PORT HUENEME (PHE)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Port Hueneme (PHE)
Audit Dates:	June 30, 1997
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Clark King
Auditor:	Robert A. Baxter

The purpose of this summary is to provide a preliminary report of any significant audit findings. The site is operated by NOAA/ETL. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

The site is in a flat and open area with good exposure. No changes in the site characteristics were noted since the candidate site review performed on May 2, 1997. The site review provided the vista information, therefore, this audit did not repeat those measurements. The results in the audit form reflect the previously noted characteristics.

SYSTEM AUDIT NOTES

1. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.
2. Security has been provided by temporary fencing around the meteorological tower and radar antennas and RASS sources with appropriate warning signage for audio frequency hazards, but not radio frequency hazards. It is recommended signage be added warning of potential radio frequency hazards.
3. The radar transmitter module was resting on the ground under one of the antennas. It is recommended it be mounted off the ground to prevent moisture entry or other problems with it on the ground.

4. At the time of the audit there were two RASS sources not functioning. It was indicated they will be fixed after the audit.
5. All of the RASS transducers were within ±1.0°, however, 3 of the 4 dishes were out of level from 1.3° to 3.3°. Whether the dish being out of level affects the performance of the RASS is unknown. NOAA should explore this potential problem and indicate if it has affected past data and consider leveling the dishes.
6. The base of the meteorological tower is loose and can pivot. This will cause inaccuracies in the reported wind directions. The base should be secured.
7. The site is visited approximately once every four weeks. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

POTENTIAL ACTIVE NOISE SOURCES

Listen only tests showed no active sources.

POTENTIAL PASSIVE NOISE SOURCES

No problems noted

ANTENNA LEVEL AND ALIGNMENT

Other than the RASS level indicated above, no problems were noted.

RADAR PROFILER PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RASS PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RADAR PROFILER DATA INTERNAL CONSISTENCY

Data prior to the audit were reviewed from the ETL web site. Overall, the data look reasonable but there are periods when data from the first one or two gates were erroneous. These data will probably be flagged and removed from the data set during the validation stage. Comparisons to surface winds also looked reasonable.

RASS DATA INTERNAL CONSISTENCY

1. The RASS data appear limited in range when wind speeds were higher. This may be due to the two RASS sources that were faulty.
2. The overall data look reasonable. However, given the coastal environment with low level inversions, it is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project. The current mode of operation is 106 m. This will remove some of the spatial averaging and provide a much clearer picture of the atmosphere. While changing the resolution, the height range should be maintained by increasing the number of range gates collected.

SURFACE METEOROLOGY PERFORMANCE AUDIT

All sensors are scanned every 10 seconds with five minute averages recorded. No problems were noted with the performance audit results. However, not all of the variables could be audited completely. A summary of these audits are provided below:

1. The temperature sensor could not be immersed in water and the probe design was not conducive to placement in a water proof sheath while retaining good thermal conductivity. Only one ambient comparison point was therefore audited.
2. Due to the wiring and the method of sensor installation, the wind direction sensor was not removed from the tower to perform the torque tests. The wind speed torque tests were performed by removing the nose cone and measuring the torque in the shelter. Future installations should consider an alternate installation that will allow for appropriate sensor evaluation.
3. Wind data recorded include scalar wind speed and resultant vector wind direction.

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	NOAA/ETL
SITE NAME AND LOCATION:	Port Hueneme (PHE)
AUDITOR:	Robert A. Baxter
DATE:	June 30, 1997
KEY PERSON:	Clark King

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Radar Profiler	NOAA/ETL	915 MHz	915-32-1	Lo 152 - 2296 m at 58 m inc. Hi 152 - 3905 m at 101 m inc.
Virtual Temperature	RASS	NOAA/ETL	915 MHz	915-32-1	157 - 1628 m at 106 m inc. (see below)
	Audio amplifier	Crest Audio	CA4	NA	NA
10 m Wind Speed	Propeller	RM Young	Wind Monitor		0 - 50 m/s
10 m Wind Direction	Vane	RM Young	Wind Monitor		0 - 355 degrees
2 m ambient temperature	RTD	CSI	CS500	NA	-35 - 50 °C
2 m relative humidity	Solid State	CSI	CS500	NA	0 - 100%
Data Logging	Digital	CSI	CR10	NA	NA

Comments: Given the coastal environment with low level inversions, it is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage.

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? Yes

Do any operating ranges differ from those specified in the SOP? See Below

Are there any significant differences between instrumentation on site and the SOP? No

Comments: Station has solar and net radiation in addition to pressure being monitored. As indicated above the RASS resolution should be increased to about 60 m.

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Communications computer	NOAA	NA	NA	NA
Jaz drive	Iomega	NA	NA	NA

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA

Comments: Station check equipment is carried with the NOAA engineers and not left on site.

II. Sensor/Probe height and Exposure

A. Radar Profiler/RASS/Sodar

Variable	Value	Meet SOP (Yes/No)
1. Orientation (three axis radar antenna)	Radar -- -1°, 0° 10 m Vane -- 1°	Yes
2. Level (level and inclination of the horiz ant)	Radar -- <0.3° RASS -- 3.3°	Yes No
3. Distance to closest obstruction	Not significant	Yes
4. Distance to closest active noise source	No significant active RF sources	Yes

Comments: 2. Three of the four RASS dish levels were out of level. The indicated value above was the furthest out of level.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 m	Yes
2. Distance to nearest obstacle	Nothing significant	Yes
3. Is separation at least 10x obst. height?	Yes	Yes
4. Are instruments on a rooftop?	No	NA
5. Is exposure 1.5x height above roof	NA	NA
6. Arc of unrestricted flow	360°	Yes
7. Height of temp sensor above ground	2 m	Yes
8. Distance of temp sensor from obst.	trailer -- ~12 m	Yes
9. Height of DP/RH sensor above ground	2 m	Yes
10. Distance of DP/RH sensor from obst.	trailer -- ~12 m	Yes
11. Are the distances 4x the obst. height?	Yes	Yes
12. Is the sensor shielded or aspirated?	Shielded	Yes
13. Are the T/DP/RH abv representative terrain?	Yes	Yes
14. Are there significant differences between on-site equipment and the monitoring plan?	No	Yes

Comments: Wind data recorded include scalar wind speed and resultant vector wind direction. All surface sensors are scanned every 10 seconds with five minute averages recorded. The base of the meteorological tower is loose and can pivot. This will cause inaccuracies in the reported wind directions.

12. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.

III. Operation

A. Radar Profiler, RASS and Surface Meteorology

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is all instrumentation operational?	See below	See below
2. Are all cables secure?	Yes	Yes
3. Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4. Are connections clean and rust free?	Yes (see below)	Yes
5. Are serial numbers available?	See below	NA
6. Do data system times agree with audit times. If not, what is the deviation?	Yes	Yes
7. Is the printer functional?	No	Not used
8. Overall, is the site maintenance sufficient to meet the DQOs?	See below	Yes

Comments: 1. Two of the RASS sources were not functional.

4. The radar transmitter module was resting on the ground under one of the antennas. It is recommended it be mounted off the ground to prevent moisture entry or other problems with it on the ground.

5. Did not want to move equipment to get serial numbers.

8. The site is visited approximately every four weeks for routine maintenance. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

B. Radar Profiler/RASS/Sodar Settings

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Software version	POP 4	Yes
2. High mode pulse length	700 ns	Yes
3. Low mode pulse length	400 ns	Yes
4. RASS pulse length	700 ns	Yes
5. Time zone	GMT	Yes
6. Wind data consensus	55 min (see below)	Yes
7. RASS consensus	5 min (see below)	Yes

Comments: 6, 7. The configuration indicated gave a 55 minute wind data consensus but because of the polling of the surface data during the first five minutes of the hour

only gave about a 3.5 minute RASS consensus. Following the audit the RASS, the consensus was increased to 7 minutes to effectively provide a 5.5 minute consensus period (allowing the 1.5 minutes for the surface data polling). This also reduced the wind data consensus from 55 to 53 minutes.

	Wind Low Mode	Wind High Mode	RASS
First Gate	152 m	152 m	157 m
Last Gate	2296 m	3905 m	1628 m
Spacing	58 m	101 m	106 m
Full Scale Velocity	10.2	10.2	NA

Comments: Given the coastal environment with low level inversions, it is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage.

B. Auxiliary Equipment

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2. Is the site temperature recorded?	No	See below
3. Is the site temperature maintained at 20-30°C?	Yes	See below
4. Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5. Does the modem work?	Yes	Yes
6. Does the telephone work?	Yes (see below)	Yes
7. Is the site secure?	Yes (see below)	Yes
8. Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments: 2. There is no measurement of the shelter temperature. It was indicated that the temperature is not critical for the system operation.

6. The telephone is restricted to base communications.

7. Security has been provided by temporary fencing around the meteorological tower and radar antennas and RASS sources with appropriate warning signage for audio frequency hazards, but not radio frequency hazards. It is recommended signage be added warning of potential radio frequency hazards.

C. Station Check Procedures and Documentation

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Are the station logs present?	Yes	Yes
2. Are the station logs up to date?	Yes	Yes
3. Do station logs contain details as required by the SOPs?	Yes	Yes
4. Are routine checklists used?	Yes	Yes
5. Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6. Are the calibration forms present?	No	See below
7. Do the calibration forms contain details as required by the SOPs?	NA	NA
8. Are the SOPs present?	Yes	Yes
9. Are the instrument manuals present?	No	See below
10. Do the SOPs include quality control tests?	Yes	Yes
11. If quality control tests are included then how are the results of the tests documented?	In site checklist	Yes
12. Has the site technician undergone training as specified in the SOPs?	See Below	Yes
13. Is the site visited twice weekly?	No	See below
14. Does the site technician understand the SOPs?	Yes	Yes (see below)

Comments: 6. Calibration records are maintained at NOAA/ETL

9. Manuals are maintained at NOAA/ETL. If repairs are needed then the engineer brings the manuals to the site.

12. There are no site technicians. During most times there is an engineer in the field that travels from site to site for the checks and needed maintenance.

13, 14. The site is visited approximately every four weeks for routine maintenance. In between the visits the data are polled and reviewed on a regular basis. Data are retrieved hourly and reviewed daily. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

D. Chain of Custody

1. Review paper work for chain of custody from field to data processing.	Comments: The site is inspected every four weeks with all data archived at that time. Paperwork older than about two months is forwarded to NOAA/ETL.
2. How are data stored?	Data are stored locally on the computer hard drive with consensus files and surface data transferred on an hourly basis to the communications computer. The files on the communications computer are downloaded to NOAA/ETL on an hourly basis and then erased.
3. How often are the data backed up?	Files are copied to a Jaz drive on an hourly basis. These data are recovered on a monthly basis when the engineer visits the site.

Comments: 1. It is recommended a carbonless or similar form be used for the site checklist. In that manner a copy could be left at the site while the original can be sent back to NOAA/ETL.

V. Preventive Maintenance

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is preventive maintenance discussed in the SOPs?	Yes	Yes
2. Is preventive maintenance being performed?	Yes	Yes
3. Are field operators given special training in preventive maintenance?	Yes	Yes
4. Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	See below	Yes
5. Are maintenance logs maintained and reviewed?	Yes	Yes

Comments: 4. Tools and spares are carried with the field engineers. Some spares such as RASS transducers are stored at various sites throughout the NOAA/ETL network.

VI. Overall Comments

Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1. Overall, is the station maintenance sufficient to meet the DQOs?	Yes	Yes
2. Does the siting meet the program objectives?	Yes	Yes
3. Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4. Does the QC program appear to be working?	Yes	Yes
5. Overall, does the meteorological data look reasonable?	Yes	See below
6. Overall, does the data appear to meet the program objectives?	Yes	Yes

Comments: 5. The RASS data appear limited in range when wind speeds were higher. This may be due to the two RASS sources that were faulty. The overall data look reasonable. However, given the coastal environment with low level inversions, it is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project. The current mode of operation is 106 m. The finer resolution will remove some of the spatial averaging and provide a much clearer picture of the atmosphere. When changing the resolution, the height range should be maintained by increasing the number of range gates collected.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Port Hueneme	Instrument:	NOAA/ETL RWP
Date:	June 30, 1997	Receiver s/n:	915-32-1
Time:	PDT	Interface s/n:	915-32-1
Measurements group:	NOAA/ETL	Firmware version:	POP 4
Key contact:	Clark King	System antenna angles:	054°, 141°
Audited by:	Bob Baxter	Measured orientation:	055°, 141°
Site longitude:	119° 13.20' W	Orientation difference:	-001°, 000°
Site latitude:	34° 09.85' N	Antenna inclination diff:	< 0.3° from 15° on both horizontal, < 0.1° on vertical
Site elevation:	2 m msl	Horizontal beam angle:	15°
Magnetic declination:	15° (appx)	Beam directions:	54°, 141° ind.

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	<2	Trees and Flat sided building at ~500 - 800 m.
NA	30	<2	Trees and power lines at ~800 m
NA	60	2	Power lines, water tank and buildings at ~800 m.
NA	90	2	Flat sided buildings at ~700 m.
NA	120	3	Buildings at ~300 m, brush in the near field.
NA	128	4	Water tower at ~ 1,000 m.
NA	150	5	Buildings and crane at ~200 - 400 m.
NA	164	7	Antenna array at ~400 m.
NA	180	3	Flat sided buildings at ~150 m. This is where the power will be drawn from.
NA	210	5	Power lines and construction equipment at ~200 - 300 m.
NA	240	5	Power lines and trees at ~200 m.
NA	270	6	Power lines at ~150 m. Frequently traveled road.
NA	300	5	Power lines, brush and distant boat masts at ~300 m.
NA	330	4	Power lines, brush and distant boat masts at ~300 m. Road at ~400 m.

Comments: 3 of the 4 dishes were out of level from 1.3° to 3.3°. Above vista taken from the May 2, 1997 survey.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND SPEED

Date: June 30, 1997
Start: 1215 PDT
Finish: 1245 PDT
Auditor: Bob Baxter

Site name: Port Hueneme
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Clark King

Sensor Mfg: R.M. Young
Sensor s/n: unknown
K factor: 2.4
Range: 0 - 50 m/s
Logger: Campbell CR10
Logger s/n: NA
Prop s/n: 49561

Model: Wind Monitor
Sensor Ht.: 10 m
Starting torque: 0.2 gm-cm
Starting Threshold: 0.29 m/s

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WS Calibration Point	M/S Input	M/S Chart	M/S Diff. Chart	M/S DAS	M/S Diff. DAS	% Diff. DAS
1	0.0	#N/A	#N/A	0.0	0.0	#N/A
2	2.5	#N/A	#N/A	2.5	0.0	#N/A
3	7.4	#N/A	#N/A	7.4	0.0	0.0
4	14.7	#N/A	#N/A	14.7	0.0	0.0
5	22.1	#N/A	#N/A	22.1	0.0	0.0

Pass/Fail Criteria: +/-.25 m/s; ws <= 5 m/s
+/- 5%; ws > 5 m/s

Comments: Sensor passed.

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SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND DIRECTION

Date: June 30, 1997
Start: 0915 PDT
Finish: 1200 PDT
Auditor: Bob Baxter

Site name: Port Hueneme
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Clark King

Sensor Mfg: R.M. Young
Serial No.: NA
K Factor: NA
Range: 0 - 355 deg
Logger: Campbell CR10
Logger s/n: NA

Model: Wind Monitor
Sensor Ht.: 10 m
Starting torque: NA gm-cm
Starting threshold: #DIV/0! M/S

Last calibration date: unknown

Crossarm: 178.5 deg true

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WD Audit Point	Degrees Reference	Corrected Degrees Reference	Degrees Chart	Diff. Chart Deg.	Degrees DAS	Linearity	Total Diff DAS Deg.
Orientation	178.5				179.3		0.8
1	45	44.2	#N/A	#N/A	43.2	0.1	-1.0
2	90	89.2	#N/A	#N/A	87.1	-1.0	-2.1
3	135	134.2	#N/A	#N/A	133.6	0.5	-0.6
4	180	179.2	#N/A	#N/A	178.2	0.1	-1.0
5	225	224.2	#N/A	#N/A	224.6	1.5	0.4
6	270	269.2	#N/A	#N/A	266.4	-1.7	-2.8
7	315	314.2	#N/A	#N/A	313.4	0.3	-0.8

Avg difference:		-1.1
Maximum difference:	-1.7	-2.8

Criteria: Orientation: +/- 2 degrees
Linearity: +/- 3 degrees
Maximum Difference: +/- 5 degrees

Comments: Sensor passed error test.
The tower base is loose and can pivot in the wind causing inaccuracies in the wind direction data. The base should be secured.
The wind direction threshold could not be checked without removing the sensor from the tower. Due to the method of installation it was decided not to remove the sensor.

Phe

SCOS97-NARSTO AUDIT RECORD
AMBIENT TEMPERATURE

Date: June 30, 1997
Start: 1403 PDT
Finish: 1403 PDT
Auditor: Bob Baxter

Site name: Port Hueneme
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Clark King

Sensor Mfg: Cambell Scientific
Serial No.: NA
Range: -35 - 50 Deg C

Model: CS500
Sensor Ht.: 2 m

Logger: Campbell CR10
Logger s/n: NA

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	21.4	#N/A	#N/A	21.8	0.4
2	0.0	#N/A	#N/A	0.0	0.0
3	0.0	#N/A	#N/A	0.0	0.0

Criteria: +/- 0.5 degree Celsius

Comments: The sensor could not be immersed in water. When placed in a water proof sheath, there was not enough heat transfer to perform the audit. A single point comparison was performed which showed acceptable results.

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SCOS97-NARSTO AUDIT RECORD
RELATIVE HUMIDITY (DEW POINT TEMPERATURE)

Date: June 30, 1997
Start: 0955 PDT
Finish: 1000 PDT
Auditor: Bob Baxter

Site name: Port Hueneme
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Clark King

Sensor Mfg: Campbell Scientific
Serial No.: unknown
Range: 0 - 100 Percent

Model: CS500
Sensor Ht.: 2 m

Logger: Campbell CR10
Logger s/n: NA

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

RH/DP Audit Point	%RH Input	Deg C Input	% RH Chart	Deg C Chart	Deg C Diff. Chart	%RH DAS	Deg C DAS	Deg C Diff. DAS
1	67.8	14.0	#N/A	#N/A	#N/A	68.1	14.1	0.1

Criteria: +/- 1.5 degree Celsius

Comments: The calibration date is unknown, but the sensor is new. Sensor passed criteria.

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POINT LOMA (PTL)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Point Loma
Audit Dates:	7/17/97 to 7/19/97
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Jean Timmerman
Auditor:	Alexander N. Barnett

The purpose of this summary is to provide a preliminary report of any significant audit findings. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

The site is on the ocean side of the U.S. Naval Command, Control, and Ocean Surveillance Center facility located on Point Loma. The site is on a sea cliff at the base of a drainage that is approximately 100 meters wide and 75 meters from the top to the RWP location . The elevation of the RWP above sea level is 23 meters. A ridge line, that defines the top of the Point Loma Peninsula, is approximately 400 to 500 meters from the site running from the North to the East side.

SYSTEM AUDIT NOTES

1. The low mode winds are collected at 100 meter intervals with 100 meter pulse lengths. The high mode winds are collected at 200 meter intervals with 400 meter pulse lengths. The SCOS97 project recommends that the RWP winds to be collected at 60 meter intervals in the low mode and 100 meter intervals in the high mode to provide better resolution at the lower altitudes. When set to collect data at 60 meter intervals the data was variable and did not reach up very high. It was recommended by the manufacturer that the RWP be operated in the present mode to compensate for the ground clutter that occurs in the northeast beam due to its orientation toward the ridge line. Although resolution is lost in the lower levels, better data capture is noted at higher levels. See comment 7 below.

2. The RASS virtual temperature data is collected at 100 meter intervals. Although the SCOS97 project recommends that the RASS data to be collected at 60 meter intervals to provide better resolution in the lower layers, the data accuracy suffers from the ground clutter that is present in the northeast beam. See comment 7 below.
3. It is recommended that the hardware technicians mark the position of the RWP antenna foot pads to provide a quick check of the antenna orientation. Movement away from the marks will indicate that the antenna has moved and requires repositioning.
4. A procedure for filling out the site documentation (station log book and checklist) should be added to the SDAPCD RWP/RASS SOP to ensure that all actions are performed completely and consistently during each site check.
5. A procedure for checking the level and orientation of the RWP antenna, and the level of the RASS acoustic sources should be added to the SDAPCD RWP/RASS SOP to ensure that it is performed completely and consistently during each site check.
6. Ear protection should be provided. All persons working in close proximity to the antennas during the RASS data collection period should have appropriate ear protection to protect their hearing.
7. Ground clutter is apparent in the first 500 meters of the low mode wind data collected by the northeast beam. This beam is pointed toward the Point Loma ridge line. These passive noise sources will affect both the wind speed and wind direction values. Reorienting the RWP antenna should be considered so that both oblique beams point out to sea.
8. The wind and virtual temperature data collected at this site are representative of the seaward conditions of the Point Loma ridge and are not representative of the conditions in the greater San Diego basin.

POTENTIAL ACTIVE NOISE SOURCES

A scan of the frequencies between 914 and 916 mHz revealed a large number of carriers. The carriers are assumed to be from the naval communications and radar operations in the area. It was not apparent if the carriers were influencing the readings.

POTENTIAL PASSIVE NOISE SOURCES

The cliffs and hills to the north through east side of the site present potential reflective surfaces to the northeast beam. A review of the data showed ground clutter to approximately 500 meters in the northeast antenna data in the low mode of

operation. The northeast antenna data in the high mode of operation did not show ground clutter, but the spectral peak for these range gates appeared smoothed and translated toward lower values.

ANTENNA LEVEL AND ALIGNMENT

1. The RWP antenna alignment was set to 26° true, the audit measured pointing direction was determined to be 33° true, a difference of -7° true. The pointing direction was corrected following the audit. No further action is required.
2. The north acoustic source antenna level as found to be 3.8° in the east-west direction. This exceeded the audit criteria of ± 1.0°.
3. The south acoustic source antenna level as found to be 1.4° in the east-west direction. This exceeded the audit criteria of ± 1.0°.

RADAR PROFILER PERFORMANCE AUDIT

In the low mode of operation the RWP data did not compare well with the audit sodar data below 538 meters. This is the layer that is affected by ground clutter in the northeast antenna. In the high mode of operation the RWP and sodar data overlapped at 339 and 532 meters. The readings at these levels showed good agreement.

RASS PERFORMANCE AUDIT

A preliminary comparison of the RASS and audit rawinsonde virtual temperature data showed a good comparison. From the morning comparison (09:00 PST) the RASS data over estimated the thickness of the elevated inversion, as compared with the rawinsonde sounding, at the upper limit.

RADAR PROFILER DATA INTERNAL CONSISTENCY

There appeared to be ground clutter in the northeast beam due to the cliffs and hills in that direction up to approximately 500 meters.

The spectral data showed what appeared to be a dry layer that was characterized by clutter. The low mode of operation (100 meter range gates and 100 meter pulse lengths) showed the bottom of this layer to be at approximately 850 meters. The high mode of operation (200 meter range gates with 400 meter pulse lengths) put the bottom of this layer at approximately 1750 meters.

RASS DATA INTERNAL CONSISTENCY

No problems noted.

SURFACE METEOROLOGICAL MEASUREMENTS

No surface measurements at this site.

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	SDAPCD
SITE NAME AND LOCATION:	Point Loma (PTL)
AUDITOR:	Alexander N. Barnett
DATE:	July 18, 1997
KEY PERSON:	Jean Timmerman

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Radar Profiler	Radian	LAP-3000	7245	Lo 154 - 2559 m at 96 m inc. Hi 339 - 3995 m at 192 m inc.
Virtual Temperature	RASS	Radian	LAP-3000	7241	165 - 1531 m at 104 m inc. (see below)
RASS Amp.	Audio amplifier	Peavey	CS-800x	NA	NA
10 m Wind Speed	Propeller	NA			
10 m Wind Direction	Vane	NA			
2 m ambient temperature	RTD	NA			
2 m relative humidity	Solid State	NA			
Data Logging	Digital	NA			

Comments: It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage.

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? Yes

Do any operating ranges differ from those specified in the SOP? See Below

Are there any significant differences between instrumentation on site and the SOP? No

Comments:

1. The high mode of operation is set to give 200 m winds using 400 m pulse lengths.
2. As indicated above the RASS resolution should be increased to about 60 m and the RWP wind resolution should be changed to 60 and 100 m.

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Communications computer	IBM	466DX2/Tp	NA	NA
RWP computer	IBM	466DX2/Tp	NA	NA
RASS amplifier	Peavey	CS 800x	NA	NA
Power conditioner	Tripplite	BC900LAN	NA	NA
Backup Device	Conner[1]			NA

Comments:

1. Backup is a portable unit that is brought to the site every six weeks for the data backup.

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
NA[1]	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA

Comments:

1. Station check equipment is carried with the SDAPCD technicians and not left on site.

II. Sensor/Probe height and Exposure

A. Radar Profiler/RASS/Sodar

Variable	Value	Meet SOP (Yes/No)
1. Orientation	Radar – 7°	No
2. Level (level and inclination of the horiz ant)	Radar – 0.0°,0.4° RASS – 3.8°	Yes No
3. Distance to closest obstruction	Not significant	Yes
4. Distance to closest active noise source	Numerous active RF sources between 914 and 916 mHz	Yes

Comments:

1. The orientation of one of the radar profiler antennas was off by 7°. There was a discrepancy between the readings of the auditor and site operator on the actual directions. This was resolved through a series of comparisons and identifying a potential nonlinearity and/or magnetic interference in the electronic compass used by the site operator.
2. The south RASS dish was out of level by 1.4°. The north RASS dish was out of level by 3.8°.

