

Climate Reference Network (CRN)

Site Information Handbook

December 2002



Prepared by:

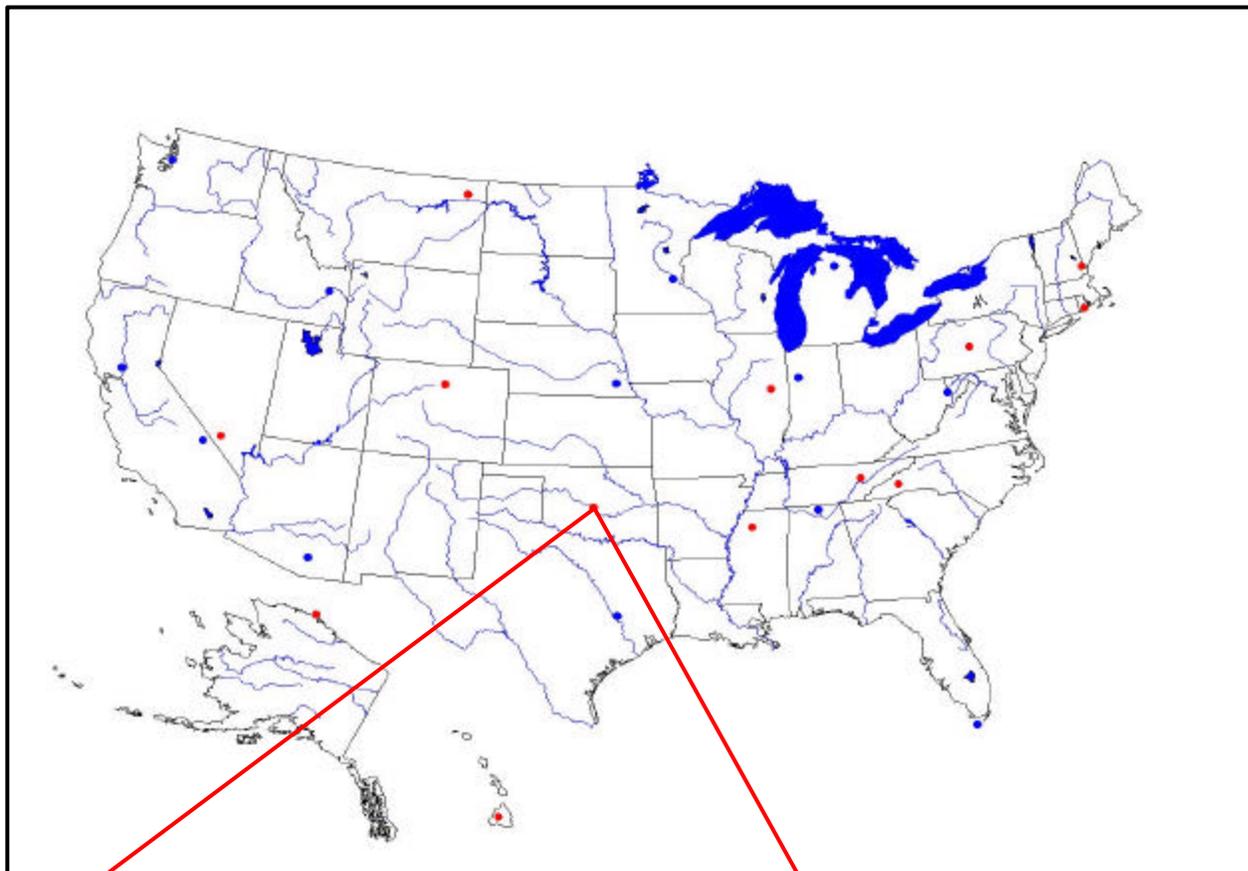
**U.S. Department of Commerce
National Oceanic and Atmospheric Administration (NOAA)
National Environmental Satellite, Data, and Information Service (NESDIS)**



U. S. Climate Reference Network Site Information Handbook

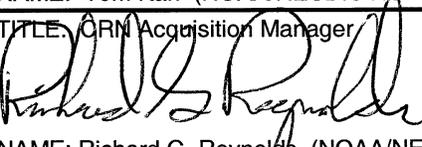
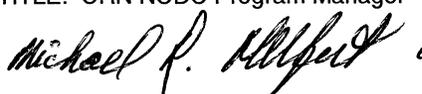
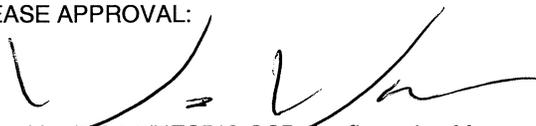
National Oceanic and Atmospheric Administration (NOAA)
National Climatic Data Center (NCDC)

December 10, 2002



**USCRN Instrument Suite
Oklahoma Agricultural
Experiment Station,
Oklahoma State University,
Stillwater, OK**

Approval Page

Document Numbers:	
NOAA/NESDIS <i>CRN Series</i> X030	NOAA-CRN/OSD-2002-0002R0UD0 December 10, 2002 DCN 0
Document Title Block:	
<h1 style="margin: 0;">Climate Reference Network (CRN)</h1> <h2 style="margin: 0;">Site Information Handbook</h2>	
PROGRAM: CRN	DOCUMENT RELEASE DATE: December 10, 2002
APPROVALS	
TITLE: CRN Program Executive Date  1/6/03 NAME: Tom Karl (NOAA/NESDIS NCDC)	
TITLE: CRN Acquisition Manager Date  30 Dec 02 NAME: Richard G. Reynolds (NOAA/NESDIS OSD)	
TITLE: CRN Implementation Manager Date  12/30/02 NAME: Mike Young (OSD / Short & Associates)	
TITLE: CRN NCDC Program Manager Date  01-02-03 NAME: Mike Helfert (NOAA/NESDIS NCDC)	
CCB RELEASE APPROVAL: Date	
	
