual intervention for recalibration is required, the process shall be executed by the operations			D/I

		staff. The staff member shall work with the user to identify and resolve the issue and then resubmits the job for the user. At this point the process will re-enter the standard workflow.			
Use Case 6 3.6 para 8	UC06-0009	**Recalibration** Recalibration requests shall be scheduled for processing and status on the tracking ticket updated to reflect that the job is in the processing queue.			D/T
Use Case 6 3.6 para 8	UC06-0010	**Recalibration** Once the recalibration processing workflow completes, the request shall be routed to operations staff for quality assurance. If no errors occurred during processing and no problems are detected in QA, the products shall be made available to the user through the delivery use case.			D/T
Use Case 6 3.6 para 8	UC06-0011	**Recalibration** The workflow for recalibration shall provide a feedback mechanism through the helpdesk ticket for users to provide additional feedback, request additional changes, or accept the delivered results. The helpdesk ticket shall not be closed until the products are accepted by the user, or it is determined that satisfactory calibrations are not possible with the data set. At this point, if the products are accepted by the user, then they shall be stored in the archive.			D/T
Use Case 6 3.6 para 9	UC06-0012	**Recalibration** Results from recalibration shall only be placed in the archive and made available to other users if only default			D/I

		parameters were specified, or if additional flags were specified to correct an issue not found during initial quality assurance.			
Use Case 6 3.6 para 9	UC06-0013	**Recalibration** The calibration product from the recalibration process shall be made available to the user that created it as the basis for a subsequent imaging or other processing step, although again the subsequent products shall not be ingested into the archive.			D/I
Use Case 6 3.6 para 9	UC06-0014	**Recalibration** The interface shall provide a mechanism for the user to easily reproduce the same calibration result at a later date.			D/T
Use Case 6 3.6 para 10	UC06-0015	**Recalibration** If errors occur during the recalibration process, or problems are detected by operations staff as part of the QA process, operations staff shall assess the issue and in consultation with the user where appropriate either cancel the request, or resubmit it after resolving the issue			D/T
Use Case 6 3.6 para 11	UC06-0016	**Recalibration – Batch Recalibration** As with Standard Calibration, batch recalibration is an observatory function. Since no external user-trigger is involved, a helpdesk ticket is shall not be created.	A special case of the recalibration use case is when a problem was identified with archive data.		
Use Case 6 3.6 para 11	UC06-0017	**Recalibration – Batch Recalibration** Staff members shall be able to identify datasets affected by pipeline errors for			D/I

		batch recalibration with an updated pipeline when a problem is identified.			
Use Case 6 3.6 para 11	UC06-0018	**Recalibration – Batch Recalibration** The batch recalibration process shall be managed through the workflow system, tracking all affected observations and managed submission of jobs to prevent overwhelming processing resources.			D/I
Use Case 6 3.6 para 11	UC06-0019	**Recalibration – Batch Recalibration** Erroneous archival calibrations shall be identified as no longer valid to prevent use of erroneous calibration .			D/I
Use Case 7 3.7 para 1/2	UC07-0001	**Combined Imaging** Combined Imaging shall combine data from different array configurations (VLA, ALMA), also including Total Power (possibly) for the final ALMA images.	The SRDP project shall simplify this process for the user community. Multi-configuration imaging allows the astronomer to capture a wider-range of spatial scales in their image than possible from just a single array configuration. The case of adding total power data from other telescopes, or combining ALMA and VLA images shall be excluded from the scope of the SRDP project. Two cases are considered, the primary difference is if the observations were taken with the intention of combination or if an archival researcher is trying to use data taken for different		D/I

			purposes to derive a multi-resolution image.		
Use Case 7 3.7 para 3	UC07-0002	**Combined Imaging – Case 1** When a telescope user proposes Combined Imaging for a project that includes multiple configurations (VLA and ALMA) as well as possibly total power (ALMA). The proposal tool shall automatically group the observations together and ensure that the spatial and spectral coordinates of the observation are consistent between the different epochs of observation. Total integration times for each configuration shall be set according to observatory determined ratios.			D/T
Use Case 7 3.7 para 4	UC07-0003	**Combined Imaging – Case 1** As each configuration is completed the data for the Combined Imaging process shall be calibrated and imaged independently using the resolution and pixel size most appropriate for the configuration, but with phase-center, field of view, and spectral axis of the common objective.			D/I
Use Case 7 3.7 para 4	UC07-0004	**Combined Imaging – Case 1** This Combined Imaging process shall follow the standard and optimized imaging use cases discussed above.			D/I
Use Case 7 3.7 para 5	UC07-0005	**Combined Imaging – Case 1** When the single epoch calibration and imaging for all configurations are			D/I