4. There were numerous RF sources detected between 914 and 916 mHz. None were noted on the RWP output frequency of 915 mHz. The data should be checked for transient offsets that may be caused by RF interference.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	NA	
2. Distance to nearest obstacle	NA	
3. Is separation at least 10x obst. Height?	NA	
4. Are instruments on a rooftop?	NA	
5. Is exposure 1.5x height above roof	NA	
6. Arc of unrestricted flow	NA	
7. Height of temp sensor above ground	NA	
8. Distance of temp sensor from obst.	NA	
9. Height of DP/RH sensor above ground	NA	
10. Distance of DP/RH sensor from obst.	NA	
11. Are the distances 4x the obst. height?	NA	
12. Is the sensor shielded or aspirated?	NA	
13. Are the T/DP/RH abv representative terrain?	NA	
14. Are there significant differences between on-site equipment and the monitoring plan?	NA	

Comments: No surface meteorological measurements.

III. Operation

A. Radar Profiler, RASS and Surface Meteorology

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is all instrumentation operational?	Yes	Yes
2. Are all cables secure?	Yes	Yes
3. Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4. Are connections clean and rust free?	Yes	Yes
5. Are serial numbers available?	Yes	Yes
6. Do data system times agree with audit times. If not, what is the deviation?	Yes	Yes
7. Is the printer functional?	NA	NA
8. Overall, is the site maintenance sufficient to meet the DQOs?	See below	Yes

Comments:

6. RWP and gateway computer clocks are within 30 seconds of each other. The RWP and gateway computer clocks are within 2 minutes of the atomic clock.

8. The site is visited approximately every three weeks for routine maintenance. There is a potential for problems to occur such as RASS source failure that would go unnoticed for up to three weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

B. Radar Profiler/RASS/Sodar Settings

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Software version	POP 4.1	Yes
2. High mode pulse length	2800 ns	Yes
3. Low mode pulse length	700 ns	Yes
4. RASS pulse length	700 ns	Yes
5. RASS acoustic temperature Range?	6.72 - 36.88°C	Yes
6. RASS acoustic source range?	10.04 - 35.06°C	Yes
7. Time zone	PST	Yes
8. Wind data consensus	55 min	Yes
9. RASS consensus	5 min	Yes

Comments:

	Wind Low Mode	Wind High Mode	RASS
First Gate	154 m	339 m	165 m
Last Gate	2559 m	3995 m	1531 m
Pulse Length	96 m	384 m	104 m
Spacing	96 m	196 m	104 m
Full Scale Velocity	10.2 m/s	10.2 m/s	409.8 m/s

Comments: It is recommended the RASS and RWP winds be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage.

B. Auxiliary Equipment

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2. Is the site temperature recorded?	No	See below
3. Is the site temperature maintained at 20-30°C?	Yes	See below
4. Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5. Does the modem work?	Yes	Yes
6. Does the telephone work?	Yes	Yes
7. Is the site secure?	Yes	Yes
8. Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments:

2. There is no measurement of the shelter temperature. It was indicated that the temperature is not critical for the system operation.

C. Station Check Procedures and Documentation

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Are the station logs present?	Yes	Yes
2. Are the station logs up to date?	Yes	Yes
3. Do station logs contain details as required by the SOPs?	Yes	Yes
4. Are routine checklists used?	Yes	Yes
5. Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6. Are the calibration forms present?	NA	NA
7. Do the calibration forms contain details as required by the SOPs?	NA	NA
8. Are the SOPs present?	No	No
9. Are the instrument manuals present?	No	See below
10. Do the SOPs include quality control tests?	Yes	Yes
11. If quality control tests are included then how are the results of the tests documented?	In site checklist	Yes
12. Has the site technician undergone training as specified in the SOPs?	Yes	Yes
13. Is the site visited twice weekly?	No	See below
14. Does the site technician understand the SOPs?	Yes	Yes (see below)

Comments:

8. SOPs should be kept at the site for reference of all personnel who visit the site.
9. Manuals are maintained at SDAPCD. If repairs are needed then the technician brings the manuals to the site.
10. There are hardware technicians and a software specialist. The hardware technicians visit the site every three weeks to verify the antenna and RASS source set ups and condition and to ensure that they are functioning properly. The software specialist visits the site every 6 weeks to back up the data and to ensure that the profiler controller and computers are operating properly. It is also the software specialist's duty to review the data three times daily to detect malfunctions in a timely manner.

13, 14. The site is visited approximately every three weeks for routine maintenance. In between the visits the data are polled and reviewed on a regular basis. Data are retrieved hourly and reviewed three times daily. There is a potential for problems to occur such as RASS source failure that would go unnoticed for up to three weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

D. Chain of Custody

1. Review paper work for chain of custody from field to data processing.	Comments: The checklist data backup and transfer information. This is a new procedure that is now in place.
2. How are data stored?	Data are stored locally on the computer hard drive with consensus files and surface data transferred on an hourly basis to the communications computer. The files on the communications computer are downloaded to SDAPCD on an hourly basis and then erased.
3. How often are the data backed up?	Files are copied to a portable tape backup drive every six weeks and taken back to the SDAPCD offices by the software specialist.

Comments:

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is preventive maintenance discussed in the SOPs?	Yes	Yes
2. Is preventive maintenance being performed?	Yes	Yes
3. Are field operators given special training in preventive maintenance?	Yes	Yes
4. Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	See below	Yes
5. Are maintenance logs maintained and reviewed?	Yes	Yes

Comments:

4. Tools and spares are carried with the field technicians.

VI. Overall Comments

Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1. Overall, is the station maintenance sufficient to meet the DQOs?	Yes	Yes
2. Does the siting meet the program objectives?	Yes	Yes
3. Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4. Does the QC program appear to be working?	Yes	Yes
5. Overall, does the meteorological data look reasonable?	Yes	See below
6. Overall, does the data appear to meet the program objectives?	Yes	Yes

Comments:

5. During the period of the audit the vertical extent of the RASS data looked limited. Whether this was due to the current meteorological conditions or the partially covered RASS source dish on the north side is unknown. A review of RASS data collected over the last 4 to 5 days showed a capability to about 800 meters, on the average. It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project. The current mode of operation is 106 m. The finer resolution will remove some of the spatial averaging and provide a much clearer picture of the atmosphere. When changing the resolution, the height range should be maintained by increasing the number of range gates collected.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Point Loma	Instrument:	LAP-3000
Date:	7/17/97 - 7/19/97	Receiver s/n:	7245
Time:		Interface s/n:	7241
Measurements group:	SDAPCD	Frimware version:	POP-4.1
Key contact:	Jean Timmerman	System rotation angle:	26° True
Audited by:	Alex Barnett	Measured orientation:	33° True
Site longitude:	117° 15.21'W	Orientation difference:	-7°
Site latitude:	32° 41.81'N	Array level:	E-W: 0.0° N-S: 0.4°
Site elevation:	23 meters	Beam zenith angle:	23.6°
Magnetic declination:		Beam directions:	26° & 296°

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	20	Cliff at 75 meters.
NA	30	25	Cliff at 75 meters, hill w/tower at 400 - 500 meters.
NA	60	25	Cliff at 75 meters, hill w/tower at 400 - 500 meters.
NA	90	30	Hill at 50 meters.
NA	120	35	Hill at 100 meters, hill at 400 meters.
NA	150	45	Hill at 50 meters.
NA	180	45	Hill at 50 meters, building w/radome at 100 meters.
NA	210	75	Hill at 50 meters, wooden pole at 100 meters.
NA	240	10	Wooden platform w/met sensors at 40 meters.
NA	270	<2	Ocean.
NA	300	<2	Ocean.
NA	330	<2	Ocean.

Comments:

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: Point Loma
Date: July 17 - 19, 1997
Measurements Group: SDAPCD
Radar Profiler: Radian Inc. Model Lap-3000
Audit Sodar: AeroVironment Model 2000

High Mode of Operations

Overall Difference Radar Profiler - Sodar	Wind Dir. (deg)
Average:	-10
Maximum:	96
Minimum:	-39
Standard Deviation:	30
Root Mean Square (RMS):	31

		Wind Dir. Difference (deg, Radar Profiler - Sodar) Level (m)				
Date	Hour	339	532			
7/18/97	18:15	-10				
	19:15	-1	10			
	20:15		-39			
	21:15	-28				
	22:15	-23				
	23:15	-24				
7/18/97	0:15	-21	-19			
	1:15		-24			
	2:15					
	3:15					
	4:15					
	5:15		-16			
	6:15		-13			
	7:15		-14			
	8:15	-16	-21			
	9:15					
	10:15					
	11:15					
	12:15					
	13:15					
	14:15					
	15:15					
	16:15					
	17:15					
	18:15					
	19:15					
	20:15					
	21:15					
	22:15					
	23:15					
7/19/97	0:15					
	1:15					
	2:15					
	3:15					
	4:15					
	5:15					
	6:15					
	7:15					
	8:15					
	9:15	96				
	Average:	-3.4	-17			
	Maximum:	95.8	10			
	Minimum:	-28.1	-39			
	Std Dev:	41.0	14			
	RMS:	38.5	21			

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: Point Loma
Date: July 17 - 19, 1997
Measurements Group: SDAPCD
Radar Profiler: Radian Inc. Model Lap-3000
Audit Sodar: AeroVironment Model 2000

High Mode of Operations

Overall Difference Radar Profiler - Sodar	Wind Speed (m/s)
Average:	-0.8
Maximum:	0.0
Minimum:	-2.8
Standard Deviation:	0.7
Root Mean Square (RMS):	1.1

		Wind Speed Difference (m/s, Radar Profiler - Sodar) Level (m)				
Date	Hour	339	532			
7/18/97	18:15	-0.4				
	19:15	-1.1	-2.8			
	20:15		-1.6			
	21:15	-0.9				
	22:15	-0.7				
	23:15	-0.4				
7/18/97	0:15	-0.2	0.0			
	1:15		-0.3			
	2:15					
	3:15					
	4:15					
	5:15		-0.5			
	6:15		-0.7			
	7:15		-0.9			
	8:15	-1.9	-0.8			
	9:15					
	10:15					
	11:15					
	12:15					
	13:15					
	14:15					
	15:15					
	16:15					
	17:15					
	18:15					
	19:15					
	20:15					
	21:15					
	22:15					
	23:15					
7/19/97	0:15					
	1:15					
	2:15					
	3:15					
	4:15					
	5:15					
	6:15					
	7:15					
	8:15					
	9:15	-0.2				
	Average:	-0.7	-1.0			
	Maximum:	-0.2	0.0			
	Minimum:	-1.9	-2.8			
	Std Dev:	0.6	0.9			
	RMS:	0.9	1.3			

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Direction Comparison

Site: Point Loma
Date: July 17 - 19, 1997
Measurements Group: SDAPCD
Radar Profiler: Radian Inc. Model Lap-3000
Audit Sodar: AeroVironment Model 2000

Low Mode of Operation

Overall Difference Radar Profiler - Sodar	Wind Dir. (deg)
Average:	-44
Maximum:	-5
Minimum:	-137
Standard Deviation:	41
Root Mean Square (RMS):	59

		Wind Dir. Difference (deg, Radar Profiler - Sodar) Level (m)					
Date	Hour	154	250	346	442	538	635
7/17/97	18:15			-16	-25		
	19:15		-9	-5		-5	
	20:15					-40	-18
	21:15			-25	-42		
	22:15				-13		
	23:15	-122		-23			
07/18/97	0:15				-15	-23	
	1:15				-21	-24	
	2:15						
	3:15	-32					
	4:15	-54					
	5:15	-93				-16	
	6:15	-113	-57			-10	
	7:15	-116	-64			-11	
	8:15	-137	-115			-20	
	9:15						
	10:15						
	11:15						
	12:15						
	13:15						
	14:15						
	15:15						
	16:15						
	17:15						
	18:15						
	19:15						
	20:15						
	21:15						
	22:15						
	23:15						
07/19/97	0:15						
	1:15						
	2:15						
	3:15						
	4:15						
	5:15						
	6:15						
	7:15						
	8:15						
	9:15						
	Average:	-95	-61	-17	-23	-19	-18
	Maximum:	-32	-9	-5	-13	-5	-18
	Minimum:	-137	-115	-25	-42	-40	-18
	Std Dev:	38	44	9	12	11	
	RMS:	102	72	19	25	21	

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: Point Loma
Date: July 17 - 19, 1997
Measurements Group: SDAPCD
Radar Profiler: Radian Inc. Model Lap-3000
Audit Sodar: AeroVironment Model 2000

Low Mode of Operation

Overall Difference Radar Profiler - Sodar	Wind Speed (m/s)
Average:	-1.5
Maximum:	0.1
Minimum:	-5.1
Standard Deviation:	1.5
Root Mean Square (RMS):	2.1

		Wind Speed Difference (m/s, Radar Profiler - Sodar) Level (m)					
Date	Hour	154	250	346	442	538	635
7/17/97	18:15			-0.2	-0.3		
	19:15		-1.2	-1.0		-2.2	
	20:15					-1.3	-1.1
	21:15			-0.8	-0.3		
	22:15				-0.5		
	23:15	-2.1		-0.6			
07/18/97	0:15				0.1	0.1	
	1:15				-0.6	-0.1	
	2:15						
	3:15	-1.2					
	4:15	-0.2					
	5:15	-2.3				-0.6	
	6:15	-2.4	-5.1			-0.8	
	7:15	-3.0	-5.0			-1.1	
	8:15	-3.1	-5.1			-0.9	
	9:15						
	10:15						
	11:15						
	12:15						
	13:15						
	14:15						
	15:15						
	16:15						
	17:15						
	18:15						
	19:15						
	20:15						
	21:15						
	22:15						
	23:15						
07/19/97	0:15						
	1:15						
	2:15						
	3:15						
	4:15						
	5:15						
	6:15						
	7:15						
	8:15						
	9:15						
	Average:	-2.0	-4.1	-0.6	-0.3	-0.9	-1.1
	Maximum:	-0.2	-1.2	-0.2	0.1	0.1	-1.1
	Minimum:	-3.1	-5.1	-1.0	-0.6	-2.2	-1.1
	Std Dev:	1.0	1.9	0.4	0.2	0.7	
	RMS:	2.3	4.4	0.7	0.4	1.1	

SCOS97-NARSTO Audit Report
Radar Profiler - Rawinsonde Wind Comparison

Site: Point Loma
Date: July 17-18, 1997
Measurements Group: SDAPCD
Radar Profiler: Radian LAP-3000
Audit Rawinsonde: VIZ Model W-9000

High Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	-1.2
Maximum:	2.4
Minimum:	-9.1
Standard Deviation:	2.2
Root Mean Square:	2.5

High Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	-1
Maximum:	39
Minimum:	-26
Standard Deviation:	14
Root Mean Square:	14

WS Difference (m/s)		
Altitude	7/17/97 1600	7/18/97 1000
339	0.2	-2.9
531	-2.5	-1.2
723	-8.2	0.2
915	-9.1	-0.6
1107	-2.5	-1.4
1299	0.0	-1.3
1491	1.3	-1.2
1683	1.3	0.3
1875	0.8	-0.6
2067	-0.4	-0.8
2259	-0.3	-1.9
2451	-0.9	-1.7
2643	0.2	-3.5
2835	0.7	-2.7
3027	0.4	-2.4
3219	0.2	-3.1
3411	-0.3	-2.1
3603	0.1	-1.1
3795	0.5	2.4
Average:	-1.0	-1.3
Maximum:	1.3	2.4
Minimum:	-9.1	-3.5
Std Dev:	2.9	1.4
RMS:	3.0	1.9

WD Difference (deg)		
Altitude	7/17/97 1600	7/18/97 1000
339	33.9	-11
531	-10.0	1
723	-17.0	-26
915	-14.7	-22
1107	-0.4	-8
1299	14.4	18
1491	6.6	39
1683	-5.4	1
1875	1.8	-21
2067	-12.5	-16
2259	-9.1	-16
2451	-10.6	0
2643	7.1	14
2835	4.2	3
3027	14.2	-2
3219	10.0	6
3411	-3.0	10
3603	-9.2	3
3795	-6.6	-8
Average:	0	-2
Maximum:	34	39
Minimum:	-17	-26
Std Dev:	13	16
RMS:	12	16

Comments:

SCOS97-NARSTO Audit Report
Radar Profiler - Rawinsonde Wind Comparison

Site: Point Loma
Date: July 17-19, 1997
Measurements Group: SDAPCD
Radar Profiler: Radian LAP-3000
Audit Rawinsonde: VIZ Model W-9000

Low Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	-1.5
Maximum:	2.0
Minimum:	-5.5
Standard Deviation:	1.7
Root Mean Square:	2.2

Low Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	-2
Maximum:	37
Minimum:	-34
Standard Deviation:	19
Root Mean Square:	19

WS Difference (m/s)		
Altitude	7/17/97 1600	7/18/97 1000
154	-2.6	
250	-1.6	
346		
442		-3.3
538	-2.2	-0.3
634	-4.5	1.0
730	-4.3	-1.3
826	-5.5	-2.0
922	-4.6	-0.5
1018	-1.3	0.0
1114	2.0	-1.6
1210		-1.4
1306		-0.8
1402		-0.8
1498		-1.3
1594		-0.2
1690		
1786		
1882		-0.7
1978		-1.1
2074		-0.9
2170		-1.3
2266		-1.4
2362		-0.8
2458		-0.5
Average:	-2.7	-1.0
Maximum:	2.0	1.0
Minimum:	-5.5	-3.3
Std Dev:	2.3	0.9
RMS:	3.5	1.3

WD Difference (deg)		
Altitude	7/17/97 1600	7/18/97 1000
154	20	
250	28	
346		
442		-6
538	-20	4
634	-18	-11
730	-14	-13
826	-16	21
922	-15	7
1018	-7	-15
1114	0	-6
1210		17
1306		21
1402		35
1498		37
1594		11
1690		
1786		
1882		-25
1978		-1
2074		-34
2170		-34
2266		-14
2362		-16
2458		7
Average:	-5	-1
Maximum:	28	37
Minimum:	-20	-34
Std Dev:	17	20
RMS:	17	20

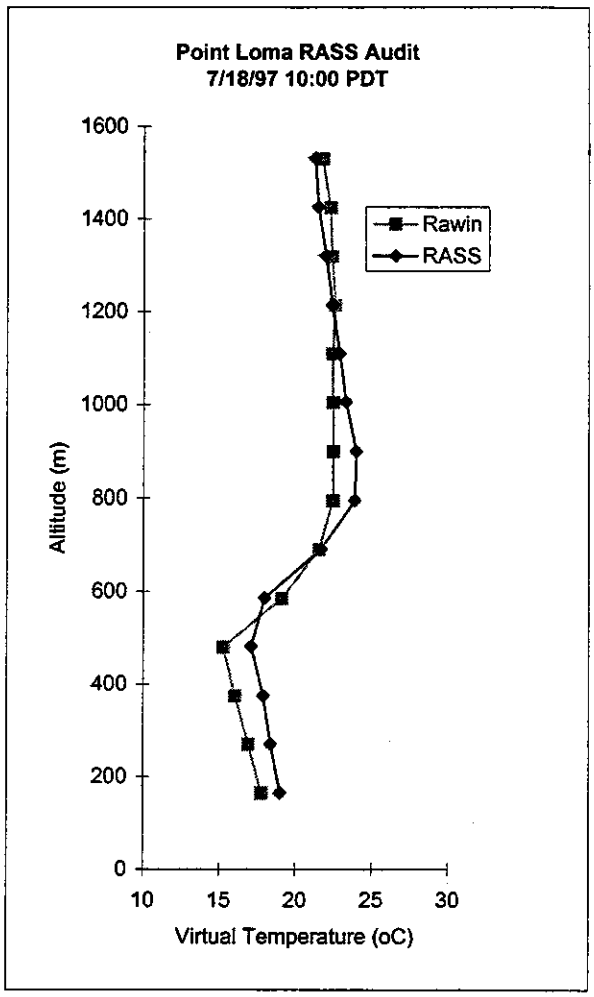
SCOS97-NARSTO Audit Report
RASS - Rawinsonde Virtual Temperature Comparison

Date: 7/18/97
Start: 0:00 PDT
End: 0:41 PDT
Key Person: Jean Timmerman
Auditor: Alex Barnett

Site Name: Pt. Loma
Project: Upper-Air Audit
Measurement Org.: SDAPCD

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1531	21.3	21.8	-0.5
1426	21.5	22.3	-0.8
1321	22.0	22.4	-0.4
1215	22.4	22.6	-0.2
1110	22.9	22.4	0.5
1006	23.3	22.4	0.9
900	24.0	22.5	1.5
795	23.9	22.5	1.5
691	21.7	21.6	0.1
586	18.0	19.1	-1.1
481	17.1	15.3	1.8
375	17.9	16.1	1.9
271	18.4	16.9	1.5
165	19.0	17.8	1.2



Results Summary

Ave. Diff. :	0.6
Std. Dev. :	1.0
Max Diff. :	1.9
Min. Diff. :	-1.1

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	1535571
Td offset (oC):	-2.5
RH offset (%)	-10.0
Sonde Pressure (mb):	1009.9
Ref Pressure (mb):	1010.0
Difference (mb):	-0.1

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

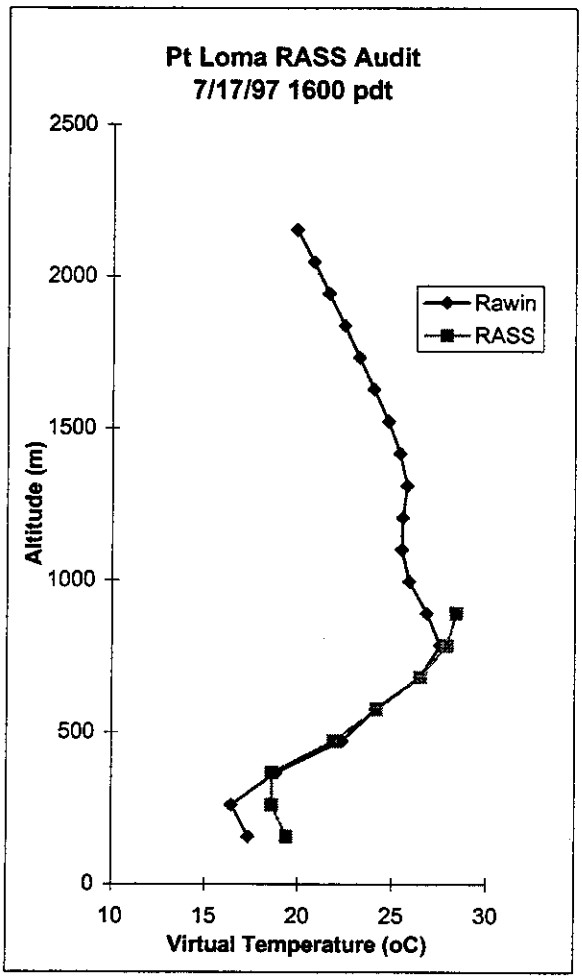
SCOS97-NARSTO Audit Report
RASS - Rawinsonde Virtual Temperature Comparison

Date: 7/17/97
Start: 6:00 PDT
End: 6:45 PDT
Key Person: Jean Timmerman
Auditor: Alex Barnett

Site Name: Pt. Loma
Project: Upper-Air Audit
Measurement Org.: SDAPCD

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
2152	9999	19.8	NA
2047	9999	20.8	NA
1942	9999	21.6	NA
1837	9999	22.4	NA
1732	9999	23.2	NA
1627	9999	24.0	NA
1522	9999	24.8	NA
1417	9999	25.4	NA
1312	9999	25.8	NA
1207	9999	25.5	NA
1102	9999	25.5	NA
997	9999	25.9	NA
892	28.4	26.8	1.6
787	27.9	27.5	0.4
682	26.5	26.5	0.0
577	24.2	24.1	0.1
472	21.9	22.3	-0.4
367	18.6	18.8	-0.2
262	18.6	16.4	2.2
157	19.4	17.4	2.0



Results Summary

Ave. Diff. :	0.7
Std. Dev. :	1.1
Max. Diff. :	2.2
Min. Diff. :	-0.4

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	1535610
Td offset (oC):	1.1
RH offset (%)	-6.0
Sonde Pressure (mb):	1009.1
Ref Pressure (mb):	1009.5
Difference (mb):	-0.4

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

RIVERSIDE (RSD)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Riverside (RSD)
Audit Dates:	June 18, 1997
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Tim Dye, Steve Lim
Auditor:	Robert A. Baxter

The purpose of this summary is to provide a preliminary report of any significant audit findings. The audit was performed immediately following the STI training of the site technician. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

The site is at a water treatment plant with good exposure in the southern directions. There are some surrounding buildings that could produce reflections but the beam directions are away from the tallest objects.