NAME: Pong Yu (NOAA/NESDIS OSD Configuration Management Office) 1/9/2003	

Document Change Notice

DCN NO.: 0	DATE: December 10, 2002	PROGRAM : SYSTEM: CRN	PAGE NO.: 1 of 1
DOCUMENT TITLE: Climate Reference Network (CRN) Site Information Handbook			
DOCUMENT NO. NOAA-CRN/OSD-2002-0002R0UD0			
CHANGE PAGE HISTORY			
No.	Page Numbers(s)	Update Instructions (Insert/Delete/Replace)*	Reason for Change
0	Complete Document	Baseline version of the document; first publication	See COMMENTS below
COMMENTS: This DCN 0 package consists of the initial NOAA/NESDIS baseline publication of this document.			
NOTE:			
*EXAMPLES: <i>“Insert change pages 6.2-6 through 6.2-9 following page 6.2-5”</i> <i>“Replace pages 3.4-1 through 3.4-10 with change pages 3.4-1 through 3.4-10b”</i> <i>“Replace pages 4.5-24 with change page 4.5-24; delete pages 4.5-25 through 4.5-30”</i>			

Version Description Record

DOCUMENT TITLE: <i>Climate Reference Network (CRN)</i> Site Information Handbook					
DOCUMENT NUMBERS: Baseline: NOAA-CRN/OSD-2002-0002R0UD0			SYSTEM: CRN		DOCUMENT BASELINE ISSUE DATE: Original NOAA/NESDIS Baseline: December 10, 2002
DOCUMENT CHANGE HISTORY					
DCN No.	Revision/Update Nos.	Date	DCN No.	Revision/Update Nos.	Date
0	R0UD0	December 10, 2002			
NOTES:					

Preface

This document comprises the National Oceanic and Atmospheric Administration (NOAA)/ National Environmental Satellite, Data, and Information Service (NESDIS) initial baseline publication of the *Climate Reference Network (CRN) Site Information Handbook* (version DCN 0, December 10, 2002, publication). The document number is NOAA-CRN/OSD-2002-0002R0UD0.

This handbook provides an overview of the United States Climate Reference Network (USCRN) Program and the requirements needed to establish and maintain an instrument site. The document provides a general description of a typical instrument site, site preparation and installation activities, access to power, and minimal maintenance requirements. A sample copy of the Site License Agreement is included at the end of this handbook.

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

DocCCR-Multi-Misc1-2002-0001

This baseline programmatic document has been developed from the NOAA-NESDIS/NCDC Site Information Handbook, dated 09-04-02.

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.

Table of Contents

Section 1. Introduction	1
1.1 Background	1
1.2 What Will Be Measured and Reported	2
Section 2. Site Selection	4
2.1 General Geographic Location Factors.....	4
2.2 Local Site Representativity Evaluation (Classification Scheme).....	5
2.2.1 Classification for Temperature/Humidity	6
2.2.2 Classification for Precipitation	6
2.2.3 Classification for Solar Radiation.....	7
2.2.4 Classification for Wind.....	7
2.3 Site Selection Process	8
Section 3. Site Specifications	9
3.1 Site Layout	9
3.2 Site Survey and Preparation	10
Section 4. Site Installation and Maintenance	11
4.1 The Installation Process	11
4.2 Operational Maintenance	11
4.2.1 Equipment and Instrument Maintenance	11
4.2.2 Site Maintenance.....	12
Section 5. Host Organization Activities	13
Appendix A	14
Appendix B	16

List of Figures

1. Proposed Typical CRN Station Configuration.....	9
--	---

Acronyms and Abbreviations

AC or a/c	alternating current
ATDD	Atmospheric Turbulence and Diffusion Division
comm	communications
CRN	Climate Reference Network
CSC	Computer Sciences Corporation
CY	calendar year
DC	direct current
DCN	Document Change Notice
DCS	Data Collection System
DOC	Department of Commerce
GCOS	Global Climate Observing System
GOES	Geostationary Operational Environmental Satellite
IR	infrared
NCDC	National Climatic Data Center
NESDIS	National Environmental Satellite, Data, and Information Service
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
NWS	National Weather Service
OSD	Office of Systems Development
RCC	Regional Climate Center
S & A	Short and Associates
SLA	Site License Agreement
SOD	Summary of the Day
USCRN	U.S. Climate Reference Network
VDR	Version Description Record
WMO	World Meteorological Organization
WWW	World Wide Web

Section 1. Introduction

The purpose of this U. S. Climate Reference Network (USCRN) Site Information Handbook is to provide an overview of the USCRN Program and the requirements needed to establish and maintain an instrument site. This handbook provides a general description of a typical instrument site, site preparation and installation activities, access to power, and minimal maintenance requirements. A draft copy of the Site License Agreement is included at the end of this handbook. This sample agreement has been reviewed and approved by the Department of Commerce, Office of the General Counsel. There is some flexibility to make minor modifications to meet specific concerns or needs of the host organization granting use of their property.

The USCRN Program has the long-term commitment of the Department of Commerce (DOC) and the National Oceanic and Atmospheric Administration (NOAA). This network will be maintained and modernized during the life of the program.

This is a unique opportunity to participate in a program that will collect and analyze the highest quality climate data possible. Research based on these data will directly support near and long term policy and decision plans made by senior government and business leaders.

The USCRN Program Manager will contact the appropriate person(s) that you may suggest to further discuss the host organization's opportunity to be a partner in establishing a high quality USCRN instrument site on the respective property.

1.1 Background

The research community, government agencies, and private businesses have identified significant shortcomings in understanding and examining long-term climate trends and change over the U.S. and surrounding regions. Some of these shortcomings are due to the lack of adequate documentation of operations and changes regarding the existing and earlier observing networks, the observing sites, and the instrumentation over the life of the network. These include inadequate overlapping observations when new instruments were installed and not using well-maintained, calibrated high-quality instruments. These factors increase the level of uncertainty when government and business decision-makers are considering long-range strategic policies and plans. Never before have people been so aware of the impact of the environment and climate variability and change on the quality of life and the economic health of a nation, its citizens, and the population of the world. This project will serve as a model for establishing similar networks in other countries.

