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DCN 1

United States Climate Reference Network (USCRN)

Configuration Management Plan and Procedures

December 2003

Prepared by:

U.S. Department of Commerce
National Oceanic and Atmospheric Administration (NOAA)
National Environmental Satellite, Data, and Information Service (NESDIS)

United States Climate Reference Network (USCRN)

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NOTE:

*EXAMPLES: *"Insert change pages 6.2-6 through 6.2-9 following page 6.2-5"*
"Replace pages 3.4-1 through 3.4-10 with change pages 3.4-1 through 3.4-10b"
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Preface

This document comprises the National Oceanic and Atmospheric Administration (NOAA)/ National Environmental Satellite, Data, and Information Service (NESDIS) initial baseline publication of the *United States Climate Reference Network (USCRN) Configuration Management Plan and Procedures* (version DCN 1, December 5, 2003 publication). The document number is NOAA-CRN/OSD-2002-0005R1UD0.

This document presents the Configuration Management Plan and Procedures for the United States Climate Reference Network (USCRN). The USCRN configuration management process will be utilized for the development, implementation, and continuous operation of the USCRN to provide management oversight of the multiplicity, quality, interoperability, accuracy, and service of the components of this unique system.

The publication of this baseline document closes the following Document Configuration Change Request:

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NOAA/NESDIS acknowledges the efforts of the NOAA/NESDIS National Climatic Data Center (NCDC) and Short and Associates, Inc., for their preparation of the material in this document.

Future updates and revisions to this document will be produced and controlled by NOAA/NESDIS.

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Acronyms and Abbreviations

ADD	Archive Dataset Documentation
ATDD	Atmospheric Turbulence and Diffusion Division
ATS	Anomaly Tracking System
CCB	Configuration Control Board
CCR	Configuration Change Request
CI	Configuration Item
CM	Configuration Management
CMO	Configuration Management Office
COTS	Commercial-Off-The-Shelf
CSAR	Configuration Status Accounting Report
CSSA	Cooperative Station Service Accountability
DCN	Document Change Notice
DCO	Document Control Office
DOC	Department of Commerce
DOORS	Dynamic Object Oriented Requirements System
DT&E	Demonstration, Test, and Evaluation
ECN	Engineering Change Notice
EIA STD	Electronic Industries Alliance Standard
FCA	Functional Configuration Audit
FRD	Functional Requirement Document
FY	Fiscal Year
GCOS	Global Climate Observing System
HTML	Hypertext Mark-up Language
ICD	Interface Control Document
IR	Incident Report
ISO	International Organization for Standardization
MI^3	Metadata Integration and Improvement Initiative
NCDC	National Climatic Data Center
NESDIS	National Environmental Satellite, Data, and Information Service
NIST	National Institute of Science and Technology
NMT	Network Monitoring Team
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service

OSD	Office of Systems Development
PCA	Physical Configuration Audit
PMC	Program Management Committee
RCC	Regional Climate Center
SAP	Science Advisory Panel
SHIPS	Station History Information Processing System
SSC	Site Selection Committee
WSSRD	Web Search Store Retrieve Display
USCRN	United States Climate Reference Network
VDR	Version Description Record

Section 1. Introduction

The United States Climate Reference Network (USCRN) is a network of climate observing stations being developed as part of a National Oceanic and Atmospheric Administration (NOAA) research initiative. The purpose of USCRN is to provide and maintain future long-term (50-100 year) high-quality observations of temperature and precipitation to meet the stringent data quality and continuity requirements of the climate science community.

The USCRN will also provide the nation with a ground-based reference network that meets the requirements of the Global Climate Observing System (GCOS). During the initial phases of the program (FY 01- 03), a number of instrumentation suites are being deployed to test and evaluate the initial configuration of the system in locations across the U.S. in order to expose the instrumentation to various climate regimes. When fully implemented, a much larger network of these high-quality climate-observing systems will be strategically located nationwide to capture the representative climate regions of the U.S. The initial system is also designed to accommodate a possible expanded array of sensors such as soil moisture, soil temperature, atmospheric pressure, and wind speed/direction at the standard 10-meter height.

The USCRN will provide the following unique features.

- Data and accuracy extending over 50-100 years
- Management planning based on longevity, continuity, high quality, and service of instruments
- Accuracy tied to irrefutable standards [periodic calibration checks conforming to National Institute of Science and Technology (NIST) standards]
- High standards of measurement which are defined, documented, and maintained
- Overlapping instrument upgrades in accordance with technological advances
- Rigorous maintenance and periodic instrument recalibration/replacement
- Extensive documentation of the site environment, including digital pictures and satellite images

1.1 Purpose

Configuration Management (CM) is formally established for the USCRN as a value-added process and is identified within the business practices of the Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), the National Environmental Satellite, Data, and Information Service (NESDIS), and the National Climatic Data Center (NCDC).

CM is the process of formally managing assets, facilities, and processes by managing their requirements, including changes, and assuring conformance in each case. The purpose of CM is to provide for the integrity of the system while accommodating change; maintaining clear,

concise, and valid requirements; assuring strict conformance to approved change implementation; and communicating change promptly and accurately in the metadata archive(s). The major objectives of CM are to provide full visibility of configuration status, to ensure consistent and accurate documentation, to accommodate change, and to lower life cycle costs by reducing error.

The CM function as applied to the USCRN encompasses the classical "disciplined approach to applying technical and administrative direction and surveillance over the lifecycle of configuration items." CM of configuration items (CIs) for the USCRN will be applied using the principles of EIA Standard 649 and ISO 10007 as references, in concert with program approved documentation and the inherent discipline in applied CM software tools. The application of CM will strengthen the "management of network change" and "documentation of metadata changes and improvements" as referenced in the *"Ten Climate Monitoring Principles"* proposed by Karl et al., 1995, *"Critical Issues for Climate Monitoring."*

1.2 Scope

The CM process will be utilized for the development, implementation, and continuous operation of the USCRN to provide management oversight of the multiplicity, quality, interoperability, accuracy, and service of the components of this unique system. The system includes the following.

- Precisely calibrated instruments
- Associated and common hardware
- Software (mainly algorithms to derive Level 0 or Level 1 products)
- Communication interfaces
- Data products and associated metadata
- Facilities (local site and operations/maintenance)
- Documentation to ensure the mission requirements of the USCRN project are met and maintained

1.3 Life Cycle Support

A system's life cycle evolves from the abstract and conceptual through the detailed and technical to the concrete and specific, until the need for the system no longer exists, or the system is replaced by another solution to the requirement. CM, logistics, and operations plans exist and are updated to reflect the tailored policies and procedures necessary to continuously manage, support, and operate the USCRN. When approved by authorizing signatures this CM plan will be under document change control. The plan will be updated and reissued as changes occur in program objectives or scope.