SYSTEM AUDIT NOTES

1. The surface meteorological measurements do not meet the siting criteria due to the mounting on top of a building. This siting will affect the accuracy of wind speed, wind direction, temperature and relative humidity information. It was indicated the data will only be used for QC of the profiler data. A different surface meteorological site, less than 0.5 km to the east, will provide the primary surface data.
2. There was no specific place in the site checklist to document the QC checks performed by the technician (reasonableness checks of wind speed, wind direction and temperature). As indicated at the Barstow site, those observations should be placed in the regular site log.
3. There was some confusion about the file dates to archive. The station SOPs should be revised to indicate the files copied should include the date the last archive process was performed. This will assure a complete backup of the data set.

POTENTIAL ACTIVE NOISE SOURCES

No problems noted.

POTENTIAL PASSIVE NOISE SOURCES

Some of the surrounding buildings could produce reflections. See the Vista, Orientation and Level audit record.

ANTENNA LEVEL AND ALIGNMENT

The support blocks for the radar antenna should be marked to show the positions of the mounting legs. This will allow the site technician to quickly identify if the antenna has moved.

RADAR PROFILER PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RASS PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RADAR PROFILER DATA INTERNAL CONSISTENCY

The overall data look reasonable.

RASS DATA INTERNAL CONSISTENCY

The RASS is operating with only 12 range gates. With 60 meter gates the altitude coverage is only up to 780 meters. The limited height capability should be corrected. Following the audit the RASS configuration was changed to include 20 gates with a height coverage up to 1,560 meters. The overall data look reasonable.

SURFACE METEOROLOGY PERFORMANCE AUDIT

1. As indicated above, due to the poor siting of the sensors, the surface data from this site should not be used for any purpose other than general QC checks of the profiler data.
2. Given the qualification in (1) above, only the temperature sensor showed problems, with the high point reading 1.3° low. At the time of the audit it was not known if the sensor could be immersed so the audit was performed in a waterproof sheath. It is not known if this temperature difference was due to the

sheath, or actual problems with the sensor. It has been subsequently learned that the sensor can be immersed. However, given the qualifications on the intended use of the data, no further action is needed to resolve the problem.

3. The surface meteorological data logger was approximately 2.5 minutes slow. The logger should be set to the correct time.

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	Sonoma Technology, Inc./Radian
SITE NAME AND LOCATION:	Riverside (RSD)
AUDITOR:	Robert A. Baxter
DATE:	June 18, 1997
KEY PERSON:	Tim Dye/Steve Lim

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Radar Profiler	Radian Corp.	LAP-3000 Interface Receiver/ Modulator Profiler Monitor Antennas	NA	Lo 110 - 1429 m at 55 m inc. Hi 254 - 3525 m at 96 m inc.
Virtual Temperature	RASS	Radian Corp.	LAP-3000	NA	120 - 780 m at 60 m inc. (see below)
	Audio amplifier	Peavey	CS-800X	NA	NA
10 m Wind Speed	Cup	Met One	010B		0 - 50 m/s
10 m Wind Direction	Vane	Met One	020B		0 - 540 degrees
2 m ambient temperature	RTD	Met One	060A	NA	-50 - 50 °C
2 m relative humidity	Solid State	Met One	083C	NA	0 - 100%
Data Logging	Digital	Odessa	DSM 3260	NA	NA

Comments: The RASS range was changed during the audit to about 1200 meters. The surface wind speed is reported in miles per hour.

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? No

Do any operating ranges differ from those specified in the SOP? See Below

Are there any significant differences between instrumentation on site and the SOP? No

Comments: The operating range of the RASS should be increased further, if possible.

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Teleboot	NA	NA	NA	NA
Modem	NA	NA	NA	NA
Gateway Computer and Monitor	NA	NA	NA	NA
Zip drive	Iomega	Parallel	NA	NA

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
Clock	NA	Analog	NA	NA
Level	NA	NA	NA	NA
Ladder	NA	NA	NA	NA
Hearing Protection	NA	NA	NA	NA
Flashlight	NA	NA	NA	NA
Tool Kit	NA	NA	NA	NA
Broom	NA	NA	NA	NA

Comments:

II. Sensor/Probe height and Exposure

A. Radar Profiler/RASS/Sodar

Variable	Value	Meet SOP (Yes/No)
1. Orientation	Radar -- 0.5° 10 m Vane -- 0°	Yes
2. Level	Radar -- <0.2°	Yes
3. Distance to closest obstruction	see vista record	Yes
4. Distance to closest active noise source	No significant active RF sources	Yes

Comments:

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 m	No -- see below
2. Distance to nearest obstacle	see below	No
3. Is separation at least 10x obst. height?	see below	see below
4. Are instruments on a rooftop?	Yes	No
5. Is exposure 1.5x height above roof	No	No
6. Arc of unrestricted flow	influenced by building	No
7. Height of temp sensor above ground	10 m	No
8. Distance of temp sensor from obst.	see below	No
9. Height of DP/RH sensor above ground	10 m	No
10. Distance of DP/RH sensor from obst.	see below	No
11. Are the distances 4x the obst. height?	see below	No
12. Is the sensor shielded or aspirated?	Aspirated	Yes
13. Are the T/DP/RH abv representative terrain?	No	No
14. Are there significant differences between on-site equipment and the monitoring plan?	No	Yes

Comments: 1, 2, 3, 6, 8, 10, 11. All sensors are located on top and within a couple meters of a building. The building will influence all measurements by providing an obstruction to the flow, radiative heating and cooling and additional humidity from the chlorination processes within the open top building. Under the temperature sensor is an asphalt roadway. A different surface meteorological site, less than 0.5 km to the east, will provide the primary surface data. These data should only be used for general QC of the remotely sensed data.

III. Operation

A. Radar Profiler, RASS and Surface Meteorology

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is all instrumentation operational?	Yes	Yes
2. Are all cables secure?	Yes	Yes
3. Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4. Are connections clean and rust free?	Yes	Yes
5. Are serial numbers available?	See below	NA
6. Do data system times agree with audit times. If not, what is the deviation?	No	See below
7. Is the printer functional?	No	Not used
8. Overall, is the site maintenance sufficient to meet the DQOs?	Yes	Yes

Comments: 5. Did not want to move profiling equipment to get serial numbers.

6. Upon arrival at the site the Odessa data logger was slow by 2.5 minutes.

B. Radar Profiler/RASS/Sodar Settings

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Software version	POP 4	Yes
2. High mode pulse length	96 m	Yes
3. Low mode pulse length	54 m	Yes
4. RASS pulse length	59 m	Yes
5. Time zone	PST	Yes
6. Wind data consensus	55 min	Yes
7. RASS consensus	5 min	Yes

Comments:

	Wind Low Mode	Wind High Mode	RASS
First Gate	110 m	254 m	120 m
Last Gate	1429 m	3525 m	780 m
Spacing	55 m	96 m	60 m
Full Scale Velocity	10.2	10.2	NA

Comments: The RASS range was changed during the audit to about 1200 meters. It is recommend the RASS be operated to a higher altitude.

B. Auxiliary Equipment

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2. Is the site temperature recorded?	No	See below
3. Is the site temperature maintained at 20-30°C?	Yes	See below
4. Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5. Does the modem work?	Yes	Yes
6. Does the telephone work?	Yes	Yes
7. Is the site secure?	Yes	Yes
8. Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments: There is no measurement of the shelter temperature. It was indicated that the temperature is not critical for the system operation. Site security is good.

C. Station Check Procedures and Documentation

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Are the station logs present?	Yes	Yes
2. Are the station logs up to date?	Yes	Yes
3. Do station logs contain details as required by the SOPs?	Yes	Yes
4. Are routine checklists used?	Yes	Yes
5. Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6. Are the calibration forms present?	No	See below
7. Do the calibration forms contain details as required by the SOPs?	NA	NA
8. Are the SOPs present?	Yes	Yes
9. Are the instrument manuals present?	No	See below
10. Do the SOPs include quality control tests?	Yes	Yes
11. If quality control tests are included then how are the results of the tests documented?	Yes	See below
12. Has the site technician undergone training as specified in the SOPs?	Yes	Yes
13. Is the site visited twice weekly?	No	See below
14. Does the site technician understand the SOPs?	Yes	Yes

Comments: 6. Calibration records are maintained at STI and Radian.

9. Manuals are maintained at STI and Radian. If repairs are needed then the technician brings the manuals to the site.

11. Documentation of the QC test results were not specifically addressed. The QC test results should be placed in the maintenance checklist log.

13. The site is visited every two weeks for routine maintenance. In between the visits the data are polled and reviewed daily.

General -- The support blocks for the radar antenna should be marked to show the positions of the mounting legs. This will allow the site technician to quickly identify if the antenna has moved.

D. Chain of Custody

1. Review paper work for chain of custody from field to data processing.	Comments: The site is inspected every two weeks with all data archived and paperwork forwarded to STI in pre addressed envelopes.
2. How are data stored?	Data are stored locally on the computer hard drives with CDF files downloaded on a daily basis.
3. How often are the data backed up?	All data (CDF, moments) are copied to Zip disks every two weeks and shipped to STI.

Comments:

V. Preventive Maintenance

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is preventive maintenance discussed in the SOPs?	Yes	Yes
2. Is preventive maintenance being performed?	Yes	Yes
3. Are field operators given special training in preventive maintenance?	Yes	Yes
4. Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	Yes	Yes
5. Are maintenance logs maintained and reviewed?	Yes	Yes

Comments:

VI. Overall Comments

Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1. Overall, is the station maintenance sufficient to meet the DQOs?	Yes	Yes
2. Does the siting meet the program objectives?	Upper Air -- Yes Surface -- No	Yes No
3. Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4. Does the QC program appear to be working?	See below	NA
5. Overall, does the meteorological data look reasonable?	Yes	Yes
6. Overall, does the data appear to meet the program objectives?	See below	See below

Comments: 4. The procedures are in place for an appropriate QC program. However, the technician was just trained and a history of operation is not yet available. There was some confusion about the file dates to archive. The station SOPs should be revised to indicate the files copied should include the date the last archive process was performed. This will assure a complete backup of the data set.

The RASS was operating with only 12 range gates. With 60 meter gates the altitude coverage is only up to 780 meters. The height capability was increased to about 1200 meters following the audit. Consideration should be given to increasing the height coverage to about 1500 meters.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Riverside	Instrument:	Radian LAP 3000
Date:	June 18, 1997	Receiver s/n:	NA
Time:	0930 PDT	Interface s/n:	NA
Measurements group:	STI	Firmware version:	POP 4
Key contact:	Tim Dye	System rotation angle:	123°
Audited by:	Bob Baxter	Measured orientation:	122.5°
Site longitude:	117° 19.08' W	Orientation difference:	0.5°
Site latitude:	33° 55.16' N	Array level:	< 0.2°
Site elevation:	503 m	Beam zenith angle:	23.6°
Magnetic declination:	15°	Beam directions:	213°, 123° ind.

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
0	15	4	Poles on top of filtration plant at ~150 m.
30	45	25	Light poles on top of 15 m treatment building at ~30 m.
60	75	30	Top of south side of substation, west of treatment building at ~20 m.
90	105	20	Corner of building at ~20 m, shed at ~500 - 700 m.
120	135	2	Buildings at ~500 - 700 m.
150	165	<2	Open
180	195	8	Berm at ~40 m.
210	225	12	Berm at ~50 m.
240	255	4	Berm at ~100 m.
270	285	4	Top of pole on hill at ~100 m.
300	315	3	Corner of treatment reservoir at ~150 m.
330	345	7	Light on top of tank structure at ~100 m.

Comments: RASS level is better than 0.6°.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND SPEED

Date: June 18, 1997
Start: 0930 PDT
Finish: 1045 PDT
Auditor: Bob Baxter

Site name: Riverside (RSD)
Project: SCOS97-NARSTO
Operator: Radian/STI
Site Operator: T. Dye

Sensor Mfg: Met One
Sensor s/n: NA
K factor: 1.4
Range: 0 - 50 m/s
Logger: Odessa
Logger s/n: DSM-3260
Prop s/n: NA

Model: 010B
Sensor Ht.: ~10 m
Starting torque: 0.3 gm-cm
Starting Threshold: 0.46 m/s

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WS Calibration Point	M/S Input	M/S Chart	M/S Diff. Chart	M/S DAS	M/S Diff. DAS	% Diff. DAS
1	0.3	#N/A	#N/A	0.3	0.0	#N/A
2	5.6	#N/A	#N/A	5.6	0.0	0.1
3	10.9	#N/A	#N/A	11.2	0.3	2.5
4	21.6	#N/A	#N/A	21.6	0.0	0.1
5	32.2	#N/A	#N/A	32.3	0.1	0.2
6	42.9	#N/A	#N/A	41.8	-1.1	-2.5

Pass/Fail Criteria: +/-.25 m/s; ws <= 5 m/s
+/- 5%; ws > 5 m/s

Comments: Station is on top of building which does not meet criteria. There will be significant interference from the building. It was indicated that the data will only be used as QC of the RWP data. The data logger reports the wind speed in miles per hour.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND DIRECTION

Date: June 18, 1997
Start: 1400 PDT
Finish: 1500 PDT
Auditor: Bob Baxter

Site name: Riverside (RSD)
Project: SCOS97-NARSTO
Operator: Radian/STI
Site Operator: T. Dye

Sensor Mfg: Met One
Serial No.: NA
K Factor: 28.4
Range: 0 - 540°
Logger: Odessa
Logger s/n: DSM-3260

Model: 020B
Sensor Ht.: ~10 m
Starting torque: 3.0 gm-cm
Starting threshold: 0.33 M/S

Last calibration date: unknown

Crossarm: 1 deg true

Cal. Factors

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WD Audit Point	Degrees Reference	Corrected Degrees Reference	Degrees Chart	Diff. Chart Deg.	Degrees DAS	Linearity	Total Diff DAS Deg.
Orientation	1.0				1.0		0.0
1	0	1.0	#N/A	#N/A	1.0	0.3	0.0
2	90	91.0	#N/A	#N/A	89.0	-1.8	-2.0
3	180	181.0	#N/A	#N/A	180.0	-0.8	-1.0
4	270	271.0	#N/A	#N/A	273.0	2.3	2.0
5							
6							
7							
8							
9							
10							
11							

Avg difference:		-0.3
Maximum difference:	2.3	-2.0

Criteria: Orientation: +/- 2 degrees
Linearity: +/- 3 degrees
Maximum Difference: +/- 5 degrees

Comments: Station is on top of building which does not meet criteria. There will be significant interference from the building. It was indicated that the data will only be used as QC of the RWP data.

SCOS97-NARSTO AUDIT RECORD
AMBIENT TEMPERATURE

Date: June 18, 1997
Start: 1515 PDT
Finish: 1530 PDT
Auditor: Bob Baxter

Site name: Riverside (RSD)
Project: SCOS97-NARSTO
Operator: Radian/STI
Site Operator: T. Dye

Sensor Mfg: Met One
Serial No.: NA
Range: -50 - 50 Deg C

Model: 060A
Sensor Ht.: ~10 m

Logger: Odessa
Logger s/n: DSM-3260

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	0.0	#N/A	#N/A	0.5	0.5
2	32.8	#N/A	#N/A	33.2	0.4
3	41.2	#N/A	#N/A	39.9	-1.3

Criteria: +/- 0.5 degree Celsius

Comments:
Station is on top of building which does not meet criteria.
There will be significant interference from the building.
It was indicated that the data will only be used as QC of
the RWP data. Sensor was placed in a waterproof sheath.
It is not known if that may have caused the differences.

SCOS97-NARSTO AUDIT RECORD
RELATIVE HUMIDITY (DEW POINT TEMPERATURE)

Date: June 18, 1997
Start: 1115 PDT
Finish: 1140 PDT
Auditor: Bob Baxter

Site name: Riverside (RSD)
Project: SCOS97-NARSTO
Operator: Radian/STI
Site Operator: T. Dye

Sensor Mfg: Met One
Serial No.: NA
Range: 0 - 100 Percent

Model: 083C
Sensor Ht.: ~10 m (on bldg)

Logger: Odessa
Logger s/n: DSM-3260

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

RH/DP Audit Point	%RH Input	Deg C Input	% RH Chart	Deg C Chart	Deg C Diff. Chart	%RH DAS	Deg C DAS	Deg C Diff. DAS
1	43.0	16.5	#N/A	#N/A	#N/A	47.0	17.9	1.4

Criteria: +/- 1.5 degree Celsius

Comments: Station is on top of building which does not meet criteria. There will be significant interference from the building. Additional humidity will also be present from the water flow within 10 meters of the sensor.
It was indicated that the data will only be used as QC of the RWP data.

SAN CLEMENTE ISLAND (SCE)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	San Clemente Island (SCE)
Audit Dates:	July 3, 1997
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Clark King
Auditor:	Robert A. Baxter

The purpose of this summary is to provide a preliminary report of any significant audit findings. The site is operated by NOAA/ETL. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

The site is on the west side of the island south of the runway. The beam views are toward the runway to avoid transmission lines in the other directions. Some clutter may be experienced with aircraft takeoffs and landings.

SYSTEM AUDIT NOTES

1. The audited north radar profiler beam direction was oriented at 348° while the software setting indicated 351° thus being out of criteria. This was corrected during the audit.
2. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.
3. There are no signs warning of potential audio or radio frequency radiation. Appropriate signage is recommended.
4. Three of the RASS dishes were out of level by 1.4° to 2.1°. One of the transducers was out of level by 1.2°. The levels were corrected during the audit.
5. The site is visited approximately once every four weeks. There is a potential for problems to occur such as propeller failure or RASS source failure that would go

unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

6. The data had not been transmitted automatically to the data center. On the day of the audit a GOES satellite transmitter was installed to allow hourly uploading of the surface and upper air data. However, as of July 5, no data are yet available on the Web page.
7. One RASS source (on the west side) was faulty. The driver was found to be faulty. A replacement will be installed at the next site visit. In the interim, a good driver was installed on the west RASS source to help optimize the RASS coverage during the predominant west winds.
8. The base of the meteorological tower is not secured and can pivot. At the time of the audit the tower was tight and was not a problem. However, with time, the guy wires may loosen allowing potential tower rotation which will cause inaccuracies in the reported wind directions. The tower base should be secured.

POTENTIAL ACTIVE NOISE SOURCES

An RF scan of the frequencies from 910 to 920 MHz showed no active transmissions. Operation in the "listen only" mode showed no interference problems.

POTENTIAL PASSIVE NOISE SOURCES

No problems noted during the audit. There is a potential for aircraft movement at the adjacent air field to produce some reflective noise. In addition, as indicated above there appeared to be some "clutter removal" of what may have actually been near zero wind speeds.

ANTENNA LEVEL AND ALIGNMENT

The site north beam orientation was 351° which differed from the measured audit orientation of 348° by 3° degrees.

RADAR PROFILER PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RASS PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RADAR PROFILER DATA INTERNAL CONSISTENCY

1. At the time of the audit the height coverage was only about 500 meters. In addition, there appeared to be potential clutter that was being removed in the lowest levels. Whether the height limitation was due to meteorological conditions is unknown. The potential clutter may have actually been near zero wind speeds.
2. No data were available from the Web site location for review so past data could not be reviewed for internal consistency.

RASS DATA INTERNAL CONSISTENCY

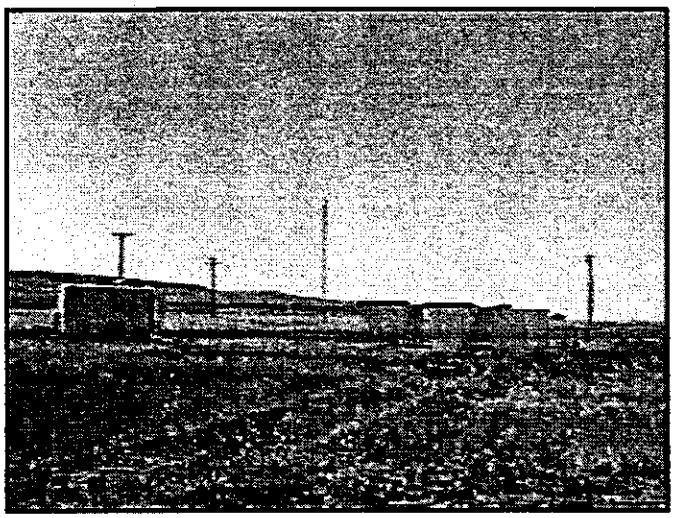
1. During the period of the audit the vertical extent of the RASS data looked limited to about 500 meters. Whether this was due to the current meteorological conditions is unknown.
2. The RASS duration was changed during the audit from 5 minutes to 7 minutes to allow for the acquisition of the surface meteorological data. This resulted in a collection interval of about 5.5 minutes.
3. The limited data reviewed during the audit looked reasonable. However, it is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project. The current mode of operation is 106 m. The finer resolution will remove some of the spatial averaging and provide a much clearer picture of the atmosphere. When changing the resolution, the height range should be maintained by increasing the number of range gates collected.

SURFACE METEOROLOGY PERFORMANCE AUDIT

All sensors are scanned every 10 seconds with five minute averages recorded. Other than the wind direction alignment error noted above, no problems were noted with the performance audit results. A summary of these audits are provided below:

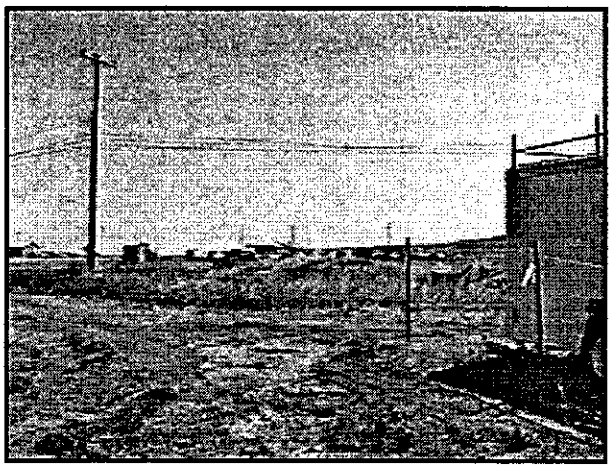
1. Due to the wiring and the method of sensor installation, the wind direction sensor was not removed from the system to perform the torque tests. A qualitative check of the bearings, while mounted on the tower, was performed and they were found to be acceptable.
2. Wind data recorded include scalar wind speed and resultant vector wind direction.
3. The wind sensor mast was found to be loose and leaning to one side. This was corrected during the audit.
4. The base of the meteorological tower is loose and can pivot. This will cause inaccuracies in the reported wind directions. The base should be secured.

San Clemente Island Site
Photographs

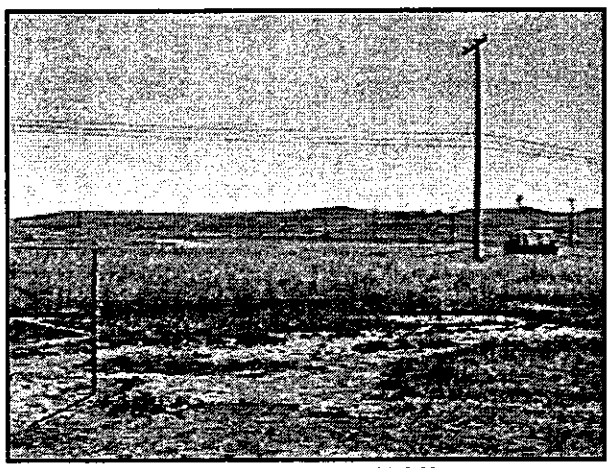


View of Site

Looking north (0°)

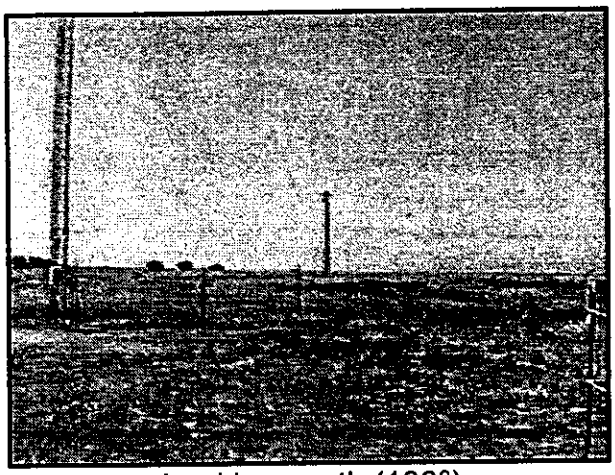


Looking northeast (45°)



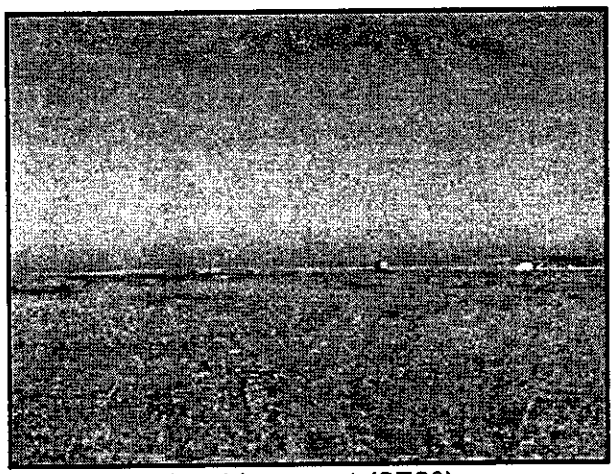
Looking east (90°)

Looking southeast (135°)



Looking south (180°)

Looking southwest (225°)



Looking west (270°)

Looking northwest (315°)

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	NOAA/ETL
SITE NAME AND LOCATION:	San Clemente Island (SCE)
AUDITOR:	Robert A. Baxter
DATE:	July 3, 1997
KEY PERSON:	Clark King

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Radar Profiler	NOAA/ETL	915 MHz	System 9	Data not available on Web
Virtual Temperature	RASS	NOAA/ETL	915 MHz	System 9	Data not available on Web
	Audio amplifier	Crown	460 CSL	NA	NA
10 m Wind Speed	Propeller	RM Young	Wind Monitor		0 - 50 m/s
10 m Wind Direction	Vane	RM Young	Wind Monitor		0 - 355 degrees
2 m ambient temperature	RTD	Vaisala	NA	NA	-35 - 50 °C
2 m relative humidity	Solid State	Vaisala	NA	NA	0 - 100%
Data Logging	Digital	CSI	CR10X	x1321	NA

Comments: It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage. The actual ranges were not available since data was not posted to the Web.