The U. S. Climate Reference Network (USCRN) is a new climate-observing network supported by the National Oceanic and Atmospheric Administration (NOAA). The Ten Climate Monitoring Principles recognized by the National Research Council (NRC) and members of the World Meteorological Organization (WMO) will guide this climate-observing network. This network meets the requirements of the Global Climate Observing System (GCOS). The USCRN

Program is being implemented and managed by the National Climatic Data Center (NCDC) located in Asheville, NC. Scientists and engineers from the Atmospheric Turbulence and Diffusion Division (ATDD) located in Oak Ridge, TN, are assisting the NCDC USCRN Program staff. System design and test, implementation, and associated programmatic budgets and plans support is being provided by the NESDIS Office of systems Development.

The primary goal of the U. S. Climate Reference Network (USCRN) is to provide future long-term high quality observations of surface air temperature and precipitation that can be coupled to past long-term observations for the detection and attribution of present and future climate change. The USCRN fulfills the Nation's need for long-term high quality climate observations and records with minimal time-dependent biases affecting the interpretation of decadal to centennial climate variability and change.

The USCRN will provide the Nation with a first class long-term (50 to 100 years) observing network that will serve as the Nation's Benchmark Climate Reference Network. When fully implemented, the network will consist of several hundred instrument suites strategically selected to capture climate trends, variations, and change across the Nation.

Data from these USCRN sites will be used to provide the best possible information on long-term changes in air temperature and precipitation, including means and extremes. Additional sensors may be added in the future, such as soil moisture and soil temperature.

USCRN data will be used in operational climate monitoring activities and for placing current climate anomalies into a historical perspective. These data will be transmitted hourly via the GOES Data Collection System (DCS) and immediately distributed by the National Weather Service (NWS) to their operational sites. These observations will also be available on-line and accessible via the Worldwide Web (WWW).

Essential components of the USCRN are well-documented life cycle maintenance, modernization, and performance histories, as well as a robust science and research component. There will be routine maintenance visits to the sites and regular calibration of the sensors. The performance of the sensors and the network will be routinely monitored. The research effort will continually evaluate the data, new sensors, and emerging calibration techniques. When a new type sensor can contribute to improving the quality of the observations, there will be at least a one-year continuity overlap of current and new sensors.

1.2 What Will Be Measured and Reported

Every USCRN instrument site is being equipped with a standard set of sensors, a data logger, and a satellite communications transmitter attached to a typical 3 meter (10 feet) instrument tower, as well as at least one weighing rain gauge, encircled by a wind shield. Off-the-shelf commercial equipment and sensors are being selected based on performance, durability, and cost.

High accuracy and precision measurements are critical. There will be a well-defined maintenance program, to include the calibration of installed sensors and periodic replacement of aging sensors. The performance of the network will be monitored on a daily basis. Indications of problems may warrant contacting the site and, if necessary, will be followed by a site visit within a few days.

Sensors are placed on the instrument tower at 1.5 meters (4.5 feet) above the surface of the ground: three temperature sensors each enclosed in aspirated solar radiation shields, an anemometer (wind speed), a pyranometer (solar energy), and an infrared (IR) thermometer (ground, skin, surface temperature). A relative humidity sensor may be added upon completion of the evaluation period, late calendar year (CY) 2003. Special considerations will be made for areas with considerable snowfall and snow depth.

The USCRN Program will measure the following climate related parameters:

- Air Temperature (Primary Measurement)
- Precipitation (Primary Measurement)
- Solar Radiation (incoming global solar energy at the surface of the Earth)
- Wind Speed (not direction)
- Ground (Skin) Surface Temperature (IR)

Precipitation data, recorded every fifteen minutes, and the other hourly observations will be collected and stored in a data logger attached to the tower. These data will be transmitted within a few minutes after each hour via a GOES satellite transmitter for further delivery to the National Climatic Data Center (NCDC), Asheville, NC. Summary of the Day (SOD) statistics will be computed operationally at the NCDC. The instrument system is designed with the capacity for future expansion to accommodate additional sensors, such as soil moisture, soil temperature, atmospheric pressure, and wind speed/direction at the standard 10-meter height. The design allows for future additions of sensors on the tower without disrupting the physical site.

Section 2. Site Selection

There are many scientific criteria governing site selection. A Network Spatial Density Study has been conducted to determine the number of instrument suites and the approximate (general) geographic locations. About 225 instrument suites selectively located throughout the 50 states, Puerto Rico and Virgin Islands will capture on a national spatial scale at least 90% of the National signal for annual climate trends, variations, and change. Additional studies are required to determine how many additional sites and where are needed to capture the regional scale changes to at least the 80% confidence level. The USCRN budget will determine the actual number of instrument suites that can be supported.

A significant consideration when examining specific instrument sites is whether the area surrounding the candidate instrument site has a high degree of probability of continuing in its present condition, without major changes for very long periods of time (50 to 100 years). The need for unchanging physical surroundings, particularly encroachment by man-made structures, is a key factor in determining the probable long-term stability of a potential site.

2.1 General Geographic Location Factors

The factors below are considered when exploring and examining the suitability of the general geographic location, as well as the specific instrument site:

- Regionally and Spatially Representative. Stations will be distributed to ensure that all major nodes of regional climate variability are captured while taking into account large-scale regional topographic factors. The Network Spatial Density Study will provide guidance.
- General location sensitive to measuring long term climate variability and trends. The site location is representative of the climate of the region, and is not heavily influenced by unique local topographic and mesoscale/microscale features/factors.
- Reasonably high probability of Long Term Site Stability and surrounding area. Minimize risk of man made encroachments over time and/or the chance the site will close due to the sale of the land or other factors. Stations located on government (federal, state, local) land or at colleges (granted/deeded land with land use restrictions) often provide a higher stability factor. This criterion also includes the need for USCRN deployment and maintenance personnel to have reasonably convenient access to the site. A review of recent (last ten years) and possible future population growth patterns in the area is a part of the overall evaluation process.
- Avoid high-risk sites: Extreme/above average frequency of tornado incidents; Enclosed locations that may “trap” air and create unusually high incidents of fog, cold air advection, etc.; Vicinity of orographically induced winds, such as Santa Ana and Chinook; Complex meteorological zones, such as adjacent to an ocean or other large bodies of water; and Persistent periods of extreme snow depths (e.g., several meters/tens

of feet). Digital topographic maps and a climatological profile of the area will be examined as part of the overall site evaluation and selection process. When available, aerial photographs are very useful.