Section 2. Authorities and Responsibilities

CM for the USCRN program involves the community described below.

USCRN Program Manager – Has ultimate responsibility for the project, including approval authority for establishing any changes to USCRN program's CM policy; provides policy level direction and the system functional and network requirements for the USCRN, which includes defining the approach, work, resources required, methods, configuration management and quality assurance procedures, schedules, and the project organization.

USCRN Acquisition Manager – Manages, coordinates, directs the overall implementation activities, and control resources; also serves as the USCRN Configuration Control Board (CCB) Chairperson and is the approval authority for the establishment of any changes to USCRN CM procedures.

USCRN Program Management Committee – Provides policy and program direction; assigns action to, and receives recommendations from the test-phase and ad-hoc working groups, and resolves issues raised from the USCRN CCB.

USCRN Configuration Control Board (CCB) – Reviews and approves changes; ranks science priority; serves as the nucleus for operation and maintenance issue resolution; and provides direction for problem Incident Reports (IRs) unresolved by the Identification and Resolution Group (IRG).

USCRN CCB Chair – Chairs the USCRN CCB; also serves as the USCRN Acquisition Manager.

USCRN Configuration Manager – Responsible for the routine management of the CM process; coordinates and tracks the review, decision, and implementation of USCRN changes; serves as the secretary for the USCRN PMC and CCB.

Deployment and Maintenance Manager – Has authority for the installation, documentation, pre-operational use, pre-operational changes, as well as calibration and maintenance of each fielded system; serves as the Maintenance Manager upon deployment completion.

Site Selection Committee (SSC) – Reviews candidate sites and survey information; scores candidates to determine those best qualified; and makes decision recommendations to the USCRN Program Manager.

Incident Resolution Group (IRG) – Identifies IRs for analysis; reviews engineering/science analyses, comments, and recommendations; determines action/resolution of IRs; and prepares and submits Configuration Change Requests (CCRs) to the USCRN CCB.

Network Monitoring Team (NMT) – Monitors health of network, receives and takes action on noted problems and queries from climate community, and initiates IRs or amends IRs as needed.

Section 3. Policy and References

The procedures contained in this document comply with established DOC, NOAA, NESDIS, and NCDC CM policies and practices. Specific reference documents include the following.

1. NOAA/OSD3-1999-0035R0UD0, November 22, 1999, Appendix A, "How to Prepare a NOAA Document Configuration Change Request (Doc CCR) Form and Related CCR Material"
2. NOAA/OSD3-1999-0035R0UD0, November 22, 1999, Appendix B, "NOAA Document Control Office (DCO) Guidelines, Standards, and Procedures"
3. NOAA-CRN/OSD-2002-0001R0UD0, June 27, 2003, Anomaly Tracking System (ATS) Users Guide (Draft)
4. CRN ATS Release 2.0 User Notes, dated April 2003
4. *"Ten Climate Monitoring Principles"* proposed by Karl et al., 1995, "*Critical Issues for Climate Monitoring"*
5. NOAA-CRN/OSD-2003-0004R0UD0, December 10, 2002, CRN Program Site Acquisition Plan
6. Charter for the USCRN PMC
7. Charter for the USCRN CCB
8. "USCRN Metadata Management - Survey to Operations," dated June 2003

Section 4. Configuration and Metadata Management Activities

Configuration management integrates the technical and administrative activities of identifying, documenting, controlling, auditing and reporting the functional and physical characteristics of the USCRN. Success of the USCRN will also depend, in part, on the detailed monitoring, tracking, and reporting of changes to functional and physical characteristics of the system and its associated metadata. Each change to these characteristics and metadata must be fully documented along with the observed and reported data in a comprehensive, timely, and high-quality data record. Periodic audits validate the data and process. The procedures for these activities are defined in Section 6, Procedures for Configuration Management.

Of particular importance to the USCRN CM activities is metadata management. Metadata is information related to the reported USCRN data. Such information is important in order to know how to process, understand, and evaluate the USCRN data. Periodic audits validate these expanded data characteristics and the information processes for their collection, archive, and reporting. The procedures for USCRN metadata and the process required to manage them are detailed in the reference 10 document titled "USCRN Metadata Management - Survey to Operations."

Section 5. Infrastructure

Geographically, there are four major elements of the USCRN. These elements are listed below.

(1) The USCRN Program Management and Central Facility located at NOAA's National Climatic Data Center, Asheville, NC.

(2) The USCRN Site Installation and Maintenance activity at the Atmospheric Turbulence and Diffusion Division (ATDD), Oak Ridge Tennessee.

(3) The USCRN Acquisition, Resources, and Support activity at NOAA's NESDIS Office of Systems Development (OSD), Suitland, MD.

(4) The USCRN systems in the field.

The infrastructure elements involved with the CM process are shown in Figure 1. Infrastructure Elements.