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? Yes

Do any operating ranges differ from those specified in the SOP? See Below

Are there any significant differences between instrumentation on site and the SOP? No

Comments: Station has solar and net radiation in addition to pressure being monitored. As indicated above the RASS resolution should be increased to about 60 m.

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Communications computer	NOAA	NA	NA	NA
Uninteruptable Power Supply	Ferrups	FE Series	NA	NA
GOES satellite link	Synergetics	4 modules in rack	NA	NA
Jaz drive	NA	NA	NA	NA

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
Shovel	NA	NA	NA	NA
Pick	NA	NA	NA	NA
Misc. Tools	NA	NA	NA	NA

Comments: Most station check equipment is carried with the NOAA engineers and not left on site.

II. Sensor/Probe height and Exposure

A. Radar Profiler/RASS/Sodar

Variable	Value	Meet SOP (Yes/No)
1. Orientation (three axis radar antenna)	Radar -- 3°, 2° 10 m Vane – 2.5°	No
2. Level (level and inclination of the horiz ant)	Radar -- <0.4° RASS – 2.1°	Yes No
3. Distance to closest obstruction	Not significant	Yes
4. Distance to closest active noise source	No significant active RF sources	Yes

Comments: 1. The orientation of one of the radar profiler antennas was off by 3°. There was a discrepancy between the readings of the auditor and site operator on the actual directions. This was resolved through a series of comparisons and identifying a potential nonlinearity and/or magnetic interference in the electronic compass used by the site operator. The audit values referenced the readings to solar observations. The 10 meter wind vane was also outside orientation criteria for the same reason, however, the overall accuracy of the system was well within criteria. No adjustments were made to the vane alignment.

2. Three of the RASS dishes were out of level by 1.4° to 2.1°. One of the transducers was out of level by 1.2°. The levels were corrected during the audit.

4. A "listen only" test of the radar revealed no significant RF sources nearby.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 m	Yes
2. Distance to nearest obstacle	not significant	Yes
3. Is separation at least 10x obst. height?	Yes	Yes
4. Are instruments on a rooftop?	No	Yes
5. Is exposure 1.5x height above roof	NA	NA
6. Arc of unrestricted flow	360°	Yes
7. Height of temp sensor above ground	2 m	Yes
8. Distance of temp sensor from obst.	NA	Yes
9. Height of DP/RH sensor above ground	2 m	Yes
10. Distance of DP/RH sensor from obst.	NA	Yes
11. Are the distances 4x the obst. height?	Yes	Yes
12. Is the sensor shielded or aspirated?	Shielded	Yes
13. Are the T/DP/RH abv representative terrain?	Yes	Yes
14. Are there significant differences between on-site equipment and the monitoring plan?	No	Yes

Comments: Wind data recorded include scalar wind speed and resultant vector wind direction. All surface sensors are scanned every 10 seconds with five minute averages recorded. The base of the meteorological tower is not secured and can pivot. At the time of the audit the tower was tight and was not a problem. However, with time, the guy wires may loosen allowing potential tower rotation which will cause inaccuracies in the reported wind directions. The tower base should be secured. The wind sensor mast was also found to be loose and leaning to one side. This was corrected during the audit.

12. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.

III. Operation

A. Radar Profiler, RASS and Surface Meteorology

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is all instrumentation operational?	No (see below)	No
2. Are all cables secure?	Yes	Yes
3. Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4. Are connections clean and rust free?	Yes	Yes
5. Are serial numbers available?	See below	NA
6. Do data system times agree with audit times. If not, what is the deviation?	Yes	Yes
7. Is the printer functional?	No	Not used
8. Overall, is the site maintenance sufficient to meet the DQOs?	See below	Yes

Comments: 1. The data had not been transmitted automatically to the data center. On the day of the audit a GOES satellite transmitter was installed to allow hourly uploading of the surface and upper air data. However, as of July 5, no data are yet available on the Web page. It was subsequently learned that the installed GOES transmitter failed within a few days after installation.

One RASS source (on the west side) was faulty. The driver was found to be bad. A replacement will be installed at the next site visit. In the interim, a good driver was installed on the west RASS source to help optimize the RASS coverage during the predominant west winds.

5. Did not want to move equipment to get serial numbers.

8. The site is visited approximately every four weeks for routine maintenance. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

B. Radar Profiler/RASS/Sodar Settings

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Software version	POP 4	Yes
2. High mode pulse length	NA	NA
3. Low mode pulse length	NA	NA
4. RASS pulse length	NA	NA
5. Time zone	GMT	Yes
6. Wind data consensus	55 min (see below)	Yes
7. RASS consensus	5 min (see below)	Yes

Comments: 2, 3, 4. No data are available on the Web to evaluate.

6, 7. The configuration indicated gave a 55 minute wind data consensus but because of the polling of the surface data during the first five minutes of the hour only gave about a 3.5 minute RASS consensus. Following the audit the RASS, the consensus was increased to 7 minutes to effectively provide a 5.5 minute consensus period (allowing the 1.5 minutes for the surface data polling). This also reduced the wind data consensus from 55 to 53 minutes.

	Wind Low Mode	Wind High Mode	RASS
First Gate	NA	NA	NA
Last Gate	NA	NA	NA
Spacing	~58 m	~101 m	~106 m
Full Scale Velocity	10.2	10.2	NA

Comments: No data were available for review from the Web site. The spacing values above are approximate. It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage.

B. Auxiliary Equipment

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2. Is the site temperature recorded?	No	See below
3. Is the site temperature maintained at 20-30°C?	Yes	See below
4. Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5. Does the modem work?	No	No
6. Does the telephone work?	No	No
7. Is the site secure?	Yes (see below)	Yes
8. Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	No	No

Comments: 2, 3. There is no measurement of the shelter temperature. It was indicated that the temperature is not critical for the system operation.

4, 5, 8. There is no phone at the site, data communications are performed via the GOES satellite. At the time of the audit, and subsequent to the audit, the communications had not been working. A potential exists for loss of data and no means of knowing this without someone physically visiting the site. A contingency plan is needed to assure the site is operational in the event an IOP is initiated.

7. Security is good. There are no signs warning of potential audio or radio frequency radiation. Appropriate signage is recommended.

C. Station Check Procedures and Documentation

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Are the station logs present?	Yes	Yes
2. Are the station logs up to date?	Yes	Yes
3. Do station logs contain details as required by the SOPs?	Yes	Yes
4. Are routine checklists used?	Yes	Yes
5. Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6. Are the calibration forms present?	No	See below
7. Do the calibration forms contain details as required by the SOPs?	NA	NA
8. Are the SOPs present?	Yes	Yes
9. Are the instrument manuals present?	No	See below
10. Do the SOPs include quality control tests?	Yes	Yes
11. If quality control tests are included then how are the results of the tests documented?	In site checklist	Yes
12. Has the site technician undergone training as specified in the SOPs?	See Below	Yes
13. Is the site visited twice weekly?	No	See below
14. Does the site technician understand the SOPs?	Yes	Yes (see below)

Comments: 6. Calibration records are maintained at NOAA/ETL

9. Manuals are maintained at NOAA/ETL. If repairs are needed then the engineer brings the manuals to the site.

12. There are no site technicians. During most times there is an engineer in the field that travels from site to site for the checks and needed maintenance.

13, 14. The site is visited approximately every four weeks for routine maintenance. In between the visits the data are polled and reviewed on a regular basis. Data are retrieved hourly and reviewed daily. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

D. Chain of Custody

1. Review paper work for chain of custody from field to data processing.	Comments: The site is inspected every four weeks with all data archived at that time. Paperwork older than about two months is forwarded to NOAA/ETL.
2. How are data stored?	Data are stored locally on the computer hard drive with consensus files and surface data transferred on an hourly basis to the communications computer. The files on the communications computer are uploaded to the GOES satellite on an hourly basis and then erased.
3. How often are the data backed up?	Files are copied to a Jaz drive on an hourly basis. These data are recovered on a monthly basis when the engineer visits the site.

Comments: 1. It is recommended a carbonless or similar form be used for the site checklist. In that manner a copy could be left at the site while the original can be sent back to NOAA/ETL.

V. Preventive Maintenance

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is preventive maintenance discussed in the SOPs?	Yes	Yes
2. Is preventive maintenance being performed?	Yes	Yes
3. Are field operators given special training in preventive maintenance?	Yes	Yes
4. Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	See below	Yes
5. Are maintenance logs maintained and reviewed?	Yes	Yes

Comments: 4. Tools and spares are carried with the field engineers. Some spares such as RASS transducers are stored at various sites throughout the NOAA/ETL network.

VI. Overall Comments

Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1. Overall, is the station maintenance sufficient to meet the DQOs?	See below	See below
2. Does the siting meet the program objectives?	Yes	Yes
3. Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4. Does the QC program appear to be working?	See below	See below
5. Overall, does the meteorological data look reasonable?	Yes	See below
6. Overall, does the data appear to meet the program objectives?	Yes	Yes

Comments: 1, 4. Problems exist with the data communications that may cause data recovery problems. Until such time as the communications are fixed, more frequent checks of the site by local island residents is recommended.

5. At the time of the audit the height coverage was only about 500 meters. In addition, there appeared to be potential clutter that was being removed in the lowest levels. Whether the height limitation was due to meteorological conditions is unknown. The potential clutter may have actually been near zero wind speeds.

It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project. The current mode of operation is about 106 m. The finer resolution will remove some of the spatial averaging and provide a much clearer picture of the atmosphere. When changing the resolution, the height range should be maintained by increasing the number of range gates collected.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	San Clemente Island	Instrument:	NOAA ETL RWP
Date:	July 3, 1997	Receiver s/n:	System 9
Time:	1230 PDT	Interface s/n:	System 9
Measurements group:	NOAA/ETL	Firmware version:	POP 4
Key contact:	Clark King	System antenna angles:	351°, 262°
Audited by:	Bob Baxter	Measured orientation:	348°, 260°
Site longitude:	118° 35.14' W	Orientation difference:	003°, 002°
Site latitude:	33° 01.03' N	Antenna inclination diff.:	< 0.4° from 15° on both horizontal, < 0.4° on vertical
Site elevation:	NA	Horizontal beam angle:	15°
Magnetic declination:	15° (appx)	Beam directions:	351°, 262° ind.

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	2	Buildings at ~ 50 - 300 m. Runway for aircraft.
NA	30	12	Power lines at ~ 30 - 50 m. Hangar buildings.
NA	60	17	Power lines at ~ 20 m. Adjacent instrument shelter.
NA	90	17	Power lines at ~ 20 m.
NA	120	12	Power lines at ~20 m. Moving radar antenna at ~ 1 km.
NA	150	32	Meteorological tower at ~ 10 m. Power lines at ~ 100 m.
NA	180	8	Power lines at ~200 m.
NA	210	5	Power lines at ~ 200 - 250 m.
NA	240	2	Power lines at ~ 400 m.
NA	270	<2	Runway then clear to ocean.
NA	300	<2	Control tower at ~ 1 km and runway.
NA	330	<2	Runway and ocean.

Comments: The north beam orientation is off by 3°. The antenna system is three-axis. The RASS system is operating with approximately a 3.5 minute consensus period. A 5 minute period is recommended. The RASS has 12 range gates with approximately 100 meter gate spacing. A range up to 1500 meters with a gate spacing of 60 meters is recommended. Three of the four RASS dishes were out of level by more than 1°. One transducer was out of level by more than 1°. The levels were corrected following the audit.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND SPEED

Date: July 3, 1997
Start: 1107 PDT
Finish: 1125 PDT
Auditor: Bob Baxter

Site name: San Cle Isle (SCE)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Clark King

Sensor Mfg: R.M. Young
Sensor s/n: unknown
K factor: 2.4
Range: 0 - 50 m/s
Logger: CR10X
Logger s/n: x1321
Prop s/n: 42676

Model: Wind Monitor
Sensor Ht.: 10 m
Starting torque: 0.2 gm-cm
Starting Threshold: 0.29 m/s

Last calibration date: unknown

Cal. Factors

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WS Calibration Point	M/S Input	M/S Chart	M/S Diff. Chart	M/S DAS	M/S Diff. DAS	% Diff. DAS
1	0.0	#N/A	#N/A	0.1	0.1	#N/A
2	2.5	#N/A	#N/A	2.5	0.0	#N/A
3	7.4	#N/A	#N/A	7.4	0.0	0.0
4	12.3	#N/A	#N/A	12.3	0.0	0.0
5	22.1	#N/A	#N/A	22.1	0.0	0.0
6	34.3	#N/A	#N/A	34.3	0.0	0.0

Pass/Fail Criteria: +/-.25 m/s; ws <= 5 m/s
+/- 5%; ws > 5 m/s

Comments: The nose cone was removed to perform the torque tests.
Sensor passed.

Sce

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND DIRECTION

Date: July 3, 1997
Start: 0955 PDT
Finish: 1045 PDT
Auditor: Bob Baxter

Site name: San Cle Isle (SCE)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Clark King

Sensor Mfg: R.M. Young
Serial No.: NA
K Factor: NA
Range: 0 - 355 deg
Logger: CR10X
Logger s/n: x1321

Model: Wind Monitor
Sensor Ht.: 10 m
Starting torque: NA gm-cm
Starting threshold: #DIV/0! M/S

Last calibration date: unknown

Box: 177.5 deg true

	Cal. Factors Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WD Audit Point	Degrees Reference	Corrected Degrees Reference	Degrees Chart	Diff. Chart Deg.	Degrees DAS	Linearity	Total Diff DAS Deg.
Orientation	177.5				180.0		2.5
1	30	32.5	#N/A	#N/A	29.9	-2.8	-2.6
2	60	62.5	#N/A	#N/A	60.4	-2.3	-2.1
3	90	92.5	#N/A	#N/A	91.5	-1.2	-1.0
4	120	122.5	#N/A	#N/A	123.1	0.4	0.6
5	150	152.5	#N/A	#N/A	153.0	0.3	0.5
6	180	182.5	#N/A	#N/A	184.3	1.6	1.8
7	210	212.5	#N/A	#N/A	214.5	1.8	2.0
8	240	242.5	#N/A	#N/A	244.0	1.3	1.5
9	270	272.5	#N/A	#N/A	274.0	1.3	1.5
10	300	302.5	#N/A	#N/A	304.7	2.0	2.2
11	330	332.5	#N/A	#N/A	330.4	-2.3	-2.1
				Avg difference:			0.2
				Maximum difference:		-2.8	-2.6

Criteria: Orientation: +/- 2 degrees
Linearity: +/- 3 degrees
Maximum Difference: +/- 5 degrees

Comments: Sensor orientation was off by 2.5° but overall accuracy was within criteria. Therefore the sensor passed.
The sensor mast was loose causing it to lean to one side. This was corrected following the audit.
The wind direction threshold could not be checked without removing the sensor from the tower. Due to the method of installation it was decided not to remove the sensor.
Note the "Corrected Degrees Reference" includes the offset for the arbitrary markings on the sensor shaft.

SCOS97-NARSTO AUDIT RECORD
AMBIENT TEMPERATURE

Date: July 3, 1997
Start: 1155 PDT
Finish: 1215 PDT
Auditor: Bob Baxter

Site name: San Cle Isle (
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Clark King

Sensor Mfg: Vaisala
Serial No.: NA
Range: -35 - 50 Deg C

Model: Unknown
Sensor Ht.: 2 m

Logger: CR10X
Logger s/n: x1321

Last calibration date: unknown

	Cal. Factors	
	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	3.3	#N/A	#N/A	3.6	0.3
2	21.9	#N/A	#N/A	21.9	0.0
3	42.0	#N/A	#N/A	41.7	-0.3

Criteria: +/- 0.5 degree Celsius

Comments: The sensor was immersed in water in a waterproof sheath.
The sensor passed criteria.

Sce

SCOS97-NARSTO AUDIT RECORD
RELATIVE HUMIDITY (DEW POINT TEMPERATURE)

Date: July 3, 1997
Start: 1132 PDT
Finish: 1135 PDT
Auditor: Bob Baxter

Site name: San Cle Isle (SCE)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Clark King

Sensor Mfg: Vaisala
Serial No.: unknown
Range: 0 - 100 Percent

Model: unknown
Sensor Ht.: 2 m

Logger: CR10X
Logger s/n: x1321

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

RH/DP Audit Point	%RH Input	Deg C Input	% RH Chart	Deg C Chart	Deg C Diff. Chart	%RH DAS	Deg C DAS	Deg C Diff. DAS
1	76.2	16.2	#N/A	#N/A	#N/A	77.4	16.5	0.2

Criteria: +/- 1.5 degree Celsius

Comments: Sensor passed.

Sce

SANTA CATALINA ISLAND (SCL)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Santa Catalina Island (SCL)
Audit Dates:	July 11, 1997
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Scott Abbott
Auditor:	Robert A. Baxter

The purpose of this summary is to provide a preliminary report of any significant audit findings. The site is operated by NOAA/ETL. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

The site is on a hill overlooking Two Harbors. Exposure of the meteorological sensors is good but the surface winds will not be representative of the entire island. Synoptic winds from the east, through the south and to the west will be influenced by the shadow of the island.

SYSTEM AUDIT NOTES

1. The radar profiler time was 7 minutes slow. The time was corrected during the audit. The data logger time was within 1 minute.
2. The meteorological tower may have been vandalized. The guy wires were loose, net radiomenter bent and top dome caved in, and ground strap removed. In addition, debris was found in one of the RASS enclosures. More frequent checks of the site are recommended.
3. There are ground boring bees around the trailer. Care should be exercised walking around the site.
4. The radar profiler monitor was flickering indicating either a power problem or the monitor possibly going bad.

5. Several of the guy wires on the radar profiler antennas were loose and needed tightening.
6. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.
7. There are no signs warning of potential audio or radio frequency radiation. Appropriate signage is recommended.
8. Three of the RASS dishes were out of level by 1.8° to 5.4°. In the worst antenna the transducer was out of level by 6.2°. The worst source was releveled.
9. One of the RASS transducers was not working. A loose connection was found and repaired.
10. The site is visited approximately once every four weeks. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP. Given the importance of the offshore data provided by this site a more frequent routine check schedule is recommended.
11. The base of the meteorological tower was not secured and can pivot. At the time of the audit the guy lines were loose allowing a good deal of movement. The tower base was secured following the audit and the alignment of the wind sensor corrected.
12. The radar wind profiler amplifier module was resting on the ground. The module should be raised off the ground to prevent moisture entry or other potential problems.

POTENTIAL ACTIVE NOISE SOURCES

An RF scan of the frequencies from 914 to 916 MHz showed no active transmissions, only images of cell phone transmissions were heard. These transmissions were <u>not</u> in the radar operational frequency. Operation in the "listen only" mode showed no interference problems.

POTENTIAL PASSIVE NOISE SOURCES

No problems noted during the audit. There is a potential for reflections from the terrain features in the directions of the beams. This includes the hills, radio tower and power lines.

ANTENNA LEVEL AND ALIGNMENT

The indicated northeast beam orientation was 67° which differed from the measured audit orientation of 71° by -4° degrees. The beam direction was verified and the system setting changed following the audit. Consideration should be given to changing the current procedure of the engineer reseting the alignment values during each visit. A consensus should be reached on the correct alignment, a ground stake mounted that can be used to verify the antennas have not moved, and no further changes made during the visits. The engineers can still measure the alignment but not make any further changes unless directed so by the NOAA/ETL program manager. A potential exists for a good alignment to be made bad through a simple error in measurement.

RADAR PROFILER PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RASS PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RADAR PROFILER DATA INTERNAL CONSISTENCY

1. Periodic data show up with erroneous high wind speeds. These should be removed during the data validation phase of the program.
2. The overall patterns look reasonable.

RASS DATA INTERNAL CONSISTENCY

1. The RASS duration was changed during the audit from 5 minutes to 7 minutes to allow for the acquisition of the surface meteorological data. This resulted in a collection interval of about 5.5 minutes.
2. The data reviewed looked reasonable with general coverage up to and over 1000 meters. However, it is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project. The current mode of operation is 106 m. The finer resolution will remove some of the spatial averaging and provide a much clearer picture of the atmosphere. When changing the resolution, the height range should be maintained by increasing the number of range gates collected.

SURFACE METEOROLOGY PERFORMANCE AUDIT

All sensors are scanned every 10 seconds with five minute averages recorded. Other than the wind direction alignment error noted above, no problems were noted with the performance audit results. A summary of these audits are provided below:

1. Due to the wiring and the method of sensor installation, the wind direction sensor was not removed from the system to perform the torque tests.
2. Wind data recorded include scalar wind speed and resultant vector wind direction.
3. The guy lines for the tower were loose allowing the tower base to pivot. This will cause inaccuracies in the reported wind directions. The base was secured during the audit.
4. The wind direction vane orientation was found to be outside criteria causing directions to read 6° high. The orientation was corrected during the audit. Like the orientation of the radar wind profiler antennas, it is recommended a ground stake be placed that can be used to check the orientation of the antenna and verify the cross arm has not moved.

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	NOAA/ETL
SITE NAME AND LOCATION:	Santa Catalina Island (SCL)
AUDITOR:	Robert A. Baxter
DATE:	July 11, 1997
KEY PERSON:	Scott Abbott

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Radar Profiler	NOAA/ETL	915 MHz	System 15	Lo 152 - 2296 m at 58 m inc. Hi 138 - 3992 m at 101 m inc.
Virtual Temperature	RASS	NOAA/ETL	915 MHz	System 15	157 - 1628 at 105 m inc.
	Audio amplifier	NA	NA	NA	NA
10 m Wind Speed	Propeller	RM Young	Wind Monitor	439515	0 - 50 m/s
10 m Wind Direction	Vane	RM Young	Wind Monitor	439515	0 - 355 degrees
2 m ambient temperature	RTD	CSI	207	5715	-35 - 50 °C
2 m relative humidity	Solid State	CSI	207	5715	0 - 100%
Data Logging	Digital	CSI	21X	12636	NA

Comments: It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage.

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? Yes

Do any operating ranges differ from those specified in the SOP? See Below

Are there any significant differences between instrumentation on site and the SOP? No

Comments: Station has solar and net radiation in addition to pressure being monitored. As indicated above, the RASS resolution should be increased to about 60 m.

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Communications computer	NOAA	NA	NA	NA
Uninteruptable Power Supply	Micro Ferrus	NA	NA	NA
Optical drive	NA	NA	NA	NA

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
Broom	NA	NA	NA	NA
Screwdriver	NA	NA	NA	NA
Misc. Tools	NA	NA	NA	NA

Comments: Most station check equipment is carried with the NOAA engineers and not left on site.

II. Sensor/Probe height and Exposure

A. Radar Profiler/RASS/Sodar

Variable	Value	Meet SOP (Yes/No)
1. Orientation (three axis radar antenna)	Radar – -4°, 0.5° 10 m Vane – 6°	No
2. Level (level and inclination of the horiz ant)	Radar – <0.3° RASS – <6.2°	Yes No
3. Distance to closest obstruction	See Below	Yes
4. Distance to closest active noise source	No significant active RF sources	Yes

Comments: 1. The orientation of one of the radar profiler antennas was off by -4°. The 10 meter wind vane was also outside audit orientation criteria. Consideration should be given to changing the current procedure of the engineer reseting the alignment values during each visit. A consensus should be reached on the correct alignment, a ground stake mounted that can be used to verify the antennas have not moved, and no further changes made during the visits. The engineers can still measure the alignment but not make any further changes unless directed so by the NOAA/ETL program manager. A potential exists for a good alignment to be made bad through a simple error in measurement.

2. Three of the RASS dishes were out of level by 1.8° to 5.4°. Two of the transducers were out of level by 1.8 to 6.2°. The other two transducers could not be checked. The level of the worst dish/transducer was corrected following the audit.

3. There is a potential for reflections from the terrain features in the directions of the beams. This includes the hills, radio tower and power lines.