- Proximity. Site is within a few tens of kilometers to an existing or former observing site with a relatively long period of record (decades) of daily maximum and minimum temperature and precipitation is highly desirable. The historical data (metadata) record and observational data from these sites should be of sufficient quality and detail to permit reasonable processing of the data to account for changes with a high degree of confidence (i.e., documented vegetation and terrain changes, changes in the location of the station and/or instruments, type of instruments described, the observation time, the observing practices, etc.).
- Vicinity. Site is located in the vicinity of other similar observing systems, which are operated and maintained by personnel with a knowledge, understanding, and appreciation for the purpose of climate observing systems.
- Avoid endangered species habitats and sensitive historical locations of a sensitive nature.
- AC power source available nearby. However, in some cases solar panels may be an alternative to achieve the use of an otherwise desired location.
- Relatively easy year round access by vehicle for installation and periodic maintenance.

2.2 Local Site Representativity Evaluation (Classification Scheme)

The most desirable local surrounding landscape is a relatively large and flat open area with low local vegetation in order that the sky view is unobstructed in all directions except at the lower angles of altitude above the horizon. The area occupied by an individual instrument site is typically about 18 meters \times 18 meters (~60 feet \times ~60 feet).

Local environmental and nearby terrain factors have an influence on the "quality of a measurement." The selection of a USCRN instrument site will be the result of a balance between competing demands, such as those highlighted above and an assessment of the "quality of measurements" guidelines outlined below.

There will be many sites that are less than ideal. The USCRN will use the classification scheme below to document the "meteorological measurements representativity" at each site. This scheme, described by Michel Leroy (1998), is being used by Meteo-France to classify their network of approximately 550 stations. The classification ranges from 1 to 5 for each measured parameter. The errors for the different classes are estimated values.

2.2.1 Classification for Temperature/Humidity

Class 1 – Flat and horizontal ground surrounded by a clear surface with a slope below $1/3$ ($<19^\circ$). Grass/low vegetation ground cover <10 centimeters high. Sensors located at least 100 meters from artificial heating or reflecting surfaces, such as buildings, concrete surfaces, and parking lots. Far from large bodies of water, except if it is representative of the area, and then located at least 100 meters away. No shading when the sun elevation >3 degrees.

Class 2 – Same as Class 1 with the following differences. Surrounding Vegetation <25 centimeters. Artificial heating sources within 30m. No shading for a sun elevation $>5^\circ$.

Class 3 (error 1°C) – Same as Class 2, except no artificial heating sources within 10 meters.

Class 4 (error $\geq 2^\circ\text{C}$) – Artificial heating sources <10 meters.

Class 5 (error $\geq 5^\circ\text{C}$) – Temperature sensor located next to/above an artificial heating source, such a building, roof top, parking lot, or concrete surface.

2.2.2 Classification for Precipitation

One factor to consider is an area surrounded by uniform obstacles of about the same height. Wind speed is a significant factor that affects the accuracy of measuring liquid and frozen precipitation. Often, a wind shield is placed around the precipitation gauge to improve the accuracy of the “catch.” Wind speed (no direction) at USCRN sites is measured at a height of 1.5m, near the height of the gauge orifice.

Class 1 – Flat horizontal ground surround by a cleared surface with a slope below $1/3$ ($<19^\circ$). Any obstacle must be located at a distance of at least 4 times the height of the obstacle.

An obstacle is an object seen from the precipitation gauge with an angular width of ≥ 10 degrees.

Class 2 (error 5%) – Same as Class 1, except an obstacle is located at a distance of at least 2 times its height.

Class 3 (error 10% to 20%) – Ground with a slope below $1/2$ ($<30^\circ$). Any obstacle is located at a distance of at least its height.

Class 4 (error $>20\%$) – Ground with a slope $>30^\circ$. Obstacles located at a distance less than their height.

Class 5 (error $> 50\%$) – Obstacles overhanging the gauge.

2.2.3 Classification for Solar Radiation

Class 1 – Flat horizontal ground with a slope of the terrain $<2^\circ$. No obstacles within 100 meters.

Class 2 (error 10%) – Slope of the terrain $<5^\circ$. Obstacles within 100m and an angular height $>7^\circ$ but $<10^\circ$.

Class 3 (error 15%) – Slope of the terrain $<7^\circ$. Obstacles within 100m and an angular height $\geq 10^\circ$.

Class 4 (error 20%) – Obstructions that would obstruct a significant portion of direct radiation.

Class 5 (error 30%) – Obstacles overhanging the sensor or near a building.

2.2.4 Classification for Wind

Defined for wind sensor at a height of 10m. USCRN measures wind speed only (no direction) at a height of 1.5m.

Class 1 – Sensor located at a distance of at least ten (10) times the height of the obstacle (elevation angle $<5.7^\circ$). Object considered an obstacle if seen at angular width $>10^\circ$. Obstacle is below 5.5m height within a 150m radius and 7m within a 300m radius. Wind sensor located a minimum distance of 15 times the width of thin nearby obstacles (i.e. mast, tree with angular width $<10^\circ$). Surrounding terrain relief change ≤ 5 m within a 300m radius.

Class 2 (error 10%) – Same as Class 1 except terrain change ≤ 5 m within a 100m radius.

Class 3 (error 20%) – Same as Class 1 except no obstacles within five times the height of the nearby obstacles (elevation angle $<11.3^\circ$). Wind sensor located a minimum distance of 10 times the width of thin nearby obstacles. Terrain change ≤ 1 m within a 10m radius.

Class 4 (error 30%) – Same as Class 3 except no obstacles within 2.5 times the height of the nearby obstacles (elevation angle $<21.8^\circ$).