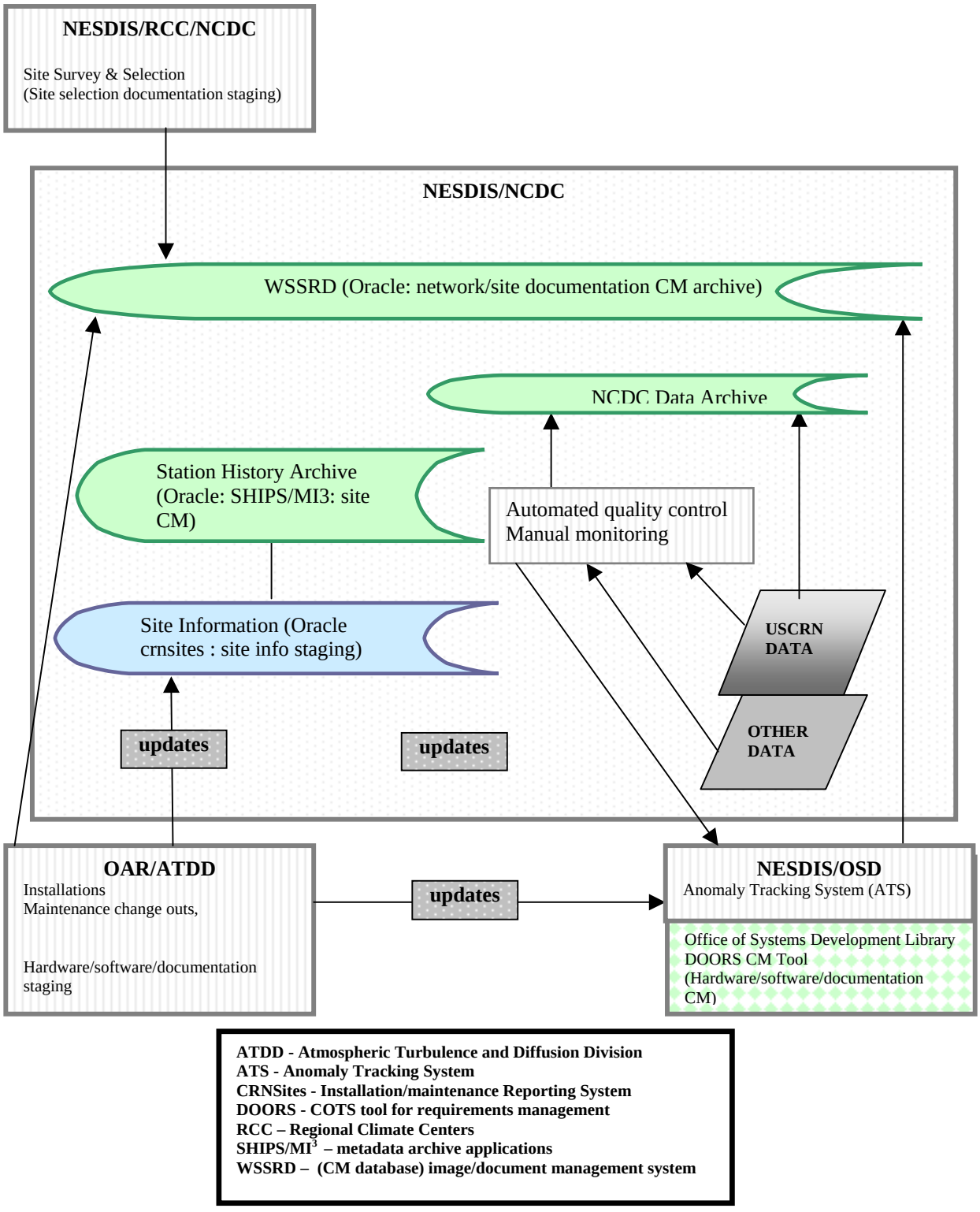

Figure 1. Infrastructure Elements

In general, the CM process begins with the performance of field site surveys by NOAA's Regional Climate Centers (RCCs) and continues through the site selection steps and procedures as detailed in reference 6, "Program Site Acquisition Plan." Once the Site Selection Committee selects a site is selected, the Deployment and Maintenance Manager at ATDD prepares and installs the site under the direction of the Acquisition Manger. After installation and checkout is complete, the installed site system configuration, metadata, and observed data are managed and controlled using tools and resources at Asheville, NC and Suitland, MD.

5.1 Records Storage and Management

The infrastructure includes storage of electronic and non-digital records for engineering and configuration management activities and is managed by the following entities.

1. At NCDC:
   a. An Oracle based system stores USCRN observed data.
   b. The USCRN Network Monitoring Team applies automated and manual quality control checks.
   c. The NCDC Station History Archive database is the primary repository for USCRN metadata.
   d. Web Search Store Retrieve Display (WSSRD) is an imagery storage and access system that includes digital photographs, maps, forms, scanned notes, and other metadata related to USCRN sites. Information is included about the data ingest, data processing, data storage, technical manuals for instruments, software and dataset documentation. Table 1 in the Reference 10 document "USCRN Metadata Management - Survey to Operations" lists the station metadata maintained by NCDC. (MI^3 is a future enhancement for data storage and management at NCDC).
   e. CRNsites is an intermediate storage database table used to provide installation and equipment change information from ATDD to NCDC. (A developing Cooperative Station Service Accountability (CSSA) reporting mechanism may replace this information path in the future).
   f. Archive Dataset Documentation (ADD) is a repository for network related metadata not intrinsic to a particular CRN site. Table 2 in the Reference 10 document "USCRN Metadata Management - Survey to Operations" document describes data stored in ADD.

2. At OSD:

   NESDIS USCRN Anomaly Tracking System (ATS). The ATS system is a Web-based automated tracking system used for entering operational problems, or incident reports (IRs). The ATS is also used to track the process of resolving IRs.

3. At ATDD:

   There are many documents related to the USCRN system, its design, implementation, and calibrations. Such documentation will be stored and managed by ATDD with copies of all versions archived at NCDC. Included will be all engineering documents, drawings, parts lists, vendor manuals, calibration information and procedures, wiring diagrams, system requirements and specifications, site specific drawings and other documents, Engineering Change Notices (ECN), etc. Documentation is defined for USCRN CM as any form of configuration information or process definition, regardless of its media form.

5.2 Security

The security, integrity, and access of all data and metadata is paramount. Each of the integrated system tools has appropriate safeguards and backup contingency plans. These safeguards include username identification and password, and periodic offsite data backup.

5.3 Data Access

On-line access to observed data site and network metadata collected at NCDC are provided for both restricted and un-restricted (password) users through NCDC's Web Page.

Section 6. Configuration Management Procedures

Configuration management identifies, controls, and provides the status of defined end-items (hardware, software, firmware) that comprise the system. These end-items result in a system baseline produced by the engineering design and implementation processes that start with the formal functional requirements. The following paragraphs describe the procedures required to identify the system baseline configuration and manage changes to that baseline.

6.1 Configuration Identification

Configuration management begins with configuration identification. A physical item hierarchy is developed that defines the relationship between each part and each part to its higher assembly. Normally, the hierarchy for the system's end-item products is defined as early as possible in their development. The engineering design review process maps traceability of these end-items to formal functional requirements and user needs.

Configuration identification results in a product structure that includes the selection and identification of the configuration structure for all the Configuration Items (CIs) in the USCRN infrastructure. This process also allocates identifiers and version numbers for CIs, labeling each CI and entering it into the CM database (WSSRD). For the USCRN, the product structure is defined in the physical hierarchy of CIs listed in Appendix E, USCRN Product Structure. The documentation of these Configuration Items (CIs), including the allocation of identifiers and version numbers for CIs, will be entered into the CM database. The CIs are defined through documentation.

6.1.1 Requirements

Typically, user needs are first developed into functional requirements and then allocated in detailed hardware and software system design specifications. Requirements should always be clear, concise, and valid. A requirement is not a valid requirement unless it is documented and approved. For the USCRN, the approved functional requirements are defined in the Functional Requirements Document (FRD), which is under document control by the OSD DCO.

USCRN system requirements are contained in the documentation of the CIs.

Changes to USCRN requirements require the submission and approval of a formal Configuration Change Request (CCR). The procedure for submitting a CCR is detailed in Section 6.2.1.