		complete, the data from all configurations shall be imaged jointly to create the combined Image, using the same spatial and spectral axes as for the individual configurations.			
Use Case 7 3.7 para 5	UC07-0006	**Combined Imaging – Case 1** The Combined Imaging process shall allow the PI to specify an additional recalibration step to normalize flux scales, correct weighting issues, or otherwise normalize the data. The PI shall be able to specify the same imaging parameters as in the standard and optimized imaging cases specified above.			D/I
Use Case 7 3.7 para 6	UC07-0007	**Combined Imaging – Case 1** For standard products, the Combined Imaging process shall incorporate current best practices for combining ALMA interferometric and total power data shall be used (currently feather), while multiple options may be presented for optimized imaging cases..	If necessary, ALMA total power may be included at the end as a separate processing step.		D/I
Use Case 7 3.7 para 6	UC07-0008	**Combined Imaging – Case 1** Diagnostic plots for the combined imaging shall be produced and included in the weblog			D/I
Use Case 7 3.7 para 7	UC07-0009	**Combined Imaging – Case 2** The Combined Imaging process shall be able to input calibrated data sets both from the user's cache space and from data currently in the archive.	An archive user identifies multiple observations in the archive from separate projects that have similar enough spatial and spectral parameters that means that they could be combined with minor regridding.		D/I

			These observations could be from separate projects that could either be follow-up projects from the same research group or from another research group that is trying to minimize observing time by making use for archival data for part of their project. It is assumed that calibrations for all of the observations exist or can be generated through a re-calibration process.		
Use Case 7 3.7 para 9	UC07-0010	**Combined Imaging – Case 2** The Combined Imaging process shall image calibrated data sets together using the imaging parameters specified by user. Unlike Combined Imaging Use Case 1, the spatial and spectral co-ordinates of the product cannot be deduced from the parent project and shall be explicitly set by the user.			D/I
Use Case 7 3.7 para 9	UC07-0011	**Combined Imaging – Case 2** Parameters selected for Combined Imaging shall be suitable for all data sets, and should be validated both for applicability and to ensure that the implied requested re-gridding is within tolerance. For example, the channel width shall not be smaller than that of the coarsest spectral resolution data.			D/I
Use Case 7 3.7	UC07-0012	**Combined Imaging**			D/I

para 10		In both Combined Imaging use cases the resulting image shall be ingested into the archive provided that the calibration used on the input data sets is available from the archive.			
Use Case 8 3.8 para 1-4	UC08-0001	**Time Critical Observations** The proposal submission tool shall flag Time Critical use cases, as indicated by the telescope using during proposal submission. The Time Critical flag shall persist throughout the lifecycle of the project and be made available to the data processing subsystems. The proposal submission tool shall allow the telescope user to specify which data products should be treated as time critical: calibrated visibilities, quick-look images, or science-ready images. As with the standard calibration and imaging use cases, for SRDP products to be generated the user shall conform to standard observing templates, and specify the characteristics of the desired imaging products.	For these cases, speed may often be more important than the quality of the products. This emphasis on early access to results modifies the workflow from the standard calibration and imaging cases discussed above. This use case focuses two somewhat separate, but related, observation types: - triggered observations that were submitted at regular call for proposal, and - target of opportunity observations submitted through a director's discretionary time request		D/T
Use Case 8 3.8 para 4	UC08-0002	**Time Critical Observations** The Time Critical process shall permit application of a lightly cleaning process optimized for speed rather than maximum quality, to create Quick-look images.			D/I
Use Case 8 3.8 para 5	UC08-0003	**Time Critical Observations** Processing Time Critical proposals shall begin as soon as data is available. The standard calibration and imaging use cases shall be invoked for Time	Because of the additional scheduling constraints of these projects, they may execute at sub-optimum times.		D/T