4. A "listen only" test of the radar revealed no significant RF sources nearby. Images of cell phone conversations were observed in the 914 to 916 MHz range but they were <u>not</u> in the actual radar operational band.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 m	Yes
2. Distance to nearest obstacle	not significant	See Below
3. Is separation at least 10x obst. height?	Yes	Yes
4. Are instruments on a rooftop?	No	Yes
5. Is exposure 1.5x height above roof	NA	NA
6. Arc of unrestricted flow	360°	Yes
7. Height of temp sensor above ground	2 m	Yes
8. Distance of temp sensor from obst.	NA	Yes
9. Height of DP/RH sensor above ground	2 m	Yes
10. Distance of DP/RH sensor from obst.	NA	Yes
11. Are the distances 4x the obst. height?	NA	Yes
12. Is the sensor shielded or aspirated?	Shielded	Yes
13. Are the T/DP/RH abv representative terrain?	Yes	Yes
14. Are there significant differences between on-site equipment and the monitoring plan?	No	Yes

Comments: Wind data recorded include scalar wind speed and resultant vector wind direction. All surface sensors are scanned every 10 seconds with five minute averages recorded. The base of the meteorological tower is not secured and can pivot. At the time of the audit the guy lines were loose allowing a good deal of movement. The tower base was secured and guy lines tightened following the audit.

2. The site is on a hill overlooking Two Harbors. Exposure of the meteorological sensors is good but the surface winds will not be representative of the entire island. Synoptic winds from the east, through the south and to the west will be influenced by the shadow of the island.

12. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.

III. Operation

A. Radar Profiler, RASS and Surface Meteorology

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is all instrumentation operational?	No (see below)	No
2. Are all cables secure?	Yes	Yes
3. Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4. Are connections clean and rust free?	Yes	Yes
5. Are serial numbers available?	See below	NA
6. Do data system times agree with audit times. If not, what is the deviation?	No	No
7. Is the printer functional?	No	Not used
8. Overall, is the site maintenance sufficient to meet the DQOs?	See below	Yes

Comments: 1. The east RASS source was not functioning. A loose connector was found and the problem corrected during the audit. In addition, the radar profiler monitor was flickering indicating either a power problem or the monitor possibly going bad.

4. The radar transmitter module was resting on the ground under one of the antennas. It is recommended it be mounted off the ground to prevent moisture entry or other problems with it on the ground.

5. Did not want to move equipment to get serial numbers.

6. The radar profiler time was 7 minutes slow. The time difference was corrected during the audit.

8. The site is visited approximately every four weeks for routine maintenance. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

B. Radar Profiler/RASS/Sodar Settings

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Software version	POP 4	Yes
2. High mode pulse length	700 ns	Yes
3. Low mode pulse length	400 ns	Yes
4. RASS pulse length	700 ns	Yes
5. Time zone	GMT	Yes
6. Wind data consensus	55 min (see below)	Yes
7. RASS consensus	5 min (see below)	Yes

Comments: 6, 7. The configuration indicated gave a 55 minute wind data consensus but because of the polling of the surface data during the first five minutes of the hour only gave about a 3.5 minute RASS consensus. Following the audit the RASS, the consensus was increased to 7 minutes to effectively provide a 5.5 minute consensus period (allowing the 1.5 minutes for the surface data polling). This also reduced the wind data consensus from 55 to 53 minutes.

	Wind Low Mode	Wind High Mode	RASS
First Gate	152	138	157
Last Gate	2296	3992	1628
Spacing	~58 m	~101 m	~105 m
Full Scale Velocity	10.2	10.2	NA

Comments: It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage.

B. Auxiliary Equipment

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2. Is the site temperature recorded?	No	See below
3. Is the site temperature maintained at 20-30°C?	Yes	See below
4. Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5. Does the modem work?	Yes	Yes
6. Does the telephone work?	Yes	Yes
7. Is the site secure?	No	No
8. Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	No	No

Comments: It should be noted that ground boring bees are around the trailer. Care should be exercised in walking around the site.

2, 3. There is no measurement of the shelter temperature. It was indicated that the temperature is not critical for the system operation.

7, 8. The meteorological tower may have been vandalized. The guy wires were loose, net radiometer bent and top dome caved in, and the ground strap removed. In addition, some debris was found in one of the RASS enclosures. More frequent checks of the site are recommended. Additionally, there are no signs warning of potential audio or radio frequency radiation. Appropriate signage is recommended.

C. Station Check Procedures and Documentation

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Are the station logs present?	Yes	Yes
2. Are the station logs up to date?	Yes	Yes
3. Do station logs contain details as required by the SOPs?	Yes	Yes
4. Are routine checklists used?	Yes	Yes
5. Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6. Are the calibration forms present?	No	See below
7. Do the calibration forms contain details as required by the SOPs?	NA	NA
8. Are the SOPs present?	Yes	Yes
9. Are the instrument manuals present?	No	See below
10. Do the SOPs include quality control tests?	Yes	Yes
11. If quality control tests are included then how are the results of the tests documented?	In site checklist	Yes
12. Has the site technician undergone training as specified in the SOPs?	See Below	Yes
13. Is the site visited twice weekly?	No	See below
14. Does the site technician understand the SOPs?	Yes	Yes (see below)

Comments: 6. Calibration records are maintained at NOAA/ETL

9. Manuals are maintained at NOAA/ETL. If repairs are needed then the engineer brings the manuals to the site.

12. There are no site technicians. During most times there is an engineer in the field that travels from site to site for the checks and needed maintenance.

13, 14. The site is visited approximately every four weeks for routine maintenance. In between the visits the data are polled and reviewed on a regular basis. Data are retrieved hourly and reviewed daily. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

D. Chain of Custody

1. Review paper work for chain of custody from field to data processing.	Comments: The site is inspected every four weeks with all data archived at that time. Paperwork older than about two months is forwarded to NOAA/ETL.
2. How are data stored?	Data are stored locally on the computer hard drive with consensus files and surface data transferred on an hourly basis to the communications computer. The files on the communications computer are downloaded to NOAA/ETL on an hourly basis and then erased.
3. How often are the data backed up?	Files are copied to an optical drive on an hourly basis. These data are recovered on a monthly basis when the engineer visits the site.

Comments: 1. It is recommended a carbonless or similar form be used for the site checklist. In that manner a copy could be left at the site while the original can be sent back to NOAA/ETL.

V. Preventive Maintenance

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is preventive maintenance discussed in the SOPs?	Yes	Yes
2. Is preventive maintenance being performed?	Yes	Yes
3. Are field operators given special training in preventive maintenance?	Yes	Yes
4. Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	See below	Yes
5. Are maintenance logs maintained and reviewed?	Yes	Yes

Comments: 4. Tools and spares are carried with the field engineers. Some spares such as RASS transducers are stored at various sites throughout the NOAA/ETL network.

VI. Overall Comments

Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1. Overall, is the station maintenance sufficient to meet the DQOs?	See below	See below
2. Does the siting meet the program objectives?	Yes	Yes
3. Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4. Does the QC program appear to be working?	See below	See below
5. Overall, does the meteorological data look reasonable?	Yes	See below
6. Overall, does the data appear to meet the program objectives?	Yes	Yes

Comments: 1, 4. Problems exist with the site security that potentially affect the data quality. More frequent checks of the site are recommended.

5. Periodic data show up with erroneous high wind speeds. These should be removed during the data validation phase of the program.

It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project. The current mode of operation is about 105 m. The finer resolution will remove some of the spatial averaging and provide a much clearer picture of the atmosphere. When changing the resolution, the height range should be maintained by increasing the number of range gates collected.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Santa Catalina Island	Instrument:	NOAA ETL RWP
Date:	July 11, 1997	Receiver s/n:	System 15
Time:	1200 PDT	Interface s/n:	System 15
Measurements group:	NOAA/ETL	Firmware version:	POP 4
Key contact:	Scott Abbott	System antenna angles:	67°, 163°
Audited by:	Bob Baxter	Measured orientation:	71°, 162.5°
Site longitude:	118° 28.97' W	Orientation difference:	-4°, 0.5°
Site latitude:	33° 26.76' N	Antenna inclination diff.:	< 0.3° from 15° on both horizontal, < 0.2° on vertical
Site elevation:	NA	Horizontal beam angle:	15°
Magnetic declination:	15° (appx)	Beam directions:	67°, 163° ind.

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
0	15	<2	View over ocean
30	45	3	Small tree on side of hill at ~500 m.
60	75	10	Top of hill at ~1000 m.
90	105	7	Hills at ~500 m.
120	135	17	Rock formation on top of hill at ~2 km.
150	165	13	Top of radio antenna on top of hill at ~2 km.
180	195	11	Top of electrical pole on top of hill at ~ 2 km.
210	225	10	Top of water tank on hill at ~ 2 km.
240	255	7	View to hill at ~2 km with radio antenna at ~20m at 12°.
270	285	4	Hill above marina at > 2 km.
300	315	<2	View over ocean with large rock at ~750 m.
330	345	30	Adjacent meteorological tower.

Comments: The northeast beam orientation differed from the audit orientation by -4°. The antenna system is three-axis. The RASS system is operating with approximately a 3.5 minute consensus period. A 5 minute period is recommended. The RASS has 12 range gates with approximately 100 meter gate spacing. A range up to 1500 meters with a gate spacing of 60 meters is recommended. Three of the four RASS dishes were out of level by more than 1°. Two transducers were out of level by more than 1° (the remaining two could not be checked). The level of the worst transducer and dish were corrected following the audit. These two were out of level by more than 5°.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND SPEED

Date: July 11, 1997
Start: 1350 PDT
Finish: 1520 PDT
Auditor: Bob Baxter

Site name: San Cat Isle (SCL)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Scott Abbott

Sensor Mfg: R.M. Young
Sensor s/n: 439515
K factor: 2.4
Range: 0 - 50 m/s
Logger: CSI 21X
Logger s/n: 12636
Prop s/n: 42676

Model: Wind Monitor
Sensor Ht.: 10 m
Starting torque: 0.3 gm-cm
Starting Threshold: 0.35 m/s

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WS Calibration Point	M/S Input	M/S Chart	M/S Diff. Chart	M/S DAS	M/S Diff. DAS	% Diff. DAS
1	0.0	#N/A	#N/A	0.1	0.1	#N/A
2	2.5	#N/A	#N/A	2.5	0.0	#N/A
3	7.4	#N/A	#N/A	7.4	0.0	0.0
4	12.3	#N/A	#N/A	12.3	0.0	0.0
5	22.1	#N/A	#N/A	22.1	0.0	0.0
6	34.3	#N/A	#N/A	34.3	0.0	0.0

Pass/Fail Criteria: +/-.25 m/s; ws <= 5 m/s
+/- 5%; ws > 5 m/s

Comments: The nose cone was removed to perform the torque tests.
Sensor passed.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND DIRECTION

Date: July 11, 1997
Start: 1100 PDT
Finish: 1405 PDT
Auditor: Bob Baxter

Site name: San Cat Isle (SCL)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Scott Abbott

Sensor Mfg: R.M. Young
Serial No.: 439515
K Factor: NA
Range: 0 - 355 deg
Logger: CSI 21X
Logger s/n: 12636

Model: Wind Monitor
Sensor Ht.: 10 m
Starting torque: NA gm-cm
Starting threshold: #DIV/0! M/S

Last calibration date: unknown

Crossarm: 173 deg true

Cal. Factors

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WD Audit Point	Degrees Reference	Corrected Degrees Reference	Degrees Chart	Diff. Chart Deg.	Degrees DAS	Linearity	Total Diff DAS Deg.
Orientation	173.0				179.0		6.0
1	45	38.0	#N/A	#N/A	47.0	1.6	9.0
2	90	83.0	#N/A	#N/A	91.5	1.1	8.5
3	135	128.0	#N/A	#N/A	136.0	0.6	8.0
4	180	173.0	#N/A	#N/A	179.0	-1.4	6.0
5	225	218.0	#N/A	#N/A	224.0	-1.4	6.0
6	270	263.0	#N/A	#N/A	270.5	0.1	7.5
7	315	308.0	#N/A	#N/A	315.0	-0.4	7.0

Avg difference:		7.4
Maximum difference:	1.6	9.0

Criteria: Orientation: +/- 2 degrees
Linearity: +/- 3 degrees
Maximum Difference: +/- 5 degrees

Comments: Sensor orientation was off by 6° and failed criteria.
Tower was loose and pivoted easily. The guy lines were tightened and the tower secured during the audit. The values above reflect the "as found" values.
The wind direction threshold could not be checked without removing the sensor from the tower. Due to the method of installation it was decided not to remove the sensor.

SCOS97-NARSTO AUDIT RECORD
AMBIENT TEMPERATURE

Date: July 11, 1997
Start: 1310 PDT
Finish: 1325 PDT
Auditor: Bob Baxter

Site name: San Cat Isle (
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Scott Abbott

Sensor Mfg: CSI
Serial No.: 5715
Range: -35 - 50 Deg C

Model: 207
Sensor Ht.: 2 m

Logger: CSI 21X
Logger s/n: 12636

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	4.7	#N/A	#N/A	5.0	0.3
2	24.6	#N/A	#N/A	24.6	0.0
3	39.6	#N/A	#N/A	39.7	0.1

Criteria: +/- 0.5 degree Celsius

Comments: The sensor was immersed in water in a waterproof sheath.
The sensor passed criteria.

Scl

SCOS97-NARSTO AUDIT RECORD
RELATIVE HUMIDITY (DEW POINT TEMPERATURE)

Date: July 11, 1997
Start: 1145 PDT
Finish: 1159 PDT
Auditor: Bob Baxter

Site name: San Cat Isle (SCL)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Scott Abbott

Sensor Mfg: CSI
Serial No.: 5715
Range: 0 - 100 Percent

Model: 207
Sensor Ht.: 2 m

Logger: CSI 21X
Logger s/n: 12636

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

RH/DP Audit Point	%RH Input	Deg C Input	% RH Chart	Deg C Chart	Deg C Diff. Chart	%RH DAS	Deg C DAS	Deg C Diff. DAS
1	59.7	13.8	#N/A	#N/A	#N/A	61.5	14.2	0.5

Criteria: +/- 1.5 degree Celsius

Comments: Sensor passed.

SANTA CLARITA (SCA)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Santa Clarita (SCA)
Audit Dates:	July 12, 1997
Instrumentation Audited:	Sodar, Surface Meteorology
Key Person(s):	Scott Abbott
Auditor:	Robert A. Baxter

The purpose of this summary is to provide a preliminary report of any significant audit findings. The site is operated by NOAA/ETL. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

The site is located in the middle of the Santa Clarita Valley along the Santa Clara River. Exposure of the meteorological sensors is good with the exception of obstructions to the east of the site that will alter the surface winds when the wind direction is from the east. The site is noisy for operation of the sodar and the beam directions are aimed toward roads which are significant noise sources. There are residences to the north and west that prevent aiming the antennas in those directions.

SYSTEM AUDIT NOTES

1. The temperature and relative humidity sensors are not over representative terrain. Gravel and asphalt surfaces are nearby.
2. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.
3. The adjacent building forms a blockage to the wind flow from the east direction. Care should be exercised in using wind data from the east direction.
4. There are no signs warning of potential audio frequency radiation. Appropriate signage is recommended.

5. The overall site at the Rio Vista treatment plant is not secure. While there is a lock on the gate, there is a gap in the fence on the east side that allows individuals to walk into the site and access the sodar antennas. There is not much that can be done to improve the security other than install an additional fence inside the plant boundary. This is probably not feasible due to aesthetic concerns.
6. The site is visited approximately once every four weeks. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

POTENTIAL ACTIVE NOISE SOURCES

There are several sources of noise. The most significant is background traffic which will tend to decrease the altitude capabilities of the sodar. The antennas are aimed in the direction of two roads that produce significant amounts of noise.

The second source of noise are the pumps that are internal to the adjacent building. While the building has been sound proofed, a sampling of the frequency spectra generated by one of the internal pumps showed broad band active noise generation at frequencies between 1100 and 2000 Hz and again at about 2080, 2460 and 2700 Hz. While the sound proofing will help to deaden these sources when listened to by the human ear, the sodar may still be able to hear the pump noise, especially in the beam aimed to the east, the direction of the building. There are three other pumps in the building in addition to a backup generator. The audio spectra from these sources is unknown.

The sodar is operating at 2400 Hz to minimize the interference from the active noise sources. Results of the "listen only" test showed no interference from active noise sources during a one hour period in the audit.

POTENTIAL PASSIVE NOISE SOURCES

In the direction of the east beam is a building that could produce reflections in the range of about 40 to 100 meters. In the south beam are trees from which reflections could be heard. The data should be reviewed carefully to invalidate data that may be contaminated by the reflections.

ANTENNA LEVEL AND ALIGNMENT

The east antenna dish and transducer inclination angle differed from the setup specification by 1.4°. The south dish and transducer differed from the setup specification by 0.6°. The levels were corrected following the audit.

SODAR PERFORMANCE AUDIT (APT)

Results of the Acoustic Pulse Transponder (APT) audit showed the sodar responded within criteria for the timing and altitude calculations. However, problems were found with the wind speed calculations. The calculation of the horizontal wind speed along the beam direction was found to differ from the audit input by up to 0.7 m/s. When combined into a resultant wind speed, this difference could be over 1 m/s. It is suspected the reason for the difference lies in sodar resolution in measuring the Doppler shift frequency of returned echoes. The current operational mode has a fairly broad bin range that translates into an effective resolution of component speeds of about 0.9 m/s. This provides a resultant resolution of about 1.2 m/s. Consideration should be given to using a finer resolution in the bin spacing for the calculation of the radial speeds.

The second problem with the sodar was found in the calculation of the U and V wind components from the radial component speeds. Recognizing the identified resolution problem above (~0.9 m/s wind speed gates), the speeds along the radial directions were calculated correctly. However, errors were found in the calculation that takes the radial speeds and converts them to U and V components. In the tests performed, the errors resulted in U and V speeds that differed significantly from the audit speeds, but directions that were accurate. The calculation errors need to be corrected and affected data reprocessed from the radial values. Word was received from NOAA on July 14 that the U and V calculation algorithm was fixed and will be installed at both the Santa Clarita and Azusa sites on July 14.

Given the zenith angle of the sodar at 20°, the horizontal components should be corrected for vertical velocity. Since vertical velocity is not measured with the sodar (it is only a two-axis sodar), there will be inaccuracies in the measured wind data even after the above problems with the calculations and resolution are resolved.

RASS PERFORMANCE AUDIT

Not applicable (no RASS at site).

SODAR DATA INTERNAL CONSISTENCY

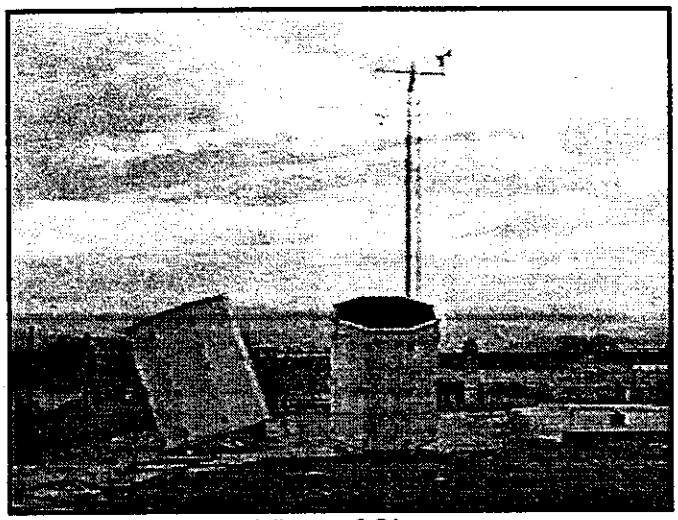
The sodar data over a several day period were reviewed. The overall patterns looked reasonable with regard to wind directions and *rough* order of magnitude speeds. Some reflections were observed in the sodar data (depressed values) possibly due to the adjacent building (east beam first several gates) and the row trees (south beam at ~100m). Patterns in the lowest gates approximated the surface wind direction data. Data should be reviewed carefully to identify periods that may have been contaminated by reflections and those data flagged in the database.

SURFACE METEOROLOGY PERFORMANCE AUDIT

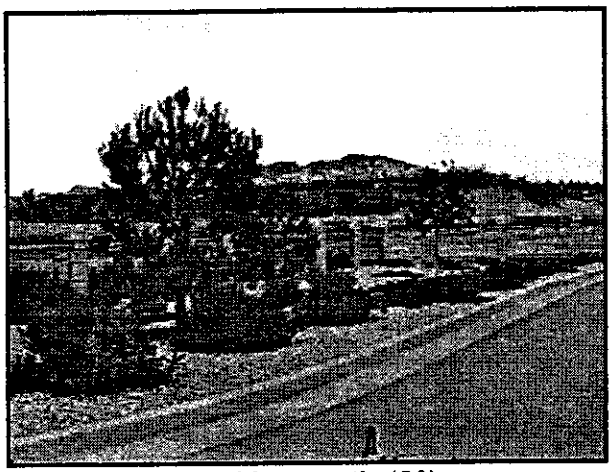
All sensors are scanned every 10 seconds with five minute averages recorded. A summary of significant audit findings is provided below:

1. Due to the wiring and the method of sensor installation, the wind direction sensor was not removed from the system to perform the torque tests.
2. Wind data recorded include scalar wind speed and resultant vector wind direction.
3. The wind direction vane orientation was found to be outside criteria causing directions to read about 5° high. The orientation was corrected during the audit.
4. As indicated above, the temperature and relative humidity sensors are not over representative terrain. Gravel and asphalt surfaces are nearby.

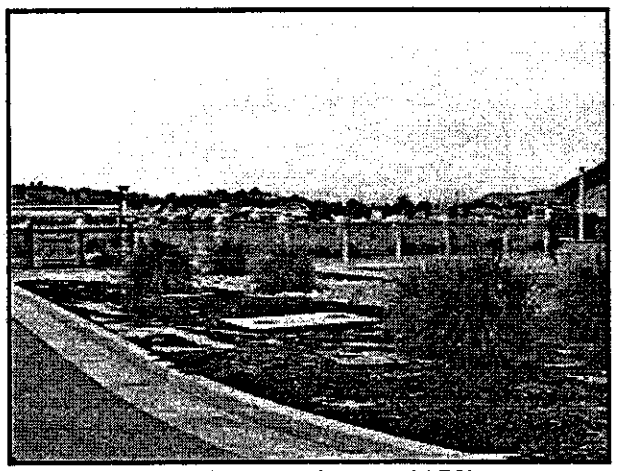
Santa Clarita Site
Photographs



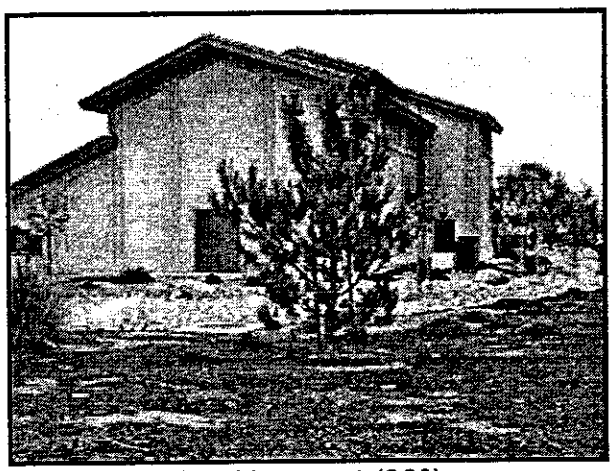
View of Site



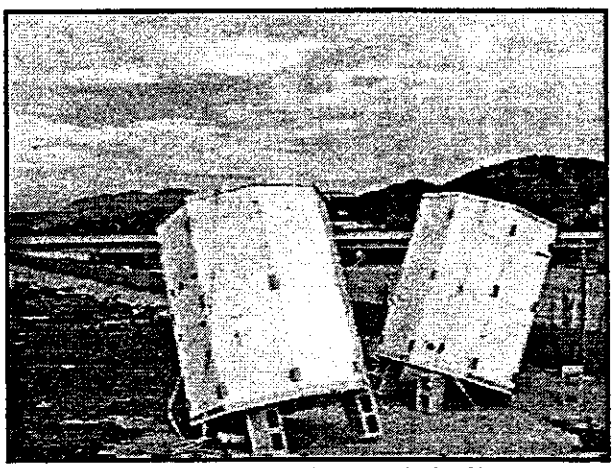
Looking north (0°)



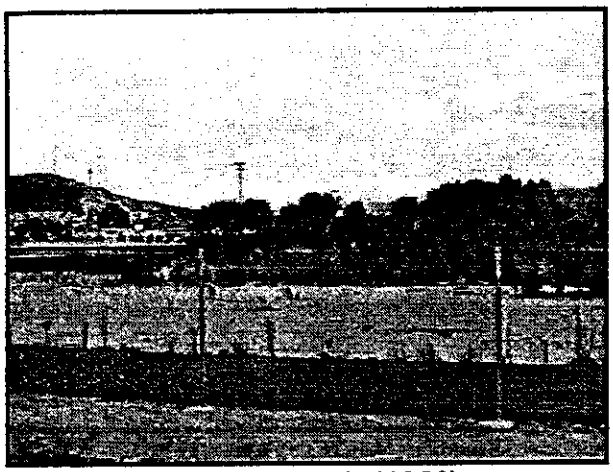
Looking northeast (45°)



Looking east (90°)

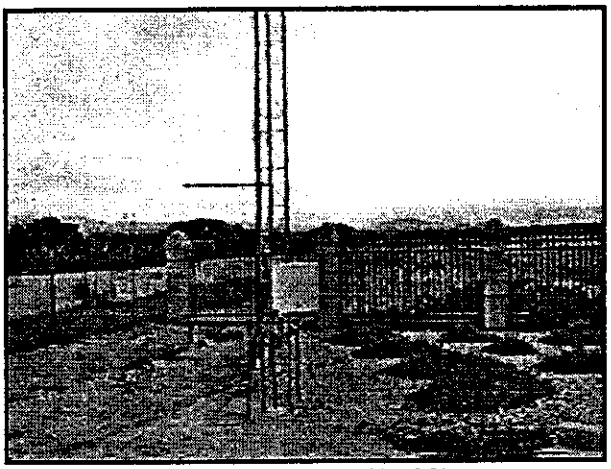


Looking southeast (135°)

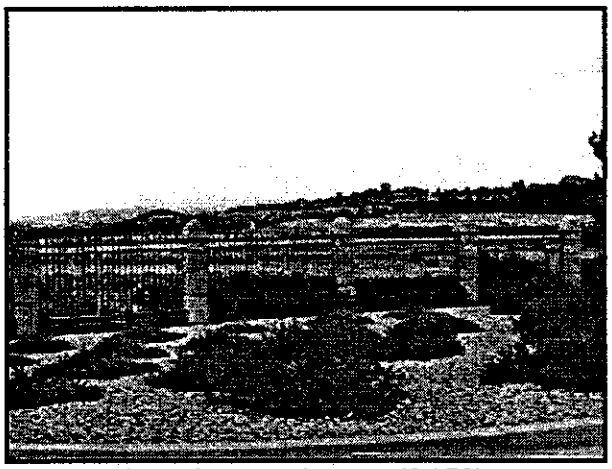


Looking south (180°)

Looking southwest (225°)



Looking west (270°)



Looking northwest (315°)

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	NOAA/ETL
SITE NAME AND LOCATION:	Santa Clarita (SCA)
AUDITOR:	Robert A. Baxter
DATE:	July 12, 1997
KEY PERSON:	Scott Abbott

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Sodar	NOAA/ETL	NA	Gov't – 319554	20 - 400 m in 20 m inc.
	Audio amplifier	Crown	NA	NA	NA
10 m Wind Speed	Propeller	RM Young	Wind Monitor	20355	0 - 50 m/s
10 m Wind Direction	Vane	RM Young	Wind Monitor	20355	0 - 355 degrees
2 m ambient temperature	RTD	Vaisala	CS500	83420006	-35 - 50 °C
2 m relative humidity	Solid State	CSI	CS500	NA	0 - 100%
Data Logging	Digital	CSI	21X	12110	NA

Comments:

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? Yes

Do any operating ranges differ from those specified in the SOP? See Below

Are there any significant differences between instrumentation on site and the SOP? No

Comments: Station has solar and net radiation in addition to pressure being monitored.