6.1.2 Functional Baseline

By definition, the configuration of a system at a specific point in time is designated a baseline. The physical parts and associated documentation define the configuration of that baseline.

A Functional Baseline is comprised of the approved documentation for a particular baseline configuration. A functional baseline describes the functional characteristics of a system and the methods used to verify that the system meets all specified functional requirements. For CRN, the functional baseline includes the FRD, system hardware specifications and software documentation, documented results of demonstration phase testing of fielded systems, evaluations of observed data and metadata, and other documentation such as Science Review Panel reports.

Typically, the Functional Baseline is established by a formal process called a Functional Configuration Audit (FCA). The FCA normally follows the successful completion of system acceptance testing to validate that all developed CIs and COTS CIs enable the system to meet all FRD requirements.

In the USCRN program, the FCA process is as follows: Based on an approved set of functional requirements (FRD), existing documentation on topics such as engineering tests, demonstration phase results, other test results, research results, calibration procedures, results of environmental testing of sensors at field locations, and any other appropriate information will be used to validate which FRD requirements have been demonstrated by the USCRN system. For FRD requirements USCRN does not meet, deviations and waivers will be submitted as CCRs and processed accordingly.

The USCRN Configuration Manager is responsible for leading and reporting on the activities of the FCA.

6.1.3 Product Baseline

The Product Baseline comprises approved formal documentation that describes all the necessary functional and physical characteristics of each CI, any required interoperability characteristics, and the selected functional and physical characteristics designated for system acceptance testing.

Typically a Product Baseline is established by conducting a Physical Configuration Audit (PCA), which usually occurs after formal acceptance testing and completion of the FCA. The PCA validates the totality of documentation defining each CI. This ensures that CIs can be readily duplicated or commercially obtained and that each meets the requirements as defined in the specifications.

For hardware, the Product Baseline typically consists of all the necessary engineering drawings, related lists, vendor documents, procurement specifications, etc., that would be used by a third-party to physically reproduce a USCRN system. For software, the baseline would include all pertinent software code, tools, procedures, and any associated documentation, including test results, required to reproduce and maintain all USCRN software.

For USCRN, the Product Baseline is the currently installed configuration and is subject to CM change control procedures as of the completion of the Demonstration Phase Evaluation.

The USCRN Configuration Manager is responsible for leading and reporting on the activities of the PCA.

6.2 Configuration Control

In order to manage changes to the configuration of the USCRN system, its CIs and related documentation and procedures, CM ensures that only authorized and identifiable CIs are accepted, recorded, and approved for the CM database. Configuration control becomes active once a baseline is established by the audit processes and data is entered into the CM database. Configuration control encompasses the submission of a CCR, the evaluation process, and ultimate approval or disapproval of the CCR. The evaluation process will consider the merit of a change to the baseline, including effects on system costs, schedules, performance, maintenance and logistics, and interface with other systems.

The authority for the review and decision of changes to the USCRN resides with the USCRN Configuration Control Board (CCB). The roles and responsibilities for the USCRN CCB can be found in Appendix D, Charter for the USCRN CCB.

6.2.1 Procedures for Submitting CCRs

Changes to systems can include improvements to mission needs, technical requirements, correction of deficiencies, improvements to data and products, and cost reductions. Formal change control consists of a series of steps that provide the optimum system evolution. The steps include a systematic proposal, justification, evaluation, decision, scheduling, coordination, implementation, and follow-up audit of approved change. The process is initiated by the submission of a Change Control Request (CCR).

Figure 2. CCR Process Diagram depicts the submission, review, decision, and implementation process for USCRN CCRs.

A typical change request is processed in the following steps.

(1) CCRs may only be submitted on CCR Form 222 (Appendix A).
(2) Configuration Change Request (CCR) Form 222 is prepared and electronically submitted through organizational authority to the OSD Configuration Management Office (CMO).
(3) The CMO previews for completion, and if complete, enters data into the CCR database, or requests additional information or corrections from the submitter.
(4) CMO reviews, prepares pre-analysis, determines related system impact with the Configuration Manager, coordinates with appropriate technical personnel and assigns review actions to appropriate focal points, prepares formal review package.
(5) Review package is electronically sent to designated NESDIS, NCDC, and ATDD CM focal points with due-date.
(6) Comments, additional information (costs, etc.), recommendations received, and issues are resolved.

(7) If no unresolved issues and recommendation is to approve, package is prepared for CCB Chair signature. **(Proceed to step 12)**
(8) If unresolved issues exist, an issue(s) package is prepared and electronically sent to CCB members in advance of next regular or special CCB meeting to determine disposition.
(9) CCB members review issue(s) and prepare for a CCB meeting.
(10) Action engineer or Configuration Manager leads CCB discussion to determine disposition (approve/disapprove/defer/more work).
(11) CCB makes decision.
(12) CCR Form 222 is used to develop change and plan implementation.
(13) CCB authorizes implementation plan and change executed.
(14) Implementation is verified by audit.
(15) Change is closed and product baseline is updated.

There are three paths for processing changes – fastrack, existing precedent, emergency, and full formal review, which are described in the following.

(1) Fastrack changes are those, which can be considered, approved and developed by the owner/developer. Examples of fastrack changes are discrepancies in documentation, minor appearance enhancements, etc.

(2) Existing precedent changes are those site configuration changes (not system configuration changes) that have been previously approved for other sites**.** These changes can speed through the system like fastrack changes, if resources (e.g., spare parts) exist.

(3) All other changes must undergo a full and formal review. These are prepared and distributed for formal review; comments and recommendations are received; issues are resolved, and consensus recommendation is derived.

In addition to the above process, Change Control allows for an emergency implementation process for changes that need immediate action due to greatly extenuating circumstances, such as those that include the threat of loss of life, severe injury, or great property damage; or where the mission is jeopardized. When emergency changes are necessary, the intermediate actions taken and the original threat shall be documented in a follow-up formal CCR that will undergo full formal review and final solution decision in accordance with this policy and the established authority structure.