		Critical projects as well. In the Time Critical case, both the clearly identified rapid reduction, and the later improved reduction shall be archived.	The SRDP system shall not wait until auxiliary information such as calibrator fluxes or antenna positions has been updated prior to beginning reduction. Time Critical cases may require pre-empting the SRDP processing queue or making additional resources available specifically for this purpose.		
Use Case 8 3.8 para 6	UC08-0004	**Time Critical Observations** The workflow manager shall notify the PI immediately when calibration or imaging products are available, with specific notice that the products have not been quality assured.			D/T
Use Case 8 3.8 para 6	UC08-0005	**Time Critical Observations** In cases of reduction failure, a high priority notification to operations shall be made so that appropriate manual mitigation can be done. Note that this may occur outside of normal business hours.			D/T
Use Case 8 3.8 para 7	UC08-0006	**Time Critical Observations** As for the data delivery use case, The interface shall allow data assessment through the weblog, and remote viewing or transfer of image subsets.	Because of the rapid pace of Time Critical projects, transfer of visibilities or full data cubes may be untenable.		D/T

| Use Case 9 3.9 para 1-3 | UC09-0001 | **Large Projects** The Large Projects process shall submit a data management plan and data release policy for data products generated during execution of the project in the observing proposal. Description of the data products and approximate size shall be included in all future proposals. Large projects shall be encouraged to work with the SRDP project to maximize the scientific return to the community. The solicitation for large proposals and supporting documentation shall be updated to provide supporting information. | Large projects are defined as a class of observing programs that require significant time on the telescope (>200 hours for the VLA and >50 hours for ALMA). SRDP is an opportunity to increase the return from these projects to the community, while assisting these expert teams in achieving the objectives of their project. Large projects can have a wide variety of observatory involvement from mostly independent projects, which take the raw data from the archive to process elsewhere vs. VLASS where all of the primary processing is done by the observatory. | | D/I |
| Use Case 9 3.9 para 4 | UC09-0002 | **Large Projects – Data Acquisition and Workflow** The SRDP Operations group shall evaluate each approved Large Project to capture and support specialized structures needed within the archive to make provenance of the eventual products more traceable. | Very large projects may require additional, specialized structures within the observing project, such as an epoch's worth of observations, or regions of sky. Support for specialized structures may include a specialized project specific "user space" in the archive interface if requested by the project. | | D/I |

Use Case 9 3.9 para 4	UC09-0003	**Large Projects – Data Acquisition and Workflow** Any Specialized Structures created to support Large Projects shall incorporate additional layers or views on the existing project structures to ensure that data remains discoverable through the non-specialized archive interfaces as well.			D/I

| Use Case 9 3.9 para 5-6 | UC09-0004 | **Large Projects – Data Processing and Quality Assurance** Large Project processing shall allow use of use the standard calibration pipeline for the calibration of the data, where the standard calibration workflow (Section 3.1) shall be followed. Large Project processing shall allow use of custom or modified pipelines to process the data and the project team shall be directly involved in the quality assurance process. | Many projects will require custom imaging or other post-calibration processing, the products produced may contain meta-data only meaningful in the context of the project, or even products that are not usually produced by the standard SRDP workflows. The project team shall be involved in the QA process and ultimately is responsible for the scientific integrity of the products. | | D/I |

Use Case 9 3.9 para 7	UC09-0005	**Large Projects – Data Processing and Quality Assurance** The SRDP system shall allow use of NRAO computing resources for the processing of the large project data provided that required computing resources does not exceed the available resources (including prior commitments).	Request of NRAO computing resources as part of a large proposal, or allowing a proposal that only includes processing support and no related observing (for instance for a large scale re-processing of archive data), shall be considered as part of the SRDP project, once reliable estimates of computing load from other use cases have been developed.		D
Use Case 9 3.9 para 8	UC09-0006	**Large Projects – Data Release** SRDP shall host reasonable volumes of data products for large projects. The large project shall deliver a set of data products with at least meta-data conforming to a standard set defined by the SRDP project.	An important obligation of large projects is release of the data products back to the astronomical community.		D
Use Case 9 3.9 para 8	UC09-0007	**Large Projects – Data Release** Meta-data specific to the large project, as agreed with the user (but in addition to the standard set defined for SRDP) shall also be stored in the archive.			D
Use Case 9 3.9 para 8	UC09-0008	**Large Projects – Data Release** Large project data in the archive shall be marked as having received QA from the project team.			
Use Case 9 3.9 para 8	UC09-0009	**Large Projects – Data Release** The archive interface shall provide a dedicated search interface that allows searching on the project meta-data as well as on the standard meta-data. This service may also be used by the project to describe the data, link to relevant publications, or otherwise provide branding and context for the results.			D