Class 5 (error $>40\%$) – Obstacles within 2.5 times the height of the nearby obstacles.

Class 6 (error $>50\%$) – Obstacles with a height >10 m, seen with an angular width greater than 60° are within a 20m distance.

2.3 Site Selection Process

The potential site owner/proprietor (host organization) reviews this handbook and the draft copy of the Site License Instructions and Agreement (see Appendices A and B). The potential host organization manager determines if a 60' × 60' area seems reasonable for on-site examination by a member of the USCRN Program team. A discussion via telephone and, if possible, an exchange of digital pictures will determine if a site visit by a USCRN Program team member is in order. USCRN Program personnel will visit the site, agree to the specific parcel(s) of land, and execute the Site License Agreement with the host organization.

Section 3. Site Specifications

This section includes specifications for the site layout, and the site survey and preparation.

3.1 Site Layout

Figure 1 provides an example of a typical instrument site configuration. The wind shield around the precipitation gauge helps to improve the accuracy of the liquid and frozen precipitation catches. Atypical instrument suite installed and operational in Stillwater, OK is depicted on the cover of this booklet.

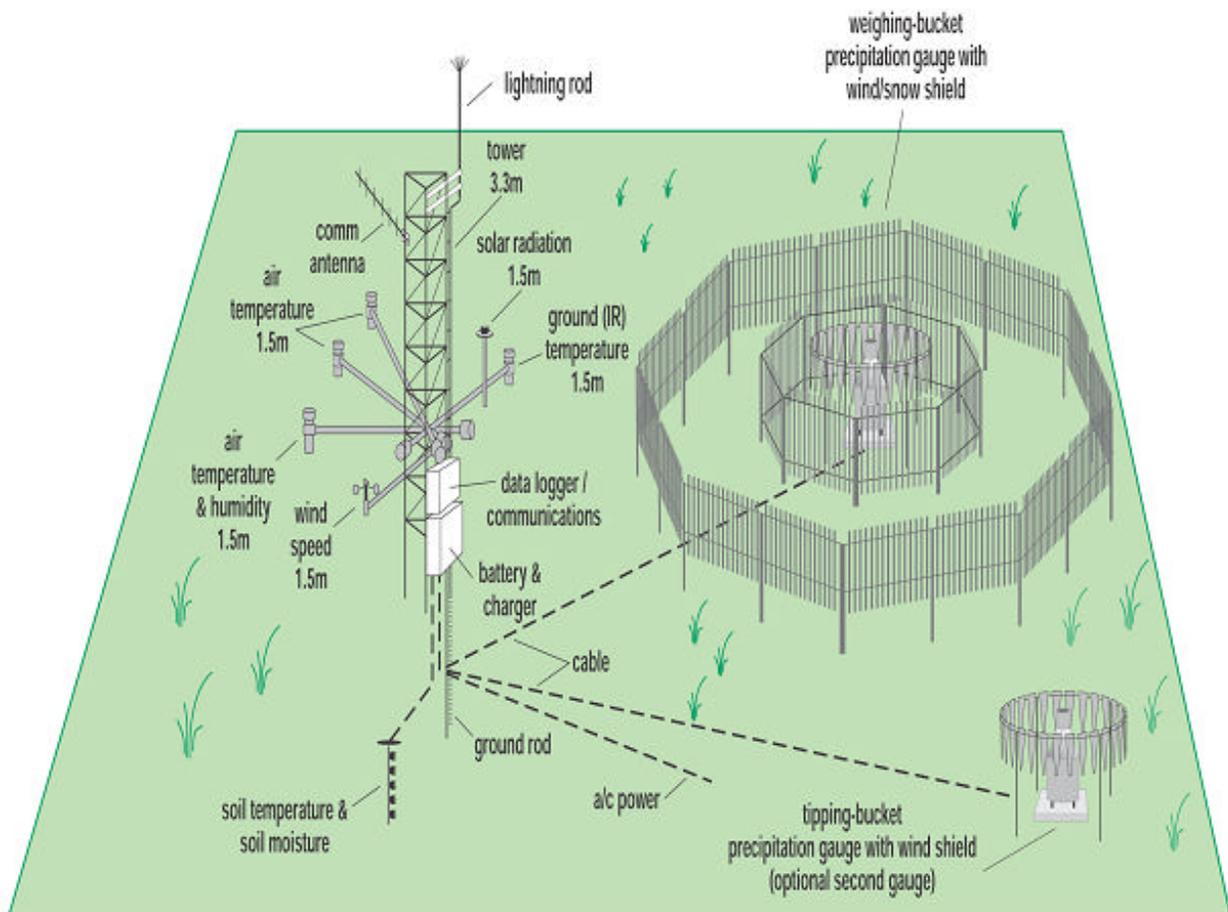


Figure 1. Proposed Typical CRN Station Configuration

The area occupied by an individual instrument suite (site) is not very large, approximately 18 meters \times 18 meters (~60 feet \times ~60 feet). There is a requirement for a nearby source of AC power. However, in some cases where AC power is not available or prohibitively expensive to install, the use of solar panels may be a viable alternative. The preferred installation is to bury

the power cable below the ground. The equipment and sensors are actually operated by DC power from batteries on a trickle charge from the AC or solar power. DC power provides a more stable power source for the sensors and ensures continued operation for several days when there is an AC (or solar) power disruption. The power situation will be examined during the site selection process. Depending on the site, a chain link fence or cattle fence, typically about four or five feet high with a gate, might be installed.

3.2 Site Survey and Preparation

USCRN Program personnel experienced in the preparation of a site and the installation of instruments will visit the site and work with local personnel to prepare the site for installation. Guidance from local personnel can be very helpful in identifying local contractors and acquiring permits that are required to pull AC power (buried cable is preferred), dig holes for concrete pads, pour concrete for the 10m instrument tower pad (about 3' × 3' × 4' deep) and about 53 feet from the tower the precipitation gauge pad (about 2' × 2' × 2.5' deep, or more depending on the local frost depth), and install a fence, if needed. The USCRN Program personnel will perform or supervise all site preparations and equipment installations, and will check out the entire system. The USCRN Program pays all costs associated with site preparation and equipment installation.