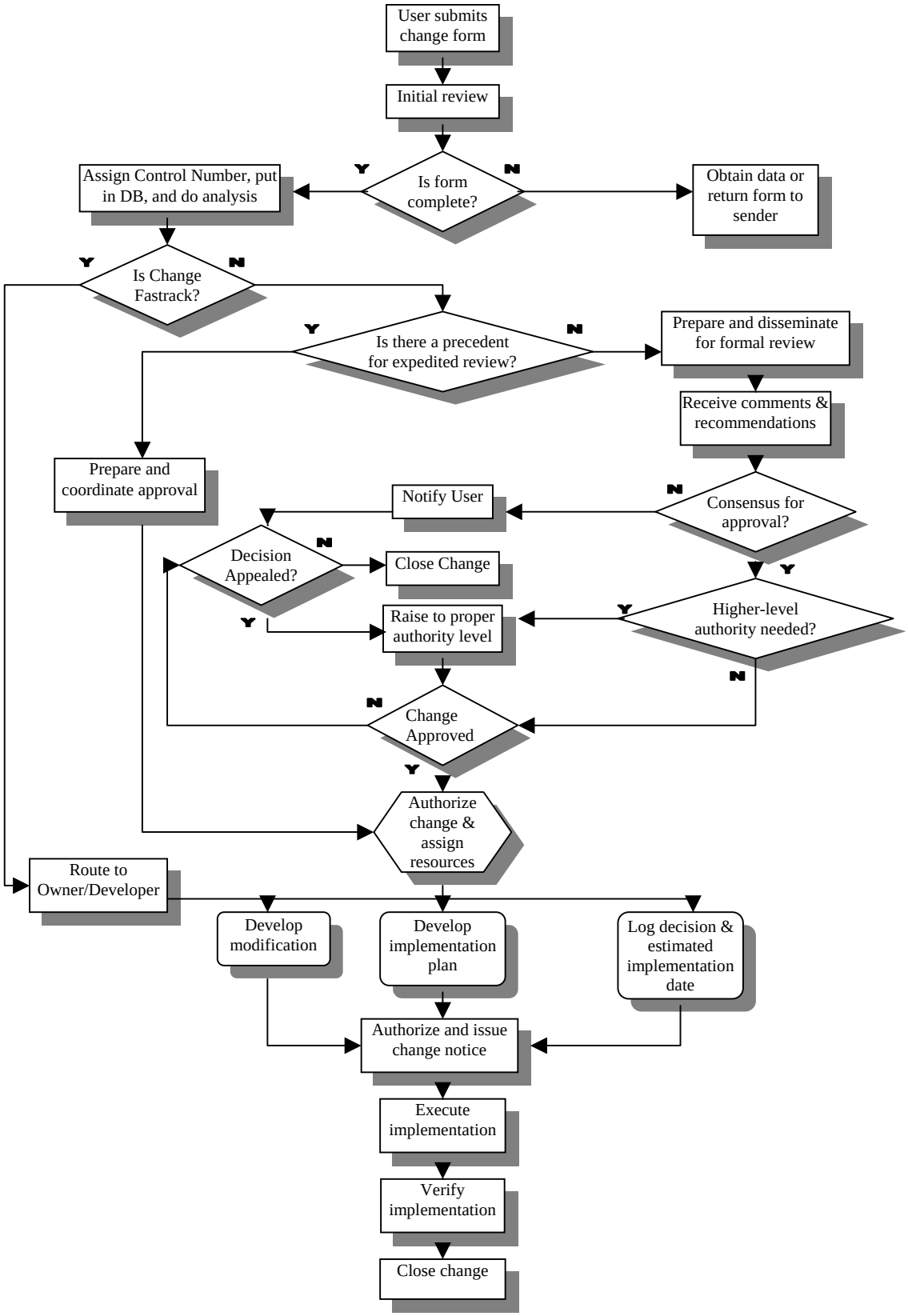

Figure 2. CCR Process Diagram

6.3 Configuration Control Boards

A major focus of any change control process is a timely change decision. USCRN change control authority ultimately resides with the Director, NCDC, who delegates authority to specific agents or boards as defined in this document. Authority levels are established such that change control responsibilities are exercised at the lowest possible level.

In all aspects, a sound, effective, and responsive process has been established and maintained to manage change. The process addresses the infusion of new technology and the wide interests and objectives of users as well as engineering, logistics, configuration management, testing, communications, manufacturing, quality assurance, budget, schedule, and other special interests in a timely fashion.

The USCRN Program Management Committee (PMC) provides policy and program direction; assigns actions to, and receives recommendations from the Science Advisory Panel; and resolves issues raised from the USCRN CCB.

The USCRN CCB serves as a configuration control board for configuration changes; ranks the impacts of changes on science priority; serves as the nucleus for operation and maintenance issue resolution; and provides direction for problem IRs unresolved by the IRG.

The SSC reviews Regional Climate Center (RCC) candidate sites and survey information; scores candidates for best qualified; and makes decision recommendations to the NCDC Director.

The IRG identifies IRs for analysis; reviews engineering/science analyses, comments, and recommendations; determines action/resolution of IRs; and prepares and submits CCRs to the CCB.

The NMT monitors the health of the USCRN network; receives and takes actions on noted problems/queries from the climate community; and initiates IRs and amends IRs as needed.

Figure 3. USCRN CM Board and Committee Relationships, depicts the relationships of these boards and committees. Further detail on the composition and decision method for each of these activities can be found in Appendix B.

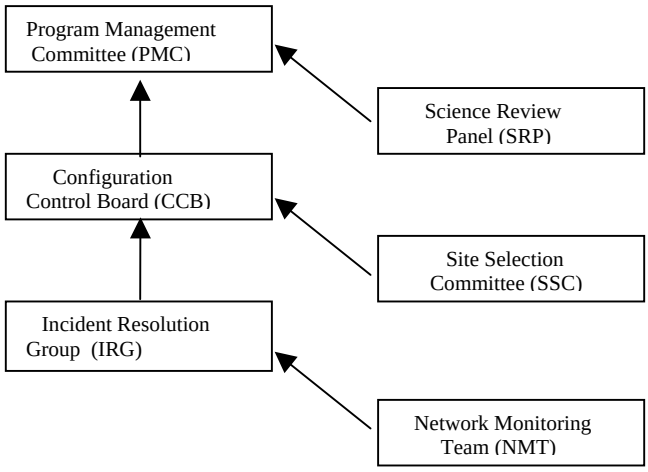

Figure 3. USCRN CM Board and Committee Relationships

6.4 Status Accounting and Reporting

Status accounting is the recording activity of CM and reports all current and historical data concerned with each CI throughout its lifecycle. This enables changes to CIs and their records in the CM database to be fully traceable.

Baselines form the foundation for status accounting and reporting. Changes to the baseline are fully related to the drawings, specifications, and documentation; and then further related to the associated parts for all components of the system.

Two types of reports will be provided. The first type is the routine, periodic Configuration Status Accounting Report (CSAR). The CSAR typically lists the approved documents that comprise the various baselines and provides the status of problem reports, proposed changes, deviations, and waivers, together with their implementation status. The CSAR may be a compilation of specific reports produced for monthly, quarterly, semi-annual, or annual review.

The CSAR will be produced by the USCRN Configuration Manager and periodically presented to the USCRN PMC and CCB.