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Communications computer	NOAA	NA	NA	NA
Jaz drive	NA	NA	NA	NA

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA

Comments: Station check equipment is carried with the NOAA engineers and not left on site.

II. Sensor/Probe height and Exposure

A. Radar Profiler/RASS/Sodar

Variable	Value	Meet SOP (Yes/No)
1. Orientation (two axis sodar)	Sodar – -0.5°, -0.5° 10 m Vane – 5.5°	Yes No
2. Level (level and inclination of the horiz ant)	E trans. – 1.4° E dish – 1.7° S trans – 0.6° S dish – 0.5°	No
3. Distance to closest obstruction	See below	See below
4. Distance to closest active noise source	See below	See below

Comments: 1. The orientation of the wind vane was outside of audit criteria. The orientation was corrected during the audit.

2. The level of both transducers was outside of criteria. They were corrected during the audit.

3. In the direction of the east beam is a building that could produce reflections in the range of about 40 to 100 meters. In the south beam are trees from which reflections could be heard. The data should be reviewed carefully to invalidate data that may be contaminated by the reflections.

4. There are several sources of noise. The most significant is background traffic which will tend to decrease the altitude capabilities of the sodar. The antennas are aimed in the direction of two roads that produce significant amounts of noise.

The second source of noise are the pumps that are internal to the adjacent building. While the building has been sound proofed, a sampling of the frequency spectra generated by one of the internal pumps showed broad band active noise generation at frequencies between 1100 and 2000 Hz and again at about 2080, 2460 and 2700 Hz. While the sound proofing will help to deaden these sources when listened to by the human ear, the sodar may still be able to hear the pump noise, especially in the beam aimed to the east, the direction of the building. There are three other pumps in the building in addition to a backup generator. The audio spectra from these sources is unknown.

The sodar is operating at 2400 Hz to minimize the interference from the active noise sources. Results of the "listen only" test showed no interference from active noise sources during a one hour period in the audit.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 m	Yes
2. Distance to nearest obstacle	40 m	see below
3. Is separation at least 10x obst. height?	No	No
4. Are instruments on a rooftop?	No	NA
5. Is exposure 1.5x height above roof	NA	NA
6. Arc of unrestricted flow	330°	See below
7. Height of temp sensor above ground	2 m	Yes
8. Distance of temp sensor from obst.	NA	Yes
9. Height of DP/RH sensor above ground	2 m	Yes
10. Distance of DP/RH sensor from obst.	NA	Yes
11. Are the distances 4x the obst. height?	Yes	Yes
12. Is the sensor shielded or aspirated?	Shielded	Yes
13. Are the T/DP/RH abv representative terrain?	No	No
14. Are there significant differences between on-site equipment and the monitoring plan?	Yes	No

Comments: Wind data recorded include scalar wind speed and resultant vector wind direction. All surface sensors are scanned every 10 seconds with five minute averages recorded.

2, 3. A building to the east provides blockage to the flow. The height of the building is about 8 meters.

6. Winds from the east (nighttime drainage flow and Santa Ana type winds) will be influenced by the building.

12. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.

13. There is gravel and asphalt (non-representative terrain) on the ground near the sensors that will influence the temperature and humidity measurements.

14. Care should be exercised in the use of the temperature and humidity data due the potential influence of the non-representative terrain at the site.

III. Operation

A. Radar Profiler, RASS and Surface Meteorology

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is all instrumentation operational?	Yes	Yes
2. Are all cables secure?	Yes	Yes
3. Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4. Are connections clean and rust free?	Yes	Yes
5. Are serial numbers available?	See below	NA
6. Do data system times agree with audit times. If not, what is the deviation?	Yes	Yes
7. Is the printer functional?	No	Not used
8. Overall, is the site maintenance sufficient to meet the DQOs?	See below	Yes

Comments: 5. Used the government property numbers for the sodar serial numbers.

8. The site is visited approximately every four weeks for routine maintenance. There is a potential for problems to occur such as propeller failure or sodar antenna movement that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

B. Radar Profiler/RASS/Sodar Settings

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Software version	DOPSPD10	Yes
2. Pulse length	90 ms	Yes
3. Time zone	GMT	Yes
4. Wind data consensus	58 min	Yes

Comments:

	Horizontal Wind
First Gate	20 m
Last Gate	400 m
Spacing	20 m

Comments:

B. Auxiliary Equipment

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	No	See below
2. Is the site temperature recorded?	No	See below
3. Is the site temperature maintained at 20-30°C?	No	See below
4. Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5. Does the modem work?	Yes	Yes
6. Does the telephone work?	Yes	Yes
7. Is the site secure?	See below	Yes
8. Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments: 1, 2, 3. There is no air conditioning in the building with the sodar electronics. The room can get hot.

7. The overall site at the Rio Vista treatment plant is not secure. While there is a lock on the gate, there is a gap in the fence on the east side that allows individuals to walk into the site and access the sodar antennas and meteorological tower. There is not much that can be done to improve the security other than install an additional fence inside the plant boundary. This is probably not feasible due to aesthetic concerns. There are no signs warning of potential audio frequency radiation. Appropriate signage is recommended.

C. Station Check Procedures and Documentation

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Are the station logs present?	Yes	Yes
2. Are the station logs up to date?	Yes	Yes
3. Do station logs contain details as required by the SOPs?	Yes	Yes
4. Are routine checklists used?	Yes	Yes
5. Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6. Are the calibration forms present?	No	See below
7. Do the calibration forms contain details as required by the SOPs?	NA	NA
8. Are the SOPs present?	Yes	Yes
9. Are the instrument manuals present?	No	See below
10. Do the SOPs include quality control tests?	Yes	Yes
11. If quality control tests are included then how are the results of the tests documented?	In site checklist	Yes
12. Has the site technician undergone training as specified in the SOPs?	See Below	Yes
13. Is the site visited twice weekly?	No	See below
14. Does the site technician understand the SOPs?	Yes	Yes (see below)

Comments: 6. Calibration records are maintained at NOAA/ETL

9. Manuals are maintained at NOAA/ETL. If repairs are needed then the engineer brings the manuals to the site.

12. There are no site technicians. During most times there is an engineer in the field that travels from site to site for the checks and needed maintenance.

13, 14. The site is visited approximately every four weeks for routine maintenance. In between the visits the data are polled and reviewed on a regular basis. Data are retrieved hourly and reviewed daily. There is a potential for problems to occur such as propeller failure or sodar antenna movement that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

D. Chain of Custody

1. Review paper work for chain of custody from field to data processing.	Comments: The site is inspected every four weeks with all data archived at that time. Paperwork older than about two months is forwarded to NOAA/ETL.
2. How are data stored?	Data are stored locally on the computer hard drive with consensus files and surface data transferred on an hourly basis to the communications computer. The files on the communications computer are downloaded to NOAA/ETL on an hourly basis and then erased.
3. How often are the data backed up?	Files are copied to a Jaz drive on an hourly basis. These data are recovered on a monthly basis when the engineer visits the site.

Comments: 1. It is recommended a carbonless or similar form be used for the site checklist. In that manner a copy could be left at the site while the original can be sent back to NOAA/ETL.

V. Preventive Maintenance

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is preventive maintenance discussed in the SOPs?	Yes	Yes
2. Is preventive maintenance being performed?	Yes	Yes
3. Are field operators given special training in preventive maintenance?	Yes	Yes
4. Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	See below	Yes
5. Are maintenance logs maintained and reviewed?	Yes	Yes

Comments: 4. Tools and spares are carried with the field engineers. Some spares such as RASS transducers are stored at various sites throughout the NOAA/ETL network.

VI. Overall Comments

Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1. Overall, is the station maintenance sufficient to meet the DQOs?	Yes	Yes
2. Does the siting meet the program objectives?	Yes	See below
3. Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4. Does the QC program appear to be working?	Yes	Yes
5. Overall, does the meteorological data look reasonable?	Yes	See below
6. Overall, does the data appear to meet the program objectives?	Yes	Yes

Comments: 2. Care should be exercised in the use of the surface wind data from the eastern quadrant as well as the temperature and humidity data.

5. The sodar data over a several day period were reviewed. The overall patterns looked reasonable with regard to wind directions and rough order of magnitude speeds. Some reflections were observed in the sodar data (depressed values) possibly due to the adjacent building (east beam first several gates) and the row trees (south beam at ~100m). Patterns in the lowest gates approximated the surface wind direction data. Data should be reviewed carefully to identify periods that may have been contaminated by reflections and those data flagged in the database. See the performance audit report regarding data accuracy and precision information relating to problems in the sodar calculations.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Santa Clarita	Instrument:	NOAA ETL Sodar
Date:	July 12, 1997	Receiver s/n:	Gov't – 319554
Time:	1300 PDT	Interface s/n:	Gov't – 319554
Measurements group:	NOAA/ETL	Software version:	DOPSOD10
Key contact:	Scott Abbott	System antenna angles:	104°, 201°
Audited by:	Bob Baxter	Measured orientation:	104.5°, 201.5°
Site longitude:	118° 32.45' W	Orientation difference:	-0.5°, -0.5°
Site latitude:	34° 25.54' N	Antenna inclination diff.:	East trans – 1.4° East dish – 1.7° South trans – 0.6° South dish – 0.5° East encl – 0.3° South encl – 0.1°
Site elevation:	NA	Horizontal beam angle:	20° ind.
Magnetic declination:	15° (appx)	Beam directions:	104°, 201° ind.

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	6	Houses and road at ~300 m. ~50 m high hill at ~400 m.
NA	30	<2	Store fronts at ~400 m.
NA	60	4	Store fronts and hills at ~500 - 800 meters.
NA	90	12	Adjacent water treatment plant building at ~40 m.
NA	120	6	Power lines and road at ~150 m.
NA	150	8	Hill side at ~300 m, road at ~150 m.
NA	180	5	Trees on opposite side of river bed at ~150 m and road.
NA	210	4	Trees on opposite side of river bed at ~150 - 200 m.
NA	240	3	Trees on opposite side of river bed at ~200 m.
NA	270	<2	Trees on opposite side of river bed at ~400 m.
NA	300	<2	Houses at ~800 m.
NA	330	3	Houses at ~ 500 m.

Comments: The survey was performed during the site evaluation on April 17, 1997. The values above are from that survey and verified during the audit. The antenna inclination angles were confirmed during the audit and adjustments made to bring them within criteria. The pointing directions are toward major roads that are noisy but no other directions were available due to potential noise problems with the neighbors. The sodar is currently operating at a reduced power to mitigate some noise complaints from a neighbor.

SCOS97-NARSTO AUDIT RECORD
AMBIENT NOISE

Site Name:	Santa Clarita	Meter Manufacturer:	Realistic
Date:	July 12, 1997	Model Number:	33-2055
Time:	1930 PDT	Averaging:	Slow
Measurements group:	NOAA/ETL	Weighting Scale:	A
Key contact:	Scott Abbott	Time Averaging (sec):	60
Audited by:	Bob Baxter	Meter Range (dB)	50 - 70

Mag. Az. Angle (deg)	True Az. Angle (deg)	Noise Min (dB)	Noise Max (dB)	Noise Avg (dB)	Comments
NA	180	51	70	55	Traffic noise as well as crickets were observed. The traffic noise will be greatest in the mornings and evenings but will also be present during all hours. The two roads in the beam directions (east and south) are among the busiest in the Santa Clarita Valley. See comments below regarding other sources of noise.

"Listen Only" Results: Response showed no active noise sources in sodar spectrum during the one hour period of the "listen only" test.

Comments: The above dB measurements were made during the site survey on April 17. The direction measured was toward the south, the current pointing direction of one of the antennas. The overall site is noisy but the selected antenna directions were needed to minimize the noise problems with adjoining neighbors.

There is a source of noise with the pumps that are internal to the adjacent building. While the building has been sound proofed, a sampling of the frequency spectra generated by one of the internal pumps showed broad band active noise generation at frequencies between 1100 and 2000 Hz and again at about 2080, 2460 and 2700 Hz. While the sound proofing will help to deaden these sources when listened to by the human ear, the sodar may still be able to hear the pump noise, especially in the beam aimed to the east, the direction of the building. There are three other pumps in the building in addition to a backup generator. The audio spectra from these sources is unknown.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND SPEED

Date: July 12, 1997
Start: 1450 PDT
Finish: 1545 PDT
Auditor: Bob Baxter

Site name: Santa Clarita (SCA)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Scott Abbott

Sensor Mfg: R.M. Young
Sensor s/n: 20355
K factor: 2.4
Range: 0 - 50 m/s
Logger: CSI 21X
Logger s/n: 12110
Prop s/n: 42676

Model: Wind Monitor
Sensor Ht.: 10 m
Starting torque: 0.2 gm-cm
Starting Threshold: 0.29 m/s

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WS Calibration Point	M/S Input	M/S Chart	M/S Diff. Chart	M/S DAS	M/S Diff. DAS	% Diff. DAS
1	0.0	#N/A	#N/A	0.0	0.0	#N/A
2	2.5	#N/A	#N/A	2.5	0.0	#N/A
3	7.4	#N/A	#N/A	7.4	0.0	0.0
4	12.3	#N/A	#N/A	12.3	0.0	0.0
5	22.1	#N/A	#N/A	22.1	0.0	0.0
6	34.3	#N/A	#N/A	34.3	0.0	0.0

Pass/Fail Criteria: +/-.25 m/s; ws <= 5 m/s
+/- 5%; ws > 5 m/s

Comments: Sensor passed.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND DIRECTION

Date: July 12, 1997
Start: 1415 PDT
Finish: 1425 PDT
Auditor: Bob Baxter

Site name: Santa Clarita (SCA)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Scott Abbott

Sensor Mfg: R.M. Young
Serial No.: 20355
K Factor: NA
Range: 0 - 355 deg
Logger: CSI 21X
Logger s/n: 12110

Model: Wind Monitor
Sensor Ht.: 10 m
Starting torque: NA gm-cm
Starting threshold: M/S

Last calibration date: unknown

Crossarm: 175 deg true

Cal. Factors

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WD Audit Point	Degrees Reference	Corrected Degrees Reference	Degrees Chart	Diff. Chart Deg.	Degrees DAS	Linearity	Total Diff DAS Deg.
Orientation	175.0				180.5		5.5
1	30	27.5	#N/A	#N/A	29.2	-2.7	1.7
2	60	57.5	#N/A	#N/A	60.6	-1.3	3.1
3	90	87.5	#N/A	#N/A	92.2	0.3	4.7
4	120	117.5	#N/A	#N/A	122.4	0.5	4.9
5	150	147.5	#N/A	#N/A	151.5	-0.4	4.0
6	180	177.5	#N/A	#N/A	183.0	1.1	5.5
7	210	207.5	#N/A	#N/A	212.5	0.6	5.0
8	240	237.5	#N/A	#N/A	242.9	1.0	5.4
9	270	267.5	#N/A	#N/A	272.5	0.6	5.0
10	300	297.5	#N/A	#N/A	302.9	1.0	5.4
11	330	327.5	#N/A	#N/A	331.5	-0.4	4.0
				Avg difference:			4.4
				Maximum difference:		-2.7	5.5

Criteria: Orientation: +/- 2 degrees
Linearity: +/- 3 degrees
Maximum Difference: +/- 5 degrees

Comments: Sensor passed linearity test but failed orientation criteria.
The wind direction threshold could not be checked without removing the sensor from the tower. Due to the method of installation it was decided not to remove the sensor.
Note the "Corrected Degrees Reference" includes the offset for the arbitrary markings on the sensor shaft.
The sensor orientation was corrected following the audit.

SCOS97-NARSTO AUDIT RECORD
AMBIENT TEMPERATURE

Date: July 12, 1997
Start: 1700 PDT
Finish: 1720 PDT
Auditor: Bob Baxter

Site name: Santa Clarita
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Scott Abbott

Sensor Mfg: Vaisala
Serial No.: 83420006
Range: -35 - 50 Deg C

Model: NA
Sensor Ht.: 2 m

Logger: CSI 21X
Logger s/n: 12110

Last calibration date: unknown

	Cal. Factors	
	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	7.3	#N/A	#N/A	7.6	0.3
2	22.1	#N/A	#N/A	22.4	0.3
3	40.1	#N/A	#N/A	39.9	-0.2

Criteria: +/- 0.5 degree Celsius

Comments: The sensor was immersed in a waterproof sheath.
Sensor passed criteria.
Note the sensor is in a naturally aspirated shield.
The sensor is not over natural terrain. There

Sca

SCOS97-NARSTO AUDIT RECORD
RELATIVE HUMIDITY (DEW POINT TEMPERATURE)

Date: July 12, 1997
Start: 1355 PDT
Finish: 1410 PDT
Auditor: Bob Baxter

Site name: Santa Clarita (SCI
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Scott Abbott

Sensor Mfg: Vaisala
Serial No.: #######
Range: 0 - 100 Percent

Model: NA
Sensor Ht.: 2 m

Logger: CSI 21X
Logger s/n: 12110

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

RH/DP Audit Point	%RH Input	Deg C Input	% RH Chart	Deg C Chart	Deg C Diff. Chart	%RH DAS	Deg C DAS	Deg C Diff. DAS
1	41.1	12.0	#N/A	#N/A	#N/A	41.2	12.1	0.1

Criteria: +/- 1.5 degree Celsius

Comments: Sensor passed.
The sensor is not over natural terrain. There is gravel and dirt below.
Sensor is in a naturally aspirated shield.

Sca

SIMI VALLEY (SIM)

SCOS97-NARSTO PRELIMINARY AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Simi Valley
Audit Dates:	June 24, 25, & 26, 1997
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Kent Field
Auditor:	Alexander N. Barnett

The purpose of this summary is to provide a preliminary report of any significant audit findings. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

1. Site was located a land fill just east of the 118 Freeway at the Madera Street exit in Simi Valley. The site location is on a rise with low hills on all sites. Spacing to these hills varies from a 400 meters to 800 meters.
2. The 118 Freeway is visible to the south of the site between two hills. It is at an elevation below the RWP antenna.
3. The audit GPS readings of latitude and longitude compared well with the site operator determined location.

SYSTEM AUDIT NOTES

1. The RWP is set to collect 15-minute averages and the RASS makes a sounding every 15 minutes. Most RWP are set to collect hourly wind data.
2. The RWP is set to collect wind data in the low mode of operation only to a maximum altitude of 1988 meters. All other SCOS97 RWP are collecting wind data in the high mode as well as the low mode.
3. The RASS is set for 100 meter spacing. Most of the RASS operating in SCOS97 are set to collect 60 meter data.
4. The RASS acoustic temperature range was set to 36.88°C to 8.06°C and the acoustic source range was set to 10.04°C to 35.06°C.

5. The site operator is the VCAPCD senior meteorologist. He has extensive experience in weather forecasting, and data handling, processing, and validation. He is the end user of the RWP and RASS data and seems to have a good feel for how well the RWP and RASS are operating through the daily reviews of the data he performs. For this reason an SOP has not been written. For the purposes of SCOS97-NARSTO, the data quality from this site should not be impacted by the lack of SOP.

POTENTIAL ACTIVE NOISE SOURCES

Truck traffic within the landfill facility.

POTENTIAL PASSIVE NOISE SOURCES

None noted.

ANTENNA LEVEL AND ALIGNMENT

1. The audit showed the X+ side to be 348° true which differed by -2° from the operator determined direction of 346°.
2. The RWP antenna level was NE-SW: 0.1° and NW-SE: 0.1°.
3. The winds are collected in the low mode only. The beam directions were x-vertical, y-vertical, 76°, 166°, 256°, and 346°.
4. Beam zenith angles were 23°.

RADAR PROFILER PERFORMANCE AUDIT

RWP - Sodar Comparison

Sodar data was collected at the Simi Valley site between 10:00 hrs. PDT on 6/24/97 and 7:00 hrs. PDT on 6/26/97. It was collected at 30 meter intervals to a maximum altitude of 750 meters. The sodar data was spatially averaged to correspond with the RWP low mode data range gates of 110, 166, 221, 276, 331, 386, 442, 497, and 552 meters. The Simi Valley RWP does not operate in the high mode, therefore the audit comparisons were confined to the low mode of operation. The validated sodar and RWP (level B) wind data compared as follows:

	Low Mode		High Mode	
	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)
Average Difference:	-4	0.8	NA	NA

Standard Deviation:	54	2.5	NA	NA
Root Mean Squared:	54	2.6	NA	NA
Maximum Difference:	176	10.2	NA	NA
Minimum Difference:	-168	-4.5	NA	NA

The audit results showed that the RWP and sodar wind direction and wind speed average differences agreed well within the audit criteria of ± 10°, and ± 1.0 m/s.

RWP - Rawinsonde Comparison

Rawinsonde soundings were conducted at the Simi Valley site on 6/25/97 at 0900 hours PDT, and 6/25/97 at 1400 hours, PDT. This audit compared only low mode wind data with the audit sodar data since the Simi Valley RWP only operates only in the low mode.

Comparisons between the rawinsonde and RWP winds agreed well within the audit criteria of ±10° for wind direction, and ± 1.0 m/s for wind speed. The audit results were as follows:

	Low Mode		High Mode	
	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)
Average Difference:	-1	1.0	NA	NA
Standard Deviation:	50	1.2	NA	NA
Root Mean Squared:	49	1.6	NA	NA
Maximum Difference:	118	4.0	NA	NA
Minimum Difference:	-167	-1.8	NA	NA

RASS PERFORMANCE AUDIT

The audit virtual temperature comparison data was provided by the pressure, temperature, and humidity data from the 6/25/97, 0900 hours PDT, and 6/25/97, 1400 hours PDT rawinsondes that collected the wind data used in the RWP - rawinsonde wind comparisons above. The average differences were -1.2°C for the 6/25/97 0900 PDT sounding, which did not meet the audit criteria of ± 1.0°C, and -0.6°C for the 6/25/97 1400 PDT sounding which was well within the audit criteria. The audit results were as follows:

	6/25/97 0900 PDT (oC)	6/25/97 1400 PDT (oC)
Average Difference:	-1.2	-0.6
Standard Deviation:	1.2	0.7
Maximum Difference:	0.1	0.7
Minimum Difference:	-3.4	-1.4

The differences between the 6/25/97, 0900 PDT audit rawinsonde and RASS soundings can be seen in the layer between the surface and 1000 meters. The RASS sounding shows the lapse condition below the elevated inversion to be more stable, the height of the inversion lower, and the strength of the inversion to be slightly less than the rawinsonde sounding. The RASS profile appears smoothed as compared with the rawinsonde profile which may be a result of the consensus averaging technique that is employed by the RASS.