Section 4. Site Installation and Maintenance

4.1 The Installation Process

Equipment and instruments undergo extensive calibration and system field-testing prior to delivery and installation at the site. This period of time is about three months long. Steps needed for a USCRN system installation include as a minimum:

- Site Survey - Document (Site Survey Checklist) Potential Site: 1-2 days per location.
- Site Preparation (includes building permits, contract services, engineering drawings, FCC approval, etc.): 1-3 days per site.
- Develop Installation Schedule.
- System Installation and Activation: 3-4 days per instrument site.
- Field Calibration: ½ day per instrument site.
- Operational Test and Evaluation Period (about ~7 months after installation).
- System Final Acceptance and Initiate Routine Maintenance Cycle.

Site Survey, Preparation, and Installation Reports will be completed. Extensive data about the instrument site and the surrounding area will be recorded. Latitude, longitude, and elevation and the distance to and height of significant features surrounding the site will be documented. Digital photographs (360-degree coverage) will be taken during installation. These data will become part of the site's permanent station history file and available to the host organization and other users.

Site preparation may be completed prior to the instrument installation visit, or all site preparation, system installation, and associated activation activities may be combined into one visit. All permits and contracts will be completed prior to arriving to perform the site preparation (start during the Site Survey visit).

4.2 Operational Maintenance

Operational maintenance will consist of maintenance of all installed equipment and instruments and site maintenance.

4.2.1 Equipment and Instrument Maintenance

At a minimum, there will be at least one scheduled annual maintenance visit to each site. This visit will include routine and corrective equipment maintenance and instrument field calibration, diagnosis, replacement, and repair. Sensor and system performance will be routinely monitored and evaluated by NCDC personnel and partners through the examination and analysis of the hourly data transmitted from the site and the Summary of the Day (SOD) statistics. Malfunctioning and damaged equipment and instruments will be repaired or replaced, typically within a few days.

4.2.2 Site Maintenance

The frequency of site maintenance (e.g., mowing, snow removal, trimming weeds along the fence) will be dictated by the location and physical characteristics of each site.

Section 5. Host Organization Activities

Services to be rendered by the host organization will be discussed when negotiating the Site License Agreement. The host organization will identify a local site contact. If conveniently located nearby, this person will be asked to provide periodic (weekly preferred) visual inspections of the site for security reasons, and report physical damage and maintenance needs. In addition, at the request of the USCRN Program Manager, the local person will visually inspect the site when the USCRN Program Staff detects a problem when analyzing the data. The host organization's local representative should immediately contact the USCRN Program Office when there is a security or other physical problem, and will secure the site from further damage (and for personnel safety reasons) until a USCRN Program team member arrives. Other activities the local representative might be asked to perform include:

- Minimum maintenance of the site (i.e. remove broken branches and other debris that fall on the sensors or tower, mow grass, cut weeds along the fence, brush snow off sensors).
- Clean pyranometer (solar radiation sensor).
- Empty rain gauge(s) and remove debris as needed.
- Provide USCRN personnel with access to the site and AC power source.

Read More About the USCRN Program at: <http://www.ncdc.noaa.gov/crn.html>

Appendix A

Instructions for USCRN SITE LICENSE AGREEMENT (SLA)

The Site License Agreement (SLA) has been reviewed and approved by the Office of the General Counsel and the Realty Specialists at the Department of Commerce (DOC), NOAA Legal Counsel, and the NOAA Eastern Administrative Support Center (EASC), Norfolk, VA.

Sometimes, the site survey reveals that the property is not acceptable. The up front work and discussions will in most cases preclude this situation from occurring. This ensures that all parties understand what is being asked of each other before time and travel funds are expended on a trip to the sites. The below sequence of events will help to prevent premature expectation of acceptance before the site review and selection process is completed.

1. Before the Site Survey, the Host Organization reviews the SLA and discusses any potential changes with the lead RCC/SC reps. Unresolved issues or questions should be referred to the USCRN Program Manager.

2. Prior to obtaining a signed SLA, a Site Survey will be conducted. The USCRN Site Review Committee will review the completed Site Survey Checklist, digital photographs, and the Summary Recommendations of the Site Survey Team/RCC. The review committee will either recommend the site for acceptance or not accept the site. The review committee's recommendation will then be presented to the Director, NCDC, for approval. (See Note below)

3. The Host Organization may have a requirement or need to make a *minor modification* to one or more of the SLA paragraphs. When this occurs and before any signatures are obtained, a digital copy of the SLA with the changes annotated must be forwarded to the USCRN Program Manager. The changes will receive a timely (typically less than a week) review by the NOAA Legal Counsel to ensure the essence of the DOC approved format and content has not been significantly altered. The Host Organization will be contacted regarding the outcome of the review and a digital copy of the final wording agreed to by both parties will be forwarded to the Host Organization for signature.

4. The Host Organization signs the SLA and sends it directly to the NCDC USCRN Program Manager, National Climatic Data Center, Federal Building, 151 Patton Avenue, Asheville, NC 28801-5001. The Director, National Climatic Data Center (NCDC), signs the SLA.

5. The original copy will be forwarded to the Realty Section, EASC, Norfolk, VA. The Realty Specialist will sign the SLA and file the original in the EASC files and enter the site information into the "Land View" data base, as required by DOC Regulations. A copy of the SLA with the Realty Signature will be returned to the USCRN Program Manager. The USCRN Program Manager will forward one of the signed copies to the Host Organization and the respective Regional Climate Center (RCC). A copy may be provided by the RCC to the respective State Climatologist (SC) per their respective arrangements. One copy will be filed in the NCDC USCRN Program files. Occasionally, the Host Organization sends more than one original and

requests these extra copies with original signatures are return to the Host Organization. This will be accommodated as requested.