The second type of report is the "on-demand" report to provide timely information to support specific analysis or user need. This type of report will be available to the USCRN user community through interactive CM and metadata access or upon request to the USCRN Configuration Manager or USCRN Network Monitoring Team respectively.

Appendix A. CCR Form

CONFIGURATION CHANGE REQUEST (CCR) **Part A**		**CCR SEQUENCE NUMBER**
1. BASIS FOR CCR ___ CORRECTIVE ___ PROBLEM PREVENTION ___ IMPROVEMENT	**2. SUBMITTING AUTHORITY (Name & Org Code)** **3. PHONE NUMBER**	**4. SUBMISSION DATE**
5. COGNIZANT TECHNICAL INDIVIDUAL		**6. PHONE NUMBER**
7. TITLE OF CHANGE		
8. TYPE OF CHANGE ___ HARDWARE ___ SOFTWARE ___ DOCUMENTATION ONLY	**9. EFFECTIVITY** ___ SYSTEM ___ SPECIFIC SITE	
10. STATEMENT OF REQUIREMENT, PROBLEM, OR DEFICIENCY		
11. KNOWN OR PROPOSED SOLUTION		
12. REQUIRED CHANGE DATE	**13. RATIONALE FOR REQUIRED CHANGE DATE**	
14. RISK FACTOR FOR CHANGE ___ LOW ___ MEDIUM ___ HIGH	**15. DECISION AUTHORITY LEVEL** ___ FAST-TRACK (* e.g.; correct documentation) ___ USCRN CCB ONLY ___ PMC	
16. USCRN CCB DISPOSITION ___ APPROVED ___ DISAPPROVED ___ RECOMMEND APPROVAL	**16. AUTHORIZING SIGNATURE** **18. DISPOSITON DATE**	
19. PMC DISPOSITION ___ APPROVED ___ DISAPPROVED	**20. AUTHORIZING SIGNATURE** **21. DISPOSITION DATE**	

CONFIGURATION CHANGE REQUEST (CCR) Part B	CCR SEQUENCE NUMBER
1. APPROVED SOLUTION	
2. WORK AUTHORIZATION NUMBER	3. ASSIGNED ACTION ENGINEER

FUNDING INFORMATION	FUNDING SOURCE	COST DATA
4. DEVELOPMENT COSTS		
5. OPERATIONAL TEST AND EVALUATION COSTS		
6. PRODUCTION COSTS		
7. COMMUNICATION SERVICE/CIRCUIT COSTS		
8. IMPLEMENTATION SUPPORT COSTS		
9. LIFE CYCLE SUPPORT COSTS		
10. TOTAL ESTIMATED COSTS		

SUPPORT INFORMATION AND SCHEDULES	
11. DEVELOPMENT SCHEDULE & STATUS	12. PROCUREMENT SCHEDULE & STATUS
13. IMPLEMENT/RETROFIT SCHEDULE & STATUS	14. REQUIRED CLEARANCES/WAIVERS/LICENSES
15. PHYSICAL ITEMS & DOCUMENTS AFFECTED	16. LOGISTICS IMPACTS
17. OPERATIONS IMPACTS	18. STAFF RESOURCES IMPACTS

IMPLEMENTATION	
19. PLANNED IMPLEMENTATION DATE	20. CHANGE NOTICE NUMBER
21. CHANGE NOTICE ISSUE DATE	22. CHANGE COMPLETION DATE

Appendix B. Authorities and Descriptions

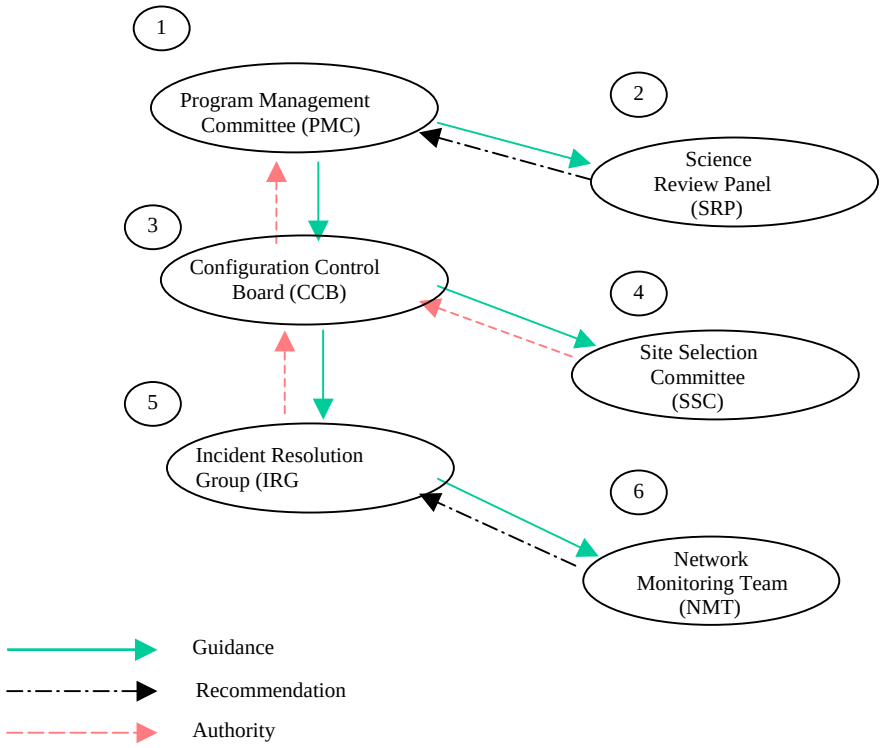

Figure 4. CRN Authority Relationships

B.1 Major Roles, Composition, and Decision Method

The following sections describe the roles, composition and decision methods used by the USCRN program authorities.