Although the 6/25/97, 1400 PDT RASS and audit rawinsonde average difference is well within the audit criteria of ± 1.0°C, and the two sounding show the heights of the top and bottom of the elevated inversion at exactly the same altitudes, there are differences that should be taken into account when using this data in the up-coming analyses. Referring to the graph of this comparison on the attached audit summary sheet, the strength of the RASS determined inversion is overall weaker than the rawinsonde determined inversion, and it appears smoothed, by comparison with the rawinsonde profile, not showing the isothermal layer between the 773 and 878 meter range gates.

RADAR PROFILER DATA INTERNAL CONSISTENCY

No problems noted.

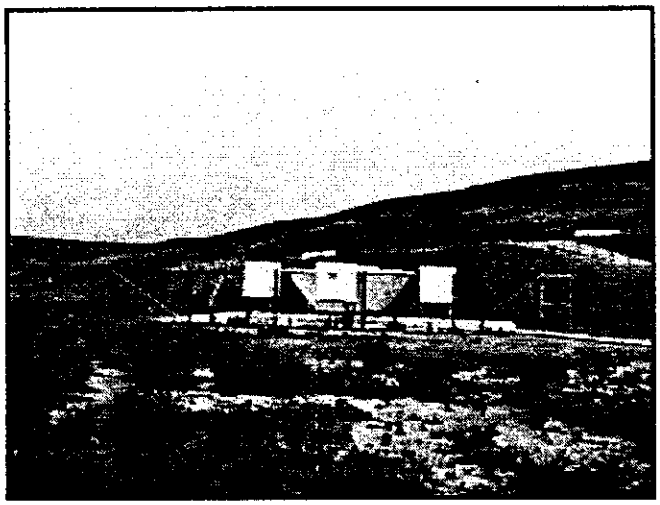
RASS DATA INTERNAL CONSISTENCY

No problems noted.

SURFACE METEOROLOGY PERFORMANCE AUDIT RESULTS

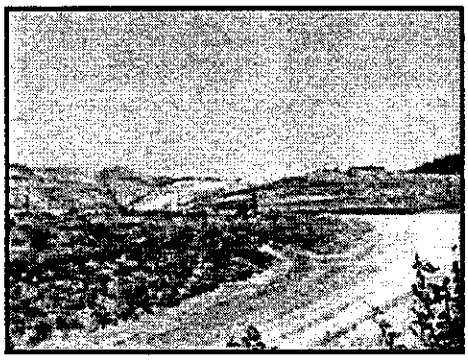
1. The corresponding audit and station ambient temperature readings did not agree within the EPA recommended criterion of ±0.5°C. The temperature sensor was not immersible and the comparison was made by collocating the two sensors in the shade. This manner of comparing the two measurement systems may be the reason for the discrepancy. It is recommended that the site operator verify the condition of the site ambient temperature measurement system and correct any problems that may be discovered.

Simi Valley Site
Photographs



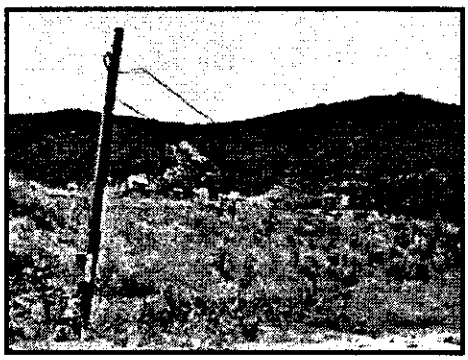
View of Site

North View



Northeast View

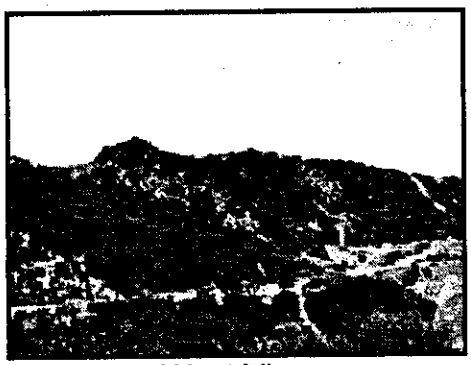
East View



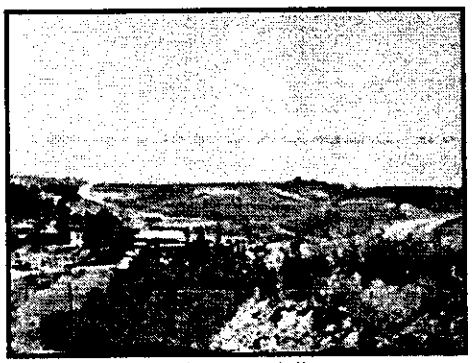
Southeast View

South View

Southwest View



West View



Northwest View

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	VCAPCD
SITE NAME AND LOCATION:	Simi Valley
AUDITOR:	Alex Barnett
DATE:	June 24, 25 & 26, 1997
KEY PERSON:	Kent Field

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
RWP/RASS		Radian	LAP-3000		
WS		Climatronics	100075	2737	0 - 50 m/s
WD		Climatronics	102139	135	0 - 540°
Temp		Rotonics	MP-100	20926	
RH		Rotonics	MP-100	20926	0 - 100%

Comments:

Are there any required variables which are not measured? No[1]

Are there any methods and/or equipment that are not in the SOP? No[1]

Do any operating ranges differ from those specified in the SOP? No[1]

Are there any significant differences between instrumentation on site and the SOP? No[1]

Comments: 1. SOP has not been written.

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
RASS Amp.	Crown	Com-Tech 810		
RWP Computer	IBM	466DX2/Tp		
Gateway Comp	IBM	466DX2/Tp		
Sfc Met Comp	Gateway	4SX-33		
Power Cond.	OneRC	CB1115	9543-3176	

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments

Comments:

II. Sensor/Probe height and Exposure

A. RWP and RASS Antenna

Variable	Value	Meet SOP (Yes/No)
1. Orientation	346° True	Yes
2. Level	N-S: 0.2° E-W: 0.1°	Yes
3. Distance to closest obstruction	None	Yes
4. Distance to closest active noise source	150'[1]	

Comments:

1. Active noise sources are trucks that move about the landfill facility. Theses sources are intermittent.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 meters	Yes
2. Distance to nearest obstacle	None	Yes
3. Is separation at least 10x obst. Height?	Yes	Yes
4. Are instruments on a rooftop?	No	NA
5. Is exposure 1.5X height above the roof?	NA	NA
6. Arc of unrestricted flow?	360°	Yes
7. Height of temp sensor above ground.	10 meters	Yes
8. Distance of temp sensor from obst.	None	yes
9. Hgt of Dew pt/RH sensor above ground.	10 meters	Yes
10. Distance Dew pt/RH sensor from obst.	None	Yes
11. Are the distances 4X from obst. Hgt.?	NA	NA
12. Is sensor shielded/motor asp?	No	Yes
13. Are temp/Dew pt/RH sensor above representative terrain?	Yes	Yes
14. Are there any significant differences between the on site equipment and the monitoring plan?	No	Yes

Comments:

III. Operation

A. Meteorology

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is all instrumentation operational?	Yes	Yes
2.	Are all cables secure?	Yes	Yes
3.	Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4.	Are connections clean and rust free?	Yes	Yes
5.	Are serial numbers available?	Yes	Yes
6.	Do data system times agree with audit times. If not, what is the deviation?	Yes	Yes
7.	Is the printer functional?	Yes	Yes
8.	Overall, is the site maintenance sufficient to meet the DQOs?	Yes	Yes

Comments:

B. RWP and RASS Settings

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Software version?	POP-3	Yes
2.	High mode wind pulse length?	NA	
3.	Low mode wind pulse length?	57 meters	Yes
4.	RASS pulse length?	105 meters	Yes
5.	RASS acoustic temperature range?	36.88 - 8.06°C	
6.	RASS acoustic source range?	10.04 - 35.06°C	
7.	Time zone	PST	No
8.	Wind data consensus	2 m/s, 60%	Yes
9.	RASS consensus	2 m/s, 50%	Yes

	Wind Low Mode	Wind High Mode	RASS
First Gate	0.11 km	NA	0.14 km
Last Gate	1.98 km	NA	1.51 km
Spacing	60.0 m	NA	105.0 m

Full Scale Velocity	10.2 m/s	NA	409.8 m/s

Comments

C. Auxiliary Equipment

Question		Response (Yes/No)	Meet SOP (Yes/No)
1.	Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2.	Is the site temperature recorded?	Yes	Yes
3.	Is the site temperature maintained at 20-30°C?	Yes	Yes
4.	Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5.	Does the modem work?	Yes	Yes
6.	Does the telephone work?	Yes	Yes
7.	Is the site secure?	Yes	Yes
8.	Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments:

D. Station Check Procedures and Documentation

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Are the station logs present?	Yes	Yes
2.	Are the station logs up to date?	Yes	Yes
3.	Do station logs contain details as required by the SOPs?	Yes[1]	
4.	Are routine checklists used?	No	
5.	Do the routine checklists contain details as required by the SOPs?	NA	
6.	Are the calibration forms present?	No	
7.	Do the calibration forms contain details as required by the SOPs?	NA	
8.	Are the SOPs present?	No[1]	
9.	Are the instrument manuals present?	Yes	
10.	Do the SOPs include quality control tests?	NA[1]	
11.	If quality control tests are included then how are the results of the tests documented?	2	
12.	Has the site technician undergone training as specified in the SOPs?	NA[3]	Yes
13.	Is the site visited twice weekly?	Weekly	Yes
14.	Does the site technician understand the SOPs?	NA[3]	Yes

Comments:

1. A written SOP has not been written yet.
2. Quality control tests consist of an internal consistency check of the data daily. If a problem is noted, the site operator will go to the site to correct the problem. Corrective actions are then recorded in the site log book.
3. Site operator created the procedures but has not written an SOP.

E. Chain of Custody

1.	Review paper work for chain of custody from field to data processing.	Comments:
2.	How are data stored?	Hard disks of RWP, Gateway, sfc met computers.
3.	How often are the data backed up?	Sfc met downloaded hourly.

Comments:

V. Preventive Maintenance

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is preventive maintenance discussed in the SOPs?	No[1]	
2.	Is preventive maintenance being performed?	Yes	
3.	Are field operators given special training in preventive maintenance?	Yes	
4.	Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	Yes	
5.	Are maintenance logs maintained and reviewed?	No[2]	

Comments:

1. The SOP has not been written yet.
2. The site log book also functions as the maintenance log book.

VI. Overall Comments

	Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1.	Overall, is the station maintenance sufficient to meet the DQOs?	Yes	Yes
2.	Does the siting meet the program objectives?	Yes	Yes
3.	Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4.	Does the QC program appear to be working?	Yes	Yes
5.	Overall, does the meteorological data look reasonable?		
6.	Overall, does the data appear to meet the program objectives?	No[1]	

Comments:

1. The RWP wind data is collected in the low mode of operation and as 15-minute averages. The SCOS97 program objectives may require the high mode of operation and hourly averages.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Simi Valley	Instrument:	LAP-3000
Date:	6/24/97 - 6/26/97	Receiver s/n:	
Time:		Interface s/n:	
Measurements group:	VCAPCD	Frimware version:	POP-3
Key contact:	Kent Field	System rotation angle:	346° True
Audited by:	Alex Barnett	Measured orientation:	348° True
Site longitude:	118° 47.85'W	Orientation difference:	-2° True
Site latitude:	34° 17.52'N	Array level:	N-S: 0.2° E-W: 0.1°
Site elevation:	917' (279.5 m)	Beam zenith angle:	23°
Magnetic declination:	14 °E	Beam directions:	NW, NE, SE, SW

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	<2	Landfill hill ¼ mile away.
NA	30	<2	Landfill hill ¼ mile away.
NA	60	<2	Landfill hill ¼ mile away.
NA	90	10	Hill ¼ mile away.
NA	120	15	Hill within ¼ away.
NA	150	20	Hill within ¼ away.
NA	180	15	Hill approximately ¼ away.
NA	210	<2	118 freeway ½ mile away
NA	240	5	Hill within ¼ mile away.
NA	270	5	Hill within ¼ mile away.
NA	300	5	Hill within ¼ mile away.
NA	330	<2	Hill approximately ½ mile away.

Comments: Beams are directed toward the NW and SW over the adjacent water treatment building. Although the other views seemed to be more open, experimenting with various beam directions showed the present configuration to be best. RFI was noted from the east.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND SPEED

Date: June 24, 1997
Start: 10:15
Finish: 10:30
Auditor: Alex Barnett

Site name: Simi Valley
Project: SCOS97-NARSTO
Operator: VCAPCD
Site Operator: Kent Field

Sensor Mfg: Climatronics
Sensor s/n: 2737
K factor: 1.4
Range: 0 - 50 m/s
Logger: EMC
Logger s/n: Station Manager
Prop s/n: 509 Vinyl

Model: 100075
Sensor Ht: 10 Meters
Starting Torque: 0.1 gm-cm
Starting Threshold: 0.60 m/s

Last calibration date02/01/97

Cal. Factors

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WS Calibration Point	MPH Input	MPH Chart	MPH Diff. Chart	MPH DAS	MPH Diff. DAS	% Diff. DAS
1	0.0	0.00	0.00	0.0	0.0	#N/A
2	0.0	0.00	0.00	0.0	0.0	#N/A
3	0.0	0.00	0.00	0.0	0.0	#N/A
4	0.0	0.00	0.00	0.0	0.0	#N/A

Pass/Fai+/-.56 MPH; ws <= 11.2 MPH
+/- 5%; ws > 11.2 MPH

Comments:

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND DIRECTION

Date: June 24, 1997
Start: 10:35
Finish: 10:50
Auditor: Alex Barnett

Site name: Simi Valley
Project: SCOS97-NARSTO
Operator: VCAPCD
Site Operator: Kent Field

Sensor Mfg: Climatronics
Serial No.: 135
K Factor: 30
Range: 0 - 540
Logger: EMC
Logger s/n: Station Manager

Model: 102319
Sensor Ht: 10 Meters
Starting Torque: 5.0 gm-cm
Starting Threhold: 0.41 M/S

Last cali02/01/97

Crossarm: 361deg true

Cal. Factors

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WD Audit Point	Degrees Reference	Corrected Degrees Reference	Degrees Chart	Diff. Chart Deg	Degrees DAS	Linearity	Total Diff DAS Deg.
Orientation	1.0				2.0		2.0
1	90	91.0	#N/A	#N/A	91.0	-0.6	0.0
2	180	181.0	#N/A	#N/A	179.0	-2.6	-2.0
3	270	271.0	#N/A	#N/A	272.0	0.4	1.0
4	360	361.0	#N/A	#N/A	362.0	0.4	1.0
5	450	451.0	#N/A	#N/A	454.0	2.4	3.0

Avg difference:		0.6
Maximum diff.:	-2.6	3.0

Criteria: Orientation: +/- 2 degrees
Linearity: +/- 3 degrees
Maximum Difference +/- 5 degrees

Comments:

SCOS97-NARSTO AUDIT RECORD
AMBIENT TEMPERATURE

Date: June 24, 1997
Start: 10:55
Finish: 11:12
Auditor: Alex Barnett

Site name: Simi Valley
Project: SCOS97-NARSTO
Operator: VCAPCD
Site Operator: Kent Field

Sensor Mfg: Rotonics
Serial No.: 20926
Range: -50 to 5Deg C

Model: MP-100
Sensor Ht: 10 Meters

Logger: EMC
Logger s/n: Station Manager

Last cali Feb-97

Cal. Factors

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	25.2	#N/A	#N/A	26.7	1.5

Criteria: +/- 0.5 degree Celsius

Comments:

SCOS97-NARSTO AUDIT RECORD
RELATIVE HUMIDITY (DEW POINT TEMPERATURE)

Date: June 24, 1997
Start: 10:55
Finish: 11:12
Auditor: Alex Barnett

Site name: Simi Valley
Project: SCOS97-NARSTO
Operator: VCAPCD
Site Operator: Kent Field

Sensor Mfc: Rotonics
Serial No.: 20926
Range: 0 - 100 Percent

Model: MP-100
Sensor Ht: 10 Meters

Logger: EMC
Logger s/Station Manager

Last cali Feb-97

Cal. Factors

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

RH/DP Audit Point	%RH Input	Deg C Input	% RH Chart	Deg C Chart	Deg C Diff. Chart	%RH DAS	Deg C DAS	Deg C Diff. DAS
1	48.9	13.7	#N/A	#N/A	#N/A	58.0	14.1	0.4

Criteria: +/- 1.5 degree Celsius

Comments:

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: Simi Valley
Date: June 24-26, 1997
Measurements Group: Ventura County APCD
Radar Profiler: Radian Inc. Model Lap-3000
Audit Sodar: AeroVironment Model 2000

Overall Difference Radar Profiler - Sodar	Wind Speed (m/s)
Average:	0.8
Maximum:	10.2
Minimum:	-4.5
Standard Deviation:	2.5
Root Mean Square (RMS):	2.6

		Wind Speed Difference (m/s, Radar Profiler - Sodar) Level (m)								
Date	Hour	110	166	221	276	331	387	442	497	552
06/24/97	10:15	0.1	0.7	0.4	1.3	2.7	4.6	9.3		10.2
	11:15	3.0	1.4	1.2	-0.8	1.0	2.0			
	12:15	1.8	1.1	-1.1	0.7	-1.4				
	13:15	1.0	0.4	-1.1	-1.5					
	14:15	0.5	0.3	-0.5	-0.8	0.0	0.5	1.9	0.7	
	15:15	2.2	1.8	0.6	0.0					
	16:15	1.8	0.7	0.3	-0.7		0.4	1.0		
	17:15	-0.2	-0.6	-1.0					2.9	
	18:15	0.7	-0.1				0.8			
	19:15							-1.1		
	20:15		0.3			-0.6	0.0	-0.3		
	21:15			-1.5	-1.5	-1.3	-0.4	-1.3	-0.5	0.2
	22:15		-2.4	-1.0	-4.5	-2.2	-0.8	-1.6		
	23:15		-3.7	0.3	-3.1	-1.0	-0.3	-1.4	-2.8	1.8
6/25/97	0:15		-1.1	-0.2		-1.5	-0.6	-1.0	-2.0	
	1:15			-0.5	-1.1	-1.1	-1.6	-0.9		1.1
	2:15			-0.1	-0.4		-0.6	0.3	2.1	
	3:15			-0.2						
	4:15									
	5:15									
	6:15				2.9	5.9	7.3	8.7	7.7	
	7:15	2.0	2.1	1.8	1.9	5.6	3.6	5.7	6.3	
	8:15		4.9	8.0	6.7	5.7	2.2	1.5	3.3	6.6
	9:15	-0.6	-0.6	-0.3	0.1	-0.7		4.4	9.4	
	10:15	-0.3	-0.5	-0.4	-0.6	0.4	0.9	3.0	5.2	7.7
	11:15	-1.9	-1.7	-2.5	-1.8	-1.9	0.2	3.4	0.6	
	12:15	2.9	1.3	0.7		0.9	0.5	0.6		
	13:15	-0.8	-1.4	-0.9	0.6	1.3	0.8	1.8		
	14:15	2.0	0.7	-0.3	0.5	2.0	2.9	5.4		
	15:15	2.2	1.4	-0.4	-0.4	-0.9	-0.3			
	16:15	1.1	-0.8	-1.2	-1.2	-0.5	0.3	-0.2		
	17:15	-0.4	0.8	0.1	-1.0	-0.8	0.8	0.8		
	18:15					1.9				
	19:15									
	20:15	0.6						-0.1		
	21:15						-0.6	0.3	0.0	3.4
	22:15	-0.7	-0.5	-1.2	0.1	-0.3	-0.2	-0.3	1.5	
	23:15		-0.4	-0.8			-0.4			
6/26/97	0:15	1.7		1.8	1.0				3.6	
	1:15		1.2	1.0				1.1	1.7	9.6
	2:15	-0.6	1.3	0.3		-2.0	0.0	0.3		
	3:15			0.1		-1.6	-0.9	-0.7		1.4
	4:15			0.1					-0.8	0.9
	5:15						-0.6			-0.1
	6:15			1.5						-0.2
	7:15									5.4
	Average:	0.8	0.2	0.1	-0.1	0.4	0.7	1.4	2.3	3.7
	Maximum:	3.0	4.9	8.0	6.7	5.9	7.3	9.3	9.4	10.2
	Minimum:	-1.9	-3.7	-2.5	-4.5	-2.2	-1.6	-1.6	-2.8	-0.2
	Std Dev:	1.3	1.6	1.7	2.1	2.4	1.9	2.9	3.4	3.8
	RMS:	1.5	1.6	1.7	2.0	2.4	2.0	3.2	4.0	5.2

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Direction Comparison

Site: Simi Valley
Date: June 24-26, 1997
Measurements Group: Ventura County APCD
Radar Profiler: Radian Inc. Model Lap-3000
Audit Sodar: AeroVironment Model 2000

Overall Difference Radar Profiler - Sodar	Wind Dir. (deg)
Average:	-4
Maximum:	176
Minimum:	-168
Standard Deviation:	54
Root Mean Square (RMS):	54

		Wind Dir. Difference (deg, Radar Profiler - Sodar) Level (m)								
Date	Hour	110	166	221	276	331	387	442	497	552
06/24/97	10:15	-17	-2	-23	-27	-25	-28	17		-3
	11:15	6	-3	-13	-58	-43	-22			
	12:15	2	-3	-14	-4	-93				
	13:15	-1	6	-2	1					
	14:15	-13	-8	-6	-9	14	-2	13	13	
	15:15	3	2	-1	16					
	16:15	1	-7	-8	-18		18	5		
	17:15	6	-3	-10					-4	
	18:15	9	-11				0			
	19:15							-23		
	20:15		-46			-31	-15	-13		
	21:15			-10	-19	-15	-12	-16	-6	47
	22:15		-33	-17	-13	-18	-13	-17		
	23:15		-4	-7	-2	-9	-12	-11	15	100
6/25/97	0:15		-21	-11		-14	-18	-19	17	
	1:15			-15	-13	-7	-9	-17		104
	2:15			-13	-16		4	34	111	
	3:15			-10						
	4:15									
	5:15									
	6:15				-155	-154	-139	-87	-11	
	7:15	-96	-117	-143	-159	151	133	134	-19	
	8:15		172	168	167	174	-73	-68	-48	-14
	9:15	-72	-55	-68	-67	-69		-27	-61	
	10:15	11	13	-2	-25	-1	3	5	-1	-18
	11:15	-26	-29	-49	-23	-40	8	39	-18	
	12:15	35	28	31		20	21	21		
	13:15	-10	-29	-44	-9	-4	30	42		
	14:15	-9	-7	-24	-28	-4	1	27		
	15:15	-3	2	-18	-21	-11	-1			
	16:15	2	-9	-29	-28	13	10	13		
	17:15	-4	-1	-3	-18	-3	10	18		
	18:15					-168				
	19:15									
	20:15	4						-1		
	21:15						-10	-9	-10	-162
	22:15	-3	-14	-9	14	0	-1	4	16	
	23:15		-19	-10			7			
6/26/97	0:15	13		-34	-35				163	
	1:15		-3	3				100	88	141
	2:15	-2	-14	-8		-3	-5	-12		
	3:15			-12		-19	-18	-19		148
	4:15			-3					-13	4
	5:15						-3			-4
	6:15			176						-13
	7:15									148
	Average:	-7	-8	-7	-22	-14	-5	5	14	37
	Maximum:	35	172	176	167	174	133	134	163	148
	Minimum:	-96	-117	-143	-159	-168	-139	-87	-61	-162
	Std Dev:	27	44	53	58	70	41	43	57	90
	RMS:	28	44	53	61	70	40	42	57	94

SCOS97-NARSTO Audit Report
Radar Profiler - Rawinsonde Wind Comparison

Site: Simi Valley
Date: June 21-23, 1997
Measurements Group: Ventura County APCD
Radar Profiler: Radian Inc. Model Lap-3000
Audit Rawinsonde: VIZ Model W-9000

Low Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	1.0
Maximum:	4.0
Minimum:	-1.8
Standard Deviation:	1.2
Root Mean Square:	1.6

Low Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	-1
Maximum:	118
Minimum:	-167
Standard Deviation:	50
Root Mean Square:	49

WS Difference (m/s)		
Altitude	6/25/97 0900	6/25/97 1400
110	1.6	0.5
165	0.9	0.9
220	0.3	0.9
275	0.6	0.6
330	1.4	1.0
385	0.6	1.4
440	0.3	1.2
495	-0.6	1.0
550	-1.2	0.9
605	-0.5	0.8
660	2.0	-1.6
715	2.9	-1.8
770	2.0	-0.4
825	0.3	0.9
880	0.9	1.1
935	1.5	1.3
990	1.3	1.0
1045	1.3	0.9
1100	1.0	1.5
1155	0.8	1.5
1210	0.1	1.5
1265	0.6	1.0
1320	1.5	0.4
1375	1.9	-0.5
1430	1.6	-1.1
1485	1.7	-1.4
1540	2.1	-1.4
1595	2.5	-0.8
1650	2.9	-0.1
1705	3.1	0.4
1760	3.6	0.5
1815	3.5	0.9
1870	3.8	1.1
1925	4.0	1.0
Average:	1.5	0.4
Maximum:	2.9	1.5
Minimum:	-1.2	-1.8
Std Dev:	1.0	1.1
RMS:	1.5	1.1