6. Every effort should be made to ensure a complete description of the property is included in the signed SLA. Typically, the description of the property will be included in the second paragraph of the SLA. However, sometimes an SLA is signed without the specific coordinates and other information about the piece of property included in the SLA. In this case, a signed memorandum from the Director, National Climatic Data Center, specifying the description of the property selected will be forwarded to the Host Organization and EASC for attachment to the already signed SLA. A copy of the memo will be retained by the NCDC USCRN Program Manager and attached to the respective signed SLA.

Appendix B

SITE LICENSE AGREEMENT (SLA) FOR THE INSTALLATION AND OPERATION OF THE U. S. CLIMATE REFERENCE NETWORK (USCRN) EQUIPMENT

THIS AGREEMENT, effective as of, _____ (*insert date*), is by and between the _____ (*Insert Host Organization Name*), ("Licensor") and the National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service (NESDIS), National Climatic Data Center (NCDC) ("Licensee").

WHEREAS Licensee desires to install and operate a NOAA U.S. Climate Reference Network (USCRN) meteorological station on Licensor's property (the "Site"); _____

[Insert City, County, State, Zip Code, Latitude, Longitude, and Elevation for EACH SITE (if SLA covers more than one piece of property)]

WHEREAS, Licensor is willing to permit, to the extent that it may do so lawfully, the installation of such USCRN station at the Site for use by Licensee solely for non-commercial operations and in a manner that will maintain the integrity of the Site, under the following terms and conditions;

NOW, THEREFORE, in consideration of the mutual covenants, terms and conditions herein contained, the parties hereto agree as follows:

1. Grant of License.

Licensor hereby grants to Licensee a revocable license, at no charge, to install a NOAA USCRN meteorological station on the Site, solely for non-commercial purposes. Licensor agrees to permit the use of, and access by vehicle to, a small parcel of land (approximately 60 feet by 60 feet) on the Site, for installation of the USCRN station. The design, installation and operation of the USCRN station shall be performed in such a manner as to provide unqualified assurance that the USCRN station will in no way cause or constitute interference with Licensor's activities.

2. Terms and Conditions of License.

This license and the permission granted hereunder to conduct the activities described in Paragraph 1 hereof shall be effective as of the date stated above and shall continue in effect until this Agreement is terminated in writing by either party upon sixty (60) days prior written notice to the other party.

The Licensor recognizes that the USCRN station will be part of a national network which will monitor the climate of the United States over the 21st Century and beyond and which will provide high quality homogeneous data.

The Licensee plans to operate this USCRN station indefinitely. The Licensee agrees to remove all Government equipment within sixty (60) days if so requested, in writing, by Licensor or when the installation is no longer required by the Licensee.

The installation and all maintenance of the USCRN station are to be performed at Licensee's sole expense. Licensee agrees to give Licensor sufficient prior notice each time that Licensee or its contractor performs installation or other work on the USCRN station to allow Licensor to be present, if it so elects, during such work. Provided, however, that Licensee expressly recognizes and agrees that Licensor shall have no liability to Licensee or anyone in connection with or arising from Licensee's installation and maintenance of the station.

In addition, in recognition of the fact that Licensee is a guest on real property, Licensee agrees to fully comply with the policies, procedures, and practices established by Licensor with regard to personnel access and activities while on Licensor's premises. This includes assuring all Licensee personnel requiring access to the Site are properly trained in relevant safety procedures.

Site preparation is to be performed at the Licensee's sole expense. Licensor acknowledges that site preparation may require clearing of trees (typically not requested) and excavation (typically limited to the tower and rain gauge concrete foundations) of the land in the immediate vicinity of the USCRN station (i.e., 60' × 60' parcel of land). It will also require the extension of AC power lines to the station (typically buried) and the erection of security fencing (to be defined by the Licensor and Licensee depending on the site situation). No such clearing of trees or excavation will be done without prior approval from the Licensor and will be discussed during the Site Survey visit.

The USCRN station will be deployed near a source of AC power. Licensor hereby gives permission to Licensee to tap into this AC power source, which is necessary to maintain the integrity of the Site. Licensor has determined not to charge Licensee for USCRN AC power costs, given that the administrative cost of recovering such amount from Licensee would exceed the cost of the AC power used by the USCRN, which is expected to be *de minimis*.

It is anticipated that Licensee's installation and operation of the USCRN station will require access to the Site for a three-day equipment installation period, a one-day twice-yearly service visit thereafter, and site survey activities prior to and during the installation period and during the service visits. Also, in the event of equipment malfunction or damage, brief access will be required for emergency maintenance. For the purpose of such emergency maintenance, Licensor will provide Licensee prompt (within 24 hours) access to its property.

Licensor and Licensee recognize the importance of maintaining Site integrity for among other things, to permit Licensor's future use of the Site and minimize potential impacts from long-term land use and land cover changes on the climate record at the USCRN Site, such as irrigation and tilling of the land near the site, typically within 100 meters. Towards that end, Licensor will report to Licensee within 24 hours any damage to the USCRN station, which Licensor observes. In addition, as a condition of Licensor's granting of this License Agreement, Licensee authorizes Licensor to: (1) maintain the integrity of the USCRN station Site, including mowing vegetation,

where such site maintenance is part of the normal operations of the Licensor, (2) to inspect and, if necessary, clean on a monthly basis the quartz diffuser on the pyranometer, (3) to empty the weighing-bucket rain gauge on a monthly basis and after each rainstorm of ten inches or more, and (4) to maintain written records of this maintenance, including date, time, what was done, and who did the maintenance. Licensee agrees to instruct Licensor on how to inspect and clean the pyranometer diffuser and empty the rain gauge bucket.

3. Licensee's Operations.

The Licensee will be responsible for the negligent acts or omissions of its employees as a result of the USCRN station being installed and operated on Licensor's site pursuant to the Federal Tort Claims Act or other applicable law. Licensee will consider and adjudicate any claims for damages or injury sustained by its personnel in the performance of their official duties in connection with this agreement pursuant to the Federal Employees Compensation Act or other applicable law.

4. No Third Party Beneficiary.

This Agreement is intended to be solely for the benefit of parties hereto and is not intended to be for the benefit of any third party.