Use Case 9 3.9 para 9	UC09-0010	**Large Projects – Data Release** Data sets produced by a large project may include standard types of products such as images and catalogs, and may also include other products. Archive support for non-standard data products shall be decided on a case by case basis.	Decisions about which types of products will be archived are made by NRAO in consultation with the project team.		D
Use Case 9 3.9 para 10	UC09-0011	**Large Projects – Commensal Projects** (Future) Commensal projects shall identify the products and the release process as part of the negotiations with NRAO as the project is initiated.	Commensal projects are not subject to the usual proposal process, and thus are slightly different from Large Projects. Facilitating commensal projects in releasing products to the community is within the scope of the SRDP project.		D
Use Case 9 3.9 para 10	UC09-0012	**Large Projects – Commensal Projects** For existing projects the SRDP project will work with the project to identify and ingest appropriate products.			D
Use Case 10 3.10 para 1	**UC010-0001**	**Curation and Reproducibility** The SRDP shall be structured to provide the means that the observatory has the full history of the processing done in producing a particular product and the means to reproduce the result if necessary.	The reproducibility of results and open data standards are a major topic of discussion in scientific research today. The production of science-ready data products is an opportunity to assist the radio astronomy community in conforming to developing standards in data provenance and process accountability.		D
Use Case 10 3.10 para 2-3	UC010-0002	**Curation and Reproducibility** Processing performed by CASA and the pipeline shall be described in a	First of two deliverables are required from the SRDP project to enable users to be able to reference this information in		D

		publically accessible, and preferably referenceable location.	reporting their findings based on observatory delivered science products.		
Use Case 10 3.10 para 2-3	UC010-0003	**Curation and Reproducibility** Individual data products, and the processing history, shall have permanent data locators to allow citation in publications.	Second of two deliverables are required from the SRDP project to enable users to be able to reference this information in reporting their findings based on observatory delivered science products.		D
Use Case 10 3.10 para 3	UC010-0004	**Curation and Reproducibility** Standards for the use of Digital Object Identifiers (DOIs) as persistent identifiers for astronomical data sets are still being developed in the community, and the SRDP project shall conform to best practices as they emerge.	The intention is that a unique DOI be produced upon request which provides a persistent identifier for the data product(s), and the provenance of that product be directly accessible as well.		D
Use Case 11 3.10 para 1	UC011-0001	**Commissioning and Validation** Throughout the SRDP project, the heuristics and operations teams shall be able to test, commission, and validate portions or the entire system prior to release for general use.	The integrated nature of the system being developed can, if not carefully considered, preclude effective testing, or force the testing onto the production system.		D
Use Case 11 3.10 para 2	UC011-0002	**Commissioning and Validation** The primary method of assuring the testability shall be the development of a written test plan as part of the development of each L1 functional requirement. However, there are several systemic capabilities that are required in support of commissioning.			D
Use Case 11 3.10 para 2.1	UC011-0003	**Commissioning and Validation** SRDP workflows shall be executable with candidate versions of the	To assist in the testing of the system it would be beneficial if at any point where the user can		D

		software. The products generated by this software shall not be exposed as SRDP products in the standard data discovery interfaces. Note: If a duplicate or test system is used to fulfill some or all of these requirements (UC011-0003-0007) the test system shall be identical in order to avoid unanticipated deployment issues.	specify calibration or imaging parameters, they shall also be able to request the scripts for download rather than actual processing. These scripts can then be used to perform testing in non-production environments.		
Use Case 11 3.10 para 4	UC011-0004	**Commissioning and Validation** Some additional meta-data such as the paths to data and working area shall be captured to allow complete scripts to be produced and not require manual editing by the user before execution.			
Use Case 11 3.10 para 2.2	UC011-0005	**Commissioning and Validation** SRDP workflows shall be executable in fragments to optimize testing.	For instance, avoiding the extraction of data from the archive and calibration each time that an imaging workflow is tested.		D
Use Case 11 3.10 para 2.3	UC011-0006	**Commissioning and Validation** It shall be possible to modify the system without losing the current execution state, or in such a way that the state information can be recaptured.	Due to long running jobs, it will not be possible to bring the system to a fully quiescent state prior to up version changes, or updates.		D
Use Case 11 3.10 para 2.4	UC011-0007	**Commissioning and Validation** The execution environment shall need to be modified to accommodate testing.	for example, using a non-standard destination directory to accumulate outputs from a regression testing run.	<mark>Probably needs clarification beyond only one example</mark>	D
Use Case 11 3.10	UC011-008	**Commissioning and Validation** SRDP processes shall allow for users to download test scripts.	In addition to the testing aspects for internal users, this mode may provide functionality for		D

para 5			users wanting to utilize the SRDP capability but not at NRAO facilities. Because the products produced this way will not go through NRAO standard QA, they will not be ingested to the NRAO archive.		