WD Difference (deg)		
Altitude	6/25/97 0900	6/25/97 1400
110	31	-167
165	59	-159
220	66	-152
275	62	12
330	34	8
385	14	-30
440	-61	16
495	-84	28
550	-85	50
605	-41	118
660	-31	114
715	-26	75
770	-38	45
825	2	46
880	29	43
935	20	36
990	18	29
1045	18	23
1100	11	14
1155	4	5
1210	1	4
1265	-6	2
1320	-13	-4
1375	-15	-9
1430	-16	-13
1485	-21	-15
1540	-23	-16
1595	-22	-14
1650	-13	-3
1705	-11	8
1760	-13	19
1815	-15	22
1870	-12	9
1925	-11	-7
Average:	-6	4
Maximum:	66	118
Minimum:	-85	-167
Std Dev:	35	61
RMS:	35	60

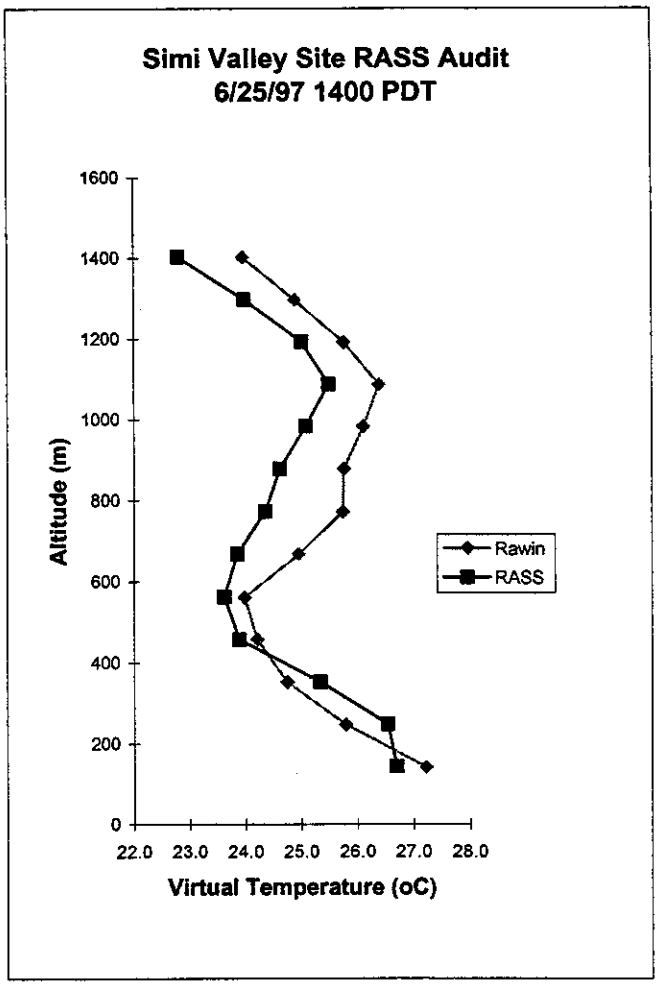
AeroVironment Environmental Services Inc.
Audit Report
RASS Summary

Date: 6/25/97
Start: 14:38 PDT
End: 14:49 PDT
Key Person: Kent Field
Auditor: Alex Barnett

Site Name: Simi Valley
Project: Upper-Air Audit
Measurement Org.: VCAPCD

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1403	22.8	24.0	-1.2
1298	24.0	24.9	-0.9
1193	25.0	25.8	-0.7
1088	25.5	26.4	-0.9
983	25.1	26.1	-1.0
878	24.6	25.8	-1.1
773	24.4	25.7	-1.4
668	23.9	25.0	-1.1
563	23.6	24.0	-0.4
458	23.9	24.2	-0.3
353	25.3	24.7	0.6
248	26.5	25.8	0.7
143	26.7	27.2	-0.5



Results Summary

Min. Diff. :	-1.4
Max Diff. :	0.7
Ave. Diff. :	-0.6
Std. Dev. :	0.7

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	1535115
Td offset (oC):	-2.5
RH offset (%)	-4.0
Sonde Pressure (mb):	979.4
Ref Pressure (mb):	979.4
Difference (mb):	0.0

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

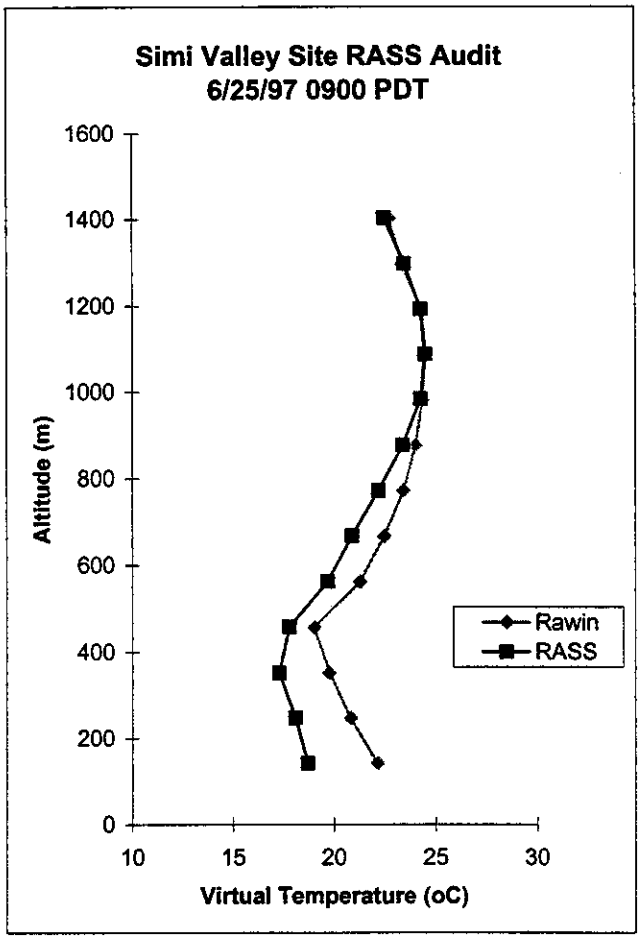
AeroVironment Environmental Services Inc.
Audit Report
RASS Summary

Date: 6/25/97
Start: 9:38 PDT
End: 10:03 PDT
Key Person: Kent Field
Auditor: Alex Barnett

Site Name: Simi Valley
Project: Upper-Air Audit
Measurement Org.: VCAPCD

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1402	22.5	22.8	-0.3
1297	23.5	23.4	0.1
1192	24.3	24.3	0.0
1087	24.5	24.6	-0.1
982	24.3	24.4	-0.1
877	23.4	24.0	-0.6
772	22.2	23.4	-1.2
667	20.9	22.5	-1.6
562	19.7	21.3	-1.6
457	17.8	19.0	-1.2
352	17.3	19.8	-2.5
247	18.1	20.8	-2.7
142	18.7	22.1	-3.4



Results Summary

Min. Diff. :	-3.4
Max Diff. :	0.1
Ave. Diff. :	-1.2
Std. Dev. :	1.2

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	1157932
Td offset (oC):	1.9
RH offset (%)	5.0
Sonde Pressure (mb):	980.9
Ref Pressure (mb):	980.6
Difference (mb):	0.3

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

TEMECULA (TCL)

SCOS97-NARSTO PRELIMINARY AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Temecula (TCL)
Audit Dates:	June 21 & 22, 1997
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Tim Dye, Mike Balkoski
Auditor:	Alexander N. Barnett

The purpose of this summary is to provide a preliminary report of any significant audit findings. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

1. Site was located in the northeast corner of the Eastern Municipal Water District Temecula Plant. The area was a relatively large gravel topped area. It was open on the east side, a single story warehouse building was to the south approximately 150' away, water treatment facilities lined the west and north side of the site, 50 - 75' away on the west and approximately 150 - 200' away on the north.
2. Power was available from the building on the west side of the site. This buidling also provided space for the RWP and RASS controllers and computers. Security was very good.
3. No RFI was detected by the RF scan of 914 - 915 MHz using the audit frequency scanner.
4. The audit GPS readings of latitude and longitude compared well with the site operator determined location.

SYSTEM AUDIT NOTES

1. The site operator, Mike Balkoski had just been hired and his training was conducted on the date of the audit, just prior to the system check. The site operator followed the STI SOP very closely in the check he performed for the audit. He appears to be

familiar with computers and didn't seem to have any problems following the procedures. It would be good to reaudit the site operator's performance later in the program, but if this is not possible, it seems that the site operator will do a good job.

POTENTIAL ACTIVE NOISE SOURCES

None noted.

POTENTIAL PASSIVE NOISE SOURCES

None noted

ANTENNA LEVEL AND ALIGNMENT

1. The audit showed the X+ side to be 168° which agreed with the operator determined direction.
2. The RWP antenna level was NE-SW: 0.1° and NW-SE: 0.1°.
3. Beam directions for low and high wind modes were 258° and 348°.
4. Beam zenith angles were 23.6°.

RADAR PROFILER PERFORMANCE AUDIT

RWP - Sodar Comparison

Sodar data was collected at the Temecula site between 14:00 hrs. PDT on 6/21/97 and 13:00 hrs. PDT on 6/23/97. It was collected at 30 meter intervals to a maximum altitude of 750 meters. The sodar data was spatially averaged to correspond with the RWP low mode data range gates of 110, 165, 220, 275, 330, 385, 440, 495, and 543 meters. Comparisons of the sodar and the RWP high mode data range gates were not possible due to the high mode range gates beginning above the sodar vertical range. The sodar and validated RWP (level one) wind data compared as follows:

	Low Mode		High Mode	
	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)
Average Difference:	-1	-1.7	NA	NA
Standard Deviation:	36	4.4	NA	NA
Root Mean Squared:	36	4.8	NA	NA
Maximum Difference:	139	9.7	NA	NA

Minimum Difference:	-98	-19.4	NA	NA

The audit results showed that the RWP and sodar wind direction average difference agreed well within the audit criteria of ± 10°, while the wind speed average difference marginally did not meet the audit criteria of ± 1.0 m/s. The validation of the sodar data revealed that the data was contaminated by noise from pumps operating on the north side of the site. Wind speeds during the audit were generally strong which assisted in minimizing the influence of the pump noise .

RWP - Rawinsonde Comparison

Rawinsonde soundings were conducted at the Temecula site on 6/23/97 at 1300 hours PDT, and 6/24/97 at 0900 hours, PDT. Comparisons with the low mode winds were not possible because the 6/23/97 sounding did not collect data below 600 meters, and the wind speeds present during the 6/24/97 sounding were less than the required threshold of 2.0 m/s.

Comparisons between the rawinsonde and the high mode RWP winds agreed well within the audit criteria of ±10° for wind direction, and ± 1.0 m/s for wind speed. The audit results were as follows:

	Low Mode		High Mode	
	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)
Average Difference:	NA	NA	-3	0.6
Standard Deviation:	NA	NA	14	1.4
Root Mean Squared:	NA	NA	14	1.4
Maximum Difference:	NA	NA	18	2.9
Minimum Difference:	NA	NA	-47	-2.7

RASS PERFORMANCE AUDIT

The audit virtual temperature comparison data was provided by the pressure, temperature, and humidity data from the 6/23/97, 1300 hours PDT, and 6/24/97, 0900 hours PDT rawinsondes that collected the wind data used in the RWP - rawinsonde wind comparisons above. Rawinsonde data for the 6/23/97 sounding was not available below 400 meters. Average differences were 0.3°C for the 6/23/97 sounding, and 0.6°C for the 6/24/97 sounding, well within the audit criteria of ± 1.0°C. The audit results were as follows:

	6/23/97 1300 PDT (oC)	6/24/97 0900 PDT (oC)
Average Difference:	0.3	0.6
Standard Deviation:	0.9	0.4
Maximum Difference:	1.6	1.0
Minimum Difference:	-1.0	-0.3

RADAR PROFILER DATA INTERNAL CONSISTENCY

1. Maximum altitudes for the high mode of operation are between 2,500 and 3,000 meters.

RASS DATA INTERNAL CONSISTENCY

No problems noted.

SURFACE METEOROLOGY PERFORMANCE AUDIT RESULTS

1. When the site power is turned off, the surface meteorological measurements data logger (Odessa Model DSM-3260) loses its time. This problem should be looked into and corrected as soon as possible.
2. The exposure of the wind sensors is obstructed by the buildings to the south and west of the site. For the sensors to be unobstructed, buildings, trees or other potential obstructions must be at least 10 times the height of the object away from the sensors.
3. The wind speed sensing system outputs differed from the corresponding audit inputs by more than the EPA recommended criteria. The transfer coefficients that

converts RPM to wind speed my not be correct. The operator should contact the manufacturer (Met One) for the proper coefficients and calibrate the system.

4. The wind direction sensing system outputs differed from the audit inputs by more than the EPA recommended criterion of ±5° for 180° and 270° . The sensor should be replaced as soon as possible.
5. The ambient temperature sensing system did not agree with the audit thermometer at the 0°C and 40°C points. It is possible that the system was operating properly. The discrepancies may be a product of the audit method that required the use of water proof sheaths in order to place the station sensor along with the audit thermometer into water baths of varying temperatures. It is suggested that the operator check the sensor performance.
6. The equivalent dew point temperature calculated from the site ambient temperature and relative humidity sensing systems differed from the audit equivalent dew point temperature by more than the EPA recommended criterion of ±1.5°C. The relative humidity sensing system should be checked and the problem identified and corrected as soon as possible.

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	Sonoma Technology, Inc.
SITE NAME AND LOCATION:	Temecula
AUDITOR:	Alexander N. Barnett
DATE:	June 21 & 22, 1997
KEY PERSON:	Tim Dye, Mike Balkoski

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
RWP		Radian	LAP-3000	7847	
RASS		Radian	LAP-3000	7868	
WS		Met One	010B	1105	0 - 50 m/s
WD		Met One	020B		0 - 540 deg
Temp.		Met One		1016	
RH		Met One	08-3C-0-6	U2679	0 - 100%

Comments:

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? No

Do any operating ranges differ from those specified in the SOP? No

Are there any significant differences between instrumentation on site and the SOP? No

Comments:

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Gateway comp.	IBM	446DX2/Tp		
RWP comp.	IBM	446DX2/Tp		
RASS amp.	Peavey	CD800		
Modem	Hayes	Optima 114		
Data logger	Odessa	DSM-3260		
Met translator	Met One	120		

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
Ear protectors				
Bubble level				
Ladder				
Checklist				

Comments:

II. Sensor/Probe Height, Level and Exposure

A. RWP and RASS

Variable	Value	Meet SOP (Yes/No)
1. Orientation	168°	Yes
2. Level	0.1°, 0.1°	Yes
3. Distance to closest obstruction	75'	Yes
4. Distance to closest active noise source	None	Yes

Comments:

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 meters	Yes
2. Distance to nearest obstacle	50'[1]	No
3. Is separation at least 10x obst. Height?	No	No
4. Are instruments on a rooftop?	No	NA
5. Is exposure 1.5X height above the roof?	NA	NA
6. Arc of unrestricted flow?	270°	Yes
7. Height of temp sensor above ground.	3 meters	Yes
8. Distance of temp sensor from obst.	None	yes
9. Hgt of Dew pt/RH sensor above ground.	3 meters	Yes
10. Distance Dew pt/RH sensor from obst.	None	Yes
11. Are the distances 4X from obst. Hgt.?	NA	NA
12. Is sensor shielded/motor asp?	Yes	Yes
13. Are temp/Dew pt/RH sensor above representative terrain?	Yes	Yes
14. Are there any significant differences between the on site equipment and the monitoring plan?	No	Yes

Comments:

1. The building that houses the RWP and RASS controllers is approximately 50' - 75' from the met tower on the west side. Additionally the building to the south of the site are closer than the 10 times criteria for unobstructed sensor exposure.

III. Operation

A. Meteorology

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is all instrumentation operational?	Yes	Yes
2.	Are all cables secure?	Yes	Yes
3.	Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4.	Are connections clean and rust free?	Yes	Yes
5.	Are serial numbers available?	Yes	Yes
6.	Do data system times agree with audit times. If not, what is the deviation?	Yes	Yes
7.	Is the printer functional?	No	Yes
8.	Overall, is the site maintenance sufficient to meet the DQOs?	yes	Yes

Comments:

B. Auxiliary Equipment

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2.	Is the site temperature recorded?	No	Yes
3.	Is the site temperature maintained at 20-30°C?	Yes[1]	Yes
4.	Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5.	Does the modem work?	Yes	Yes
6.	Does the telephone work?	Yes	Yes
7.	Is the site secure?	Yes	Yes
8.	Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments:

1. The controllers are in a concrete building that houses vats of chemicals used in water treatment. The temperature inside this building is cool even with the large sliding door

open. Even though the operator does not have control over the temperature inside the building, it appears that the temperature will remain within the specified range.

B. RWP and RASS Settings

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Software version?	POP-4	Yes
2. High mode wind pulse length?	96 meters	Yes
3. Low mode wind pulse length?	54 meters	Yes
4. RASS pulse length?	59 meters	Yes
5. Time zone	PST	No
6. Wind data consensus	2 m/s, 60%	Yes
7. RASS consensus	2 m/s, 60%	Yes

	Wind Low Mode	Wind High Mode	RASS
First Gate	0.12 km	0.28 km	0.14 km
Last Gate	1.56 km	4.37 km	1.27 km
Spacing	60.0 m	105.0 m	60.0 m
Full Scale Velocity	10.8 m/s	10.2 m/s	409.8 m/s

Comments:

C. Station Check Procedures and Documentation

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Are the station logs present?	Yes	Yes
2.	Are the station logs up to date?	Yes	Yes
3.	Do station logs contain details as required by the SOPs?	Yes	Yes
4.	Are routine checklists used?	Yes	Yes
5.	Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6.	Are the calibration forms present?	No[1]	No
7.	Do the calibration forms contain details as required by the SOPs?	NA	
8.	Are the SOPs present?	Yes	Yes
9.	Are the instrument manuals present?	Yes[2]	
10.	Do the SOPs include quality control tests?	No[3]	No
11.	If quality control tests are included then how are the results of the tests documented?	NA	
12.	Has the site technician undergone training as specified in the SOPs?	Yes	Yes
13.	Is the site visited twice weekly?	Every 2 weeks	Yes
14.	Does the site technician understand the SOPs?	Yes	Yes

Comments:

1. The calibration forms, if present, would be for the surface meteorological measurements only.
2. Instrument manuals for the RWP and RASS only were present.
3. QC test are conducted by a review of the data by the Principle Investigator. This is not something that the site operator is qualified to do. The SOP should include a data processing section and procedures for conducting these reviews.

D. Chain of Custody

1.	Review paper work for chain of custody from field to data processing.	Comments: A copy of the checklists are sent by courier each month.
2.	How are data stored?	Hard disk of the gateway computer.
3.	How often are the data backed up?	The data are downloaded to the STI Santa Rosa office daily.

Comments:

V. Preventive Maintenance

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is preventive maintenance discussed in the SOPs?	Yes	Yes
2.	Is preventive maintenance being performed?	Yes	Yes
3.	Are field operators given special training in preventive maintenance?	Yes[1]	Yes
4.	Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	Yes	Yes
5.	Are maintenance logs maintained and reviewed?	Yes[2]	Yes

Comments:

1. As part of site check only, which includes removing debris from the antenna and acoustic source enclosures, tightening the guy wires, and calling for assistance when other problems are noted.
2. The station log book and checklist serve as the maintenance log.

VI. Overall Comments

	Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1.	Overall, is the station maintenance sufficient to meet the DQOs?	Yes	Yes
2.	Does the siting meet the program objectives?	Yes	Yes
3.	Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4.	Does the QC program appear to be working?	Yes	Yes
5.	Overall, does the meteorological data look reasonable?	Yes[1]	Yes
6.	Overall, does the data appear to meet the program objectives?	Yes	Yes

Comments:

1. With the exception of the surface meteorological data.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Temecula	Instrument:	LAP-3000
Date:	6/21/97 - 6/23/97	Receiver s/n:	7847
Time:		Interface s/n:	7868
Measurements group:	STI	Frimware version:	POP-4
Key contact:	Tim Dye,	System rotation angle:	168° True
Audited by:	Alex Barnett	Measured orientation:	168° True
Site longitude:	117° 10.06'W	Orientation difference:	0° True
Site latitude:	33° 30.29'N	Array level:	NE-SW: 0.1°
			NW-SE: 0.1°
Site elevation:	1018.62' (310.5 m)	Beam zenith angle:	23.6°
Magnetic declination:	14°E	Beam directions:	NW & SW

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	10	Water treatment equipment 150' away
NA	30	5	Water treatment equipment 200' away
NA	60	<2	Chain link fence 250' away and open field beyond.
NA	90	<2	Chain link fence 250' away and open field beyond.
NA	120	<2	Chain link fence 250' away and open field beyond.
NA	150	10	Building and trees 200' away.
NA	180	20	Building and trees 150' away.
NA	210	15	Building and trees 175' away.
NA	240	30	Chemical tanks 75' away.
NA	270	30	Water treatment building 50 - 75' away.
NA	300	30	Water treatment building 50 - 75' away.
NA	330	40	Lamp post 50' away

Comments: Beams are directed toward the NW and SW over the adjacent water treatment building. Although the other views seemed to be more open, experimenting with various beam directions showed the present configuration to be best. RFI was noted from the east.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND SPEED

Date: June 22, 1997
Start: 9:20PST
Finish: 9:24PST
Auditor: Alex Barnett

Site name: Temecula
Project: SCOS97-NARSTO
Operator: STI
Site Operator: Tim Dye

Sensor Mfg: Met One
Sensor s/n: 1105
K factor: 1.4
Range: 0 - 50 m/s
Logger: Odessa
Logger s/n:
Prop s/n:

Model: 010B
Sensor Ht: 10 Meters
Starting Threshold: 0.2 gm-cm
Starting Threshold: 0.38 m/s

Last calibration date:

Cal. Factors

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WS Calibration Point	M/S Input	M/S Chart	M/S Diff. Chart	M/S DAS	M/S Diff. DAS	% Diff. DAS
1	0.3	#N/A	#N/A	0.7	0.4	#N/A
2	13.6	#N/A	#N/A	4.8	-8.8	-64.7
3	53.5	#N/A	#N/A	12.6	-40.9	-76.4
4	80.2	#N/A	#N/A	18.6	-61.6	-76.8
5	106.8	#N/A	#N/A	24.5	-82.3	-77.1
6	133.4	#N/A	#N/A	30.5	-102.9	-77.1

Pass/Fai+/-.25 m/s; ws <= 5 m/s
+/- 5%; ws > 5 m/s

Comments:

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND DIRECTION

Date: June 22, 1997
Start: 9:42PST
Finish: 10:02PST
Auditor: Alex Barnett

Site name: Temecula
Project: SCOS97-NARSTO
Operator: STI
Site Operator: Tim Dye

Sensor Mfg: Met One
Serial No.:
K Factor: 28.4
Range: 0 - 540 deg
Logger: Odessa
Logger s/n:

Model: 020B
Sensor Ht: 10 Meters
Starting Threshold: 5.0 gm-cm
Starting Threshold: 0.42 M/S

Last calibration date:

Cal. Factors

		Chart	DAS
Crossarm:	359deg true	Slope:	1.000	1.000
		Int.:	0.000	0.000

WD Audit Point	Degrees Reference	Corrected Degrees Reference	Degrees Chart	Diff. Chart Deg	Degrees DAS	Linearity	Total Diff DAS Deg.
M/S <-- Units							
Orientation	-1.0						3.0
1	90	89.0	#N/A	#N/A	89.0	-4.8	0.0
2	180	179.0	#N/A	#N/A	190.0	6.2	11.0
3	270	269.0	#N/A	#N/A	278.0	4.2	9.0
4	360	359.0	#N/A	#N/A	362.0	-1.8	3.0
5	450	449.0	#N/A	#N/A	450.0	-3.8	1.0

Avg difference: 4.8
Maximum Diff: 6.2 11.0

Criteria: Orientation: +/- 2 degrees
Linearity: +/- 3 degrees
Maximum Difference +/- 5 degrees

Vane fine is warped and the vane is nose heavy.

SCOS97-NARSTO AUDIT RECORD
AMBIENT TEMPERATURE OUTPUT

Date: June 22, 1997
Start: 10:12PST
Finish: 12:43PST
Auditor: Alex Barnett

Site nameTemecula
Project: SCOS97-NARSTO
Operator:STI
Site OperTim Dye

Audit Correction Factors
Sensor Mfg: Met One
Slope: 1
Serial No.: 1016
Int.: 0
Range: -50 to 5Deg C

Model:

Sensor Ht2 Meters

Logger: Odessa
Logger s/n:

Last calibration d

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	0.0	#N/A	#N/A	3.3	3.3
2	22.8	#N/A	#N/A	23.0	0.2
3	40.8	#N/A	#N/A	39.8	-1.0

Criteria: +/- 0.5 degree Celsius

Comments: Very slow response.
Differences at the high and low end may be due to audit method.

SCOS97-NARSTO AUDIT RECORD
RELATIVE HUMIDITY (DEW POINT TEMPERATURE)

Date:
Start: 10:50PST
Finish: 10:55PST
AuditorAlex Barnett

Site naTemecula
ProjectSCOS97-