(1) Program Management Committee (PMC)

- *Major Roles*
  - USCRN policy and program direction
  - Assigns actions to, and receives recommendations from SRP
  - Resolves issues raised from CCB
- *Composition*
  - Director, NCDC (Chair)
  - Deputy Director, NCDC
  - Director, NESDIS OSD-3, Ground Systems Division; or a designated OSD deputy
  - NCDC Configuration Manager as Secretary

- *Decisions*
    - By consensus

(2) Configuration Control Board (CCB)

- *Major Roles*
    - Serves as CCB for configuration changes
    - Ranks impacts of changes on science priority
    - Nucleus for operation and maintenance issue resolution
    - Provides direction for problem IRs unresolved by IRG
- *Composition*
    - Director, NESDIS OSD-3 (Chair & Acquisition Manager)
    - Chief, NCDC Scientific Services Division
    - USCRN Configuration Manager
    - USCRN Deployment & Maintenance Manager (Director, ATDD)
    - OSD USCRN Configuration Manager as a non-voting Secretary
- *Decisions*
    - By consensus or raised to PMC

(3) Site Selection committee (SSC)

- *Major Roles*
    - Reviews RCC candidate sites and survey information
    - Scores candidates for best qualified
    - Makes decision recommendation to Director, NCDC
- *Composition*
    - Deputy Director, NCDC (Chair) or designate
    - ATDD and OSD representatives
    - Selected RCC field representatives
    - NCDC scientists.
    - NCDC provided Secretary
- *Decisions*
    - By majority decision/signature of the Director, NCDC, or raised to CCB

(4) Incident Resolution Group (IRG)

- *Major Roles*
    - Identifies Incident Reports (IRs) for analysis
    - Reviews engineering/science analyses, comments, and recommendations
    - Determines action/resolution of IRs
    - Prepares and submits Configuration Change Requests (CCRs) to CCB
- *Composition*
    - NCDC CRN representative (Chair)
    - USCRN Deployment & Maintenance Manager (Director, ATDD)
    - ATDD Lead Hardware Engineer

- NCDC CRN Systems Integration and Planning Engineer
- NCDC CRN Lead Scientist
- NCDC provided Secretary

- *Decisions*
  - IRs closed by consensus or raised to CCB

(5) Network Monitoring Team (NMT)

- *Major Roles*
  - Monitors health of network
  - Receives and takes action on noted problems/queries from climate community
  - Initiates IRs and amends IRs as needed

- *Composition*
  - NCDC CRN Network Monitoring Lead (Team Lead)
  - NCDC QA/QC Lead
  - NCDC CRN Lead Scientist
  - ATDD CRN Hardware Chief Engineer
  - NCDC CRN Cooperating Scientist

- *Decisions*
  - Initiates IRs
  - Closes IRs in their purview (as pre-directed by IRG)
  - Makes recommendations for those IRs raised to the IRG

Appendix C
Program Management Committee Charter for the U.S. Climate Reference Network
Draft

March 20, 2003

C.1 Purpose

The purpose of the Program Management Committee (PMC) is to organize and manage the development and continuous operation of the U.S. Climate Reference Network (USCRN). The PMC also serves as the governing body for requirements, oversight of the program budget, policy, resource commitment, and provides management guidance throughout the lifecycle of the USCRN program.

For Configuration Management, the PMC assures that:

- Customer requirements are validated and approved
- Requirements drive end-item definition
- End-item requirements drive detailed design definition
- Detailed design definition drives process definition
- All produced physical items fully conform to items listed above
- Any needed strategic, science, and technology improvement is readily addressed, evaluated, and accommodated, as appropriate
- All approved and released changes, along with their associated documentation are properly managed

In order to accomplish these tasks, the PMC has delegated authority for the routine review and decision on Configuration Change Requests (CCRs) to the USCRN Configuration control Board (CCB). The organization, roles, and responsibilities of the USCRN CCB are found in the CCB Charter for the USCRN.

C.2 Authority

The PMC is established by authority of the Deputy Assistant Administrator for NOAA's NESDIS and in accordance with the CRN Configuration Management Plan.

C.3 Organization

The members of the PMC are as follows.

- Director, National Climatic Data Center (NCDC) (Chair)
- Deputy Director, NCDC
- Director, OSD-3 (Ground Systems Division)

- Designated deputy from OSD. (The NCDC Configuration Manager serves as the non-voting PMC Secretary).

C.4 Responsibilities

The responsibilities of the PMC include the following.

1. Identifying all major tasks that are essential to effective management of changes and clarifying the responsibility and authority within NESDIS OSD and NCDC for these tasks.

2. Establishing specialized management mechanisms, including lower level CCBs and Special Working Groups, necessary to accomplish recurring tasks or functions, including configuration management, site selection, and problem reporting and resolution.

3. Serving as the governing body for requirements configuration control.

4. Reviewing all decisions by the USCRN CCB and resolving those specific issues where the USCRN CCB cannot reach a consensus.

5. Allocating the resources (staff, funds, and facilities) necessary to accomplish all tasks assigned by the PMC, or, if required resources are unavailable, requesting and justifying additional resources.

6. Documenting and reporting all major decisions and rationale.

7. Recommending changes that have a significant effect on service requirements, the organization, budget, or previously approved schedule to the Deputy Assistant Administrator for NESDIS.

8. Referring any major issues that cannot be resolved by the PMC to the Deputy Assistant Administrator for NESDIS.

C.5 Operating Rules and Procedures

The PMC will operate under the following rules and procedures.

1. Members are expected to participate personally and normally will not designate an alternate to represent them at meetings. If this should be necessary, the alternate will be delegated with full authority.

2. The PMC will operate on the basis of consensus; any member can insist on the resolution of an issue by the Deputy Assistant Administrator for NESDIS. The Chair will obtain the resolution.

3. Meetings of the PMC will be announced at least two weeks in advance, longer if possible, and an agenda and brief summary of major issues to be decided or discussed will be provided at that time.

4. The Chair, in consultation with members of the PMC, will invite other persons to participate in each PMC meeting as is necessary to facilitate the work planned for that session.

5. The PMC will identify any continuing staff roles needed to support its work and will designate appropriate persons from within their offices to carry out these roles.

6. Written summaries of major decisions will be submitted to members for approval before further distribution, normally within one week after the meeting unless the PMC allocates a longer period to allow time for required staff work. Decisions will go into effect, with necessary corrections or clarifications, one week after such submissions for final approval.

Appendix D
Configuration Control Board Charter For the U.S. Climate Reference Network
Draft

March 20, 2003

D.1 Purpose

The purpose of the Configuration Control Board (CCB) is to review and make decisions on Configuration change Requests (CCRs) to the U.S. Climate Reference Network (USCRN). The CCB also serves as the body that ranks impacts of changes on the science priority, the nucleus for operation and maintenance issue resolution and the provider of direction for problem Incident Reports unresolved by the Incident Resolution Group.

For Configuration Management, the CCB serves under the guidance and direction of the PMC. Routine reporting of CCB activities will be provided to the PMC. Decisions and issues not resolved at the CCB level shall be elevated to the PMC for resolution.

The organization, roles, and responsibilities of the USCRN PMC are found in the CCB Charter for the USCRN PMC.

D.2 Authority

The CCB has been delegated authority by the USCRN PMC to serve as the principal body for CM. Decisions made by the CCB may be appealed to the PMC.

D.3 Organization

The members of the CCB are listed below.