5. Default.

In the event of the breach of any term or condition of this Agreement, in addition to its other remedies available under this Agreement or by law, Licensor may cancel this Agreement upon thirty (30) days written notice to Licensee.

6. Removal of Equipment.

In the event this agreement is terminated or canceled for any reason, Licensee shall promptly remove or have removed its equipment and shall leave the area in as good condition as existed at the time the equipment was installed, save the removal of trees and excavation of land.

7. No Assignment or Subletting.

Licensee shall not assign, transfer, or sublet any right or privilege hereby granted without the prior written consent of Licensor.

8. Publicity.

Licensee will distribute the data that is collected from the USCRN station to all public and private users via standard Licensee and National Weather Service data distribution channels.

Licensor will have the option, at its expense, for real-time local display of the USCRN station's data. Licensee will work with Licensor to set up the system to provide local display if this option is exercised.

9. No Waiver.

The failure of Licensor to enforce or insist upon compliance with any of the terms and conditions of this Agreement shall not constitute a general waiver or relinquishment of any such terms or conditions, but the same shall be and remain at all times in full force and effect.

10. Waiver of Compensation

Licensor affirms that, in consideration of Licensee's acceptance of Licensor's performance of the services mentioned in the final paragraph of Section 2 of this Agreement, Licensor will not expect nor demand compensation for those services.

11. Entire Agreement.

This Agreement constitutes the entire agreement between the parties with regard to the license to install and maintain the USCRN station and supersedes all previous and contemporaneous negotiations, understandings, and agreements, written or oral, between the parties. This Agreement may only be amended or modified in writing signed by both parties.

12. Survival.

It is the express intention and agreement of the parties hereto that all covenants, agreements, statements, representations, and warranties made in this Agreement shall survive the execution and delivery of this Agreement.

13. Partial Invalidity.

If any provision of this Agreement is held by a court of competent jurisdiction to be illegal or unenforceable, the illegal or unenforceable provision shall be deemed deleted and the remaining provisions shall continue in full force and effect, provided that the performance, rights, and obligations of the parties under this Agreement are not materially adversely affected by such deletion.

14. Agreement Subject to Federal Law.

Licensee's liability to Licensor or to any third party for damage, injury, or loss arising from Licensee's activities under this license and installation or maintenance of the USCRN station shall be subject to applicable Federal law. Execution of this Agreement in no way constitutes an obligation of funds by Licensee.

IN WITNESS WHEREOF, the parties by their duly authorized representatives have signed this Agreement as of the date stated above.

(Signatures)

FOR: (fill in Licensor/Host Activity Name)

FOR: National Climatic Data Center

Title: _____

Title: Director

Date: _____

Date: _____

EASC Reality Specialist Signature/Date: _____

NOTE: ALL SIGNATURES MUST APPEAR ON A SINGLE (THE SAME) PAGE.

Distribution List

Loc. No.	Organization	Name	Address	Copies
<i>National Oceanic and Atmospheric Administration (NOAA)</i>				
Library and Floor Locations				
001	NOAA OSD Library	c/o Verna Cauley	FB 4, Room 3307	1
344	NOAA NCDC Library	c/o Debra Braun	FED, Room 514, Asheville, NC	2
OSD				
010	NOAA/OSD3	Richard G. Reynolds	FB 4, Room 3308C	1
345	NOAA/OSD3	Richard Brooks	FB 4, Room 3301D	1
NCDC				
346	NOAA/CC11	Bruce Baker	FED, Room 420, Asheville, NC	1
347	NOAA/CC21	Debra Braun	FED, Room 514, Asheville, NC	1
348	NOAA/CC2	David Easterling	FED, Room 516, Asheville, NC	1
349	NOAA/CC3	Michael Helfert	FED, Room 468, Asheville, NC	1
350	NOAA/CC4	John Hughes	FED, Room 420F, Asheville, NC	1
351	NOAA/CC	Thomas Karl	FED, Room 557C, Asheville, NC	1
352	NOAA/CC	Sharon LeDuc	FED, Room 557A, Asheville, NC	1
OAR				
353	NOAA/ARL1	Ray Hosker	P.O. Box 2456, Oak Ridge, TN	1
354	NOAA/ARL1	Tilden Meyers	P.O. Box 2456, Oak Ridge, TN	1
NWS				
355	NOAA/OST32	Doug Gifford	SSMC2, Room 12110	1
NOAA / Computer Sciences Corporation (CSC)				
094	NOAA/CSC – CMO Copy	Kelly Coleman	FB 4, Room 3317	1
096	NOAA/CSC	Linwood Hegele	FB 4, Room 3313	1
097	NOAA/CSC	Wayne Taylor	FB 4, Room 3311	1
098	NOAA/CSC – DCO Copy	c/o Elizabeth Smith	FB 4, Room 2326	2
101	NOAA/CSC	Pong Yu	FB 4, Room 3315	1
173	NOAA/CSC	Kelly Coleman	FB 4, Room 3317	1
205	NOAA/CSC	Forrest Gray	FB 4, Room 3315A	1
NOAA / Short and Associates (S&A)				
356	S&A	Harold Bogin	FB 4, Room 3010E	1
357	S&A	James Bradley	FB 4, Room 3010E	1
358	S&A	Robert Embleton	FB 4, Room 3010E	1
359	S&A	Edwin Hiner	FB 4, Room 3010E	1
360	S&A	Edwin May	FB 4, Room 3010E	1
363	S&A	Steve Short	FB 4, Room 3010E	1
364	S&A	Michael Young	FB 4, Room 3010E	1
375	S&A (at NCDC)	Marjorie McGuirk	Asheville, NC	1

Loc. No.	Organization	Name	Address	Copies
<i>Regional Climate Centers (RCCs)</i>				
365	Southeastern RCC	Mike Janis	Columbia, SC	1
366	High Plains RCC	Ken Hubbard	Lincoln, NB	1
367	Western RCC	Kelly Redmond	Reno, NV	1
368	Western RCC	Dick Reinhardt	Reno, NV	1
TOTAL				35