- Director, NESDIS OSD-3 (Chair & Acquisition Manager)
- Chief, NCDC Scientific Services Division
- USCRN Configuration Manager
- USCRN Deployment & Maintenance Manager (Director, ATDD)
- OSD USCRN Configuration Manager serves as the non-voting Secretary

D.4 Responsibilities

The responsibilities of the CCB include the following.

1. Establishing the criteria for CCR processing (fastrack, priority, risk).

2. Validating the correction, problem prevention, or enhancement and identifying and evaluating alternate solutions.

3. Comparing estimated costs versus benefits.

4. Ranking impacts of changes on science priority.

5. Selecting the best alternative and directing its test and approving the test results.

6. Documenting and reporting all major decisions and their rationale.

7. Recommending changes that have a significant effect on service requirements, the organization, budget, or previously approved schedule to the PMC.

8. Referring any major issues that cannot be resolved by the CCB to the PMC.

9. Approving change implementation plans and schedules after receiving feedback from those impacted.

10. Providing oversight of change notification, change implementation, and verification.

D.5 Operating Rules and Procedures

The CCB will operate under the following rules and procedures.

1. Members are expected to participate personally and normally will not designate an alternate to represent them at meetings. If this should be necessary, the alternate will be delegated full authority.

2. The CCB will operate on the basis of consensus; any member can insist on the resolution of an issue by the PMC. The Chair will obtain the resolution.

3. Meetings of the CCB will be announced at least two weeks in advance, longer if possible, and an agenda and brief summary of major issues to be decided or discussed will be provided at that time.

4. The Chair, in consultation with members of the CCB, will invite other persons to participate in each CCB meeting as is necessary to facilitate the work planned for that session.

5. The CCB will identify any continuing staff roles needed to support its work and will designate appropriate persons from within their offices to carry out these roles.

6. Written summaries of major decisions will be submitted to members for approval before further distribution, normally within one week after the meeting unless the CCB allocates a

longer period to allow time for required staff work. Decisions will go into effect, with necessary corrections or clarifications, one week after such submissions for final approval.

7. Proposed changes to the Charter will be submitted to the PMC for consideration.

Appendix E
USCRN Product Structure

E.1 USCRN Hardware

I. Data Logger, Campbell Scientific CR23X

- A. Cabinet
  1. Switch, door micro-switch with wires
  2. Bolt, mounting switch -- #4-40 x 3/4 with nut and washer
  3. Bolts, U-bolts -- 5/16-18 with washers and nuts
- B. Battery
  1. Charger/Regulator
- C. Wiring Terminal Header
  1. Cable, CR23X power -- 2-conductor assembly
  2. Cable, voltage divider -- 24 awg cable assembly
- D. Fuse Block
  1. Fuse, 7.5 Amp - transmitter and rain gauge heater
  2. Fuse, 3 Amp – fans and voltage divider
- E. Rain Gauge Heater Board
  1. Resistor, rain gauge heater thermistor resistor
- F. Rain Gauge Sensors Signal Conditioner
- G. Control Box Heater
  1. Control Box Heater Board
- H. Signal Conditioner

II. Transmitter

- A. Antenna, GOES transmitter, SEIMAC TGT-1
  1. Cable, antenna - coax
  2. Cable, power – 2-conductor assembly
  3. Cable, transmitter – 9-conductor ribbon cable assembly
- B. Antenna, GPS locator

III. Power

- A. Battery Box
  1. Battery, 12V DC 100Ah Gel Cell
  2. Surge Suppressor Power Strip, ISOBAR 4 socket

3. Disconnect, low voltage
4. Outlet, 120V AC – junction box with multiple outlets
5. Transformer, Campbell Scientific battery charger transformer
6. Cables, battery - power to low voltage disconnect
7. Fuse, 30 Amp

IV. Tower

A. Ground Mount
   1. Static dissipater
      a. Connector, split bolt
      b. Bolt, dissipater mounting
   2. Wire, 4 AWG grounding
   3. Screw, stainless steel, 3/8-16 x ½ (3/16) Allen set
   4. Screw, stainless, steel, 5/16-18 x 3/8 (5/32) Allen set

B. Assembly, two-piece, 1” x 1” tower cross Hollaender fitting

C. Cross, offset, 1” x 1” Hollaender fitting

D. Cross, offset, ¾” x 1” Hollaender fitting

E. Mount, main instrument

F. Mount, main aspirated shield

G. Mount, secondary aspirated shield

V. Sensors

A. Anemometer, MetOne cup anemometer
   1. Cable, anemometer cable to data logger

B. Solar Radiation Sensor, Kipp and Zonen sensor with cable
   1. Mount, SR leveling -- aluminum base with leveling screws
   2. Mount, SR Hollaender end-cap
   3. Mount Tubing, SR -- 1" x 1.5' aluminum

C. Surface Temperature Sensor, Apogee Instruments IR sensor with cable

D. Air Temperature, PRT internally mounted assembly
   1. Aspirator Fan
   2. Cover, aspirated shield -- top piece with internal fan and mount
   3. Tube, aspirated shield intake and instrument housing
   4. Mount, Hollaender end fitting
   5. Mount Tubing - 1" x 1' aluminum tubing
   6. Cable, power

E. Precipitation Gauge, Geonor T200
   1. Bucket

2. Sensors, vibrating wire - strain gauge
    a. Surge Suppressor - for sensors
3. Heater, inlet
    a. Thermister, temperature sensor
4. Pedestal, cast aluminum frame
    a. Mount, flange - Hollaender pedestal
    b. Bolts, mounting - 5/16-18 x 3.5 SS bolts with rubber bushing, locknuts, and washers
5. Cover, with heater and electrical plug
6. Electrical Plug, auto trailer style

VI. Facility

A. Gate, 5' fence panel constructed for gate
    1. Hinge, barn door style, galvanized
    2. Latching Hasp and Catch, large galvanized
    3. Gate Support Assembly, wire rope clips and thimble
    4. Gate Support Assembly, wire rope clamps
    5. Gate Support Assembly, turnbuckle

B. Outer Fence Panel, 10' assembly of 2x4 cross members and 1x2 pickets

C. Uprights, 4x4x8" or 10" pressure treated posts

D. Outer Cross Member, 2x4x10' pressure treated lumber
    1. Screws, attachment, #8 x 2.5 wood screws
    2. Screws, hinge and hasp, 5/16 x 2 wood screws
    3. Wire Rope, 1/8" SS wire rope

E. Inner Fence Panel, 5' assembly of 2x4 cross members and 1x2 pickets

E.2 USCRN Software

For a listing of USCRN software please refer to Table 2 on webpage listed below.

http://www1.ncdc.noaa.gov/pub/data/uscrn/documentation/metadata/MetadataTable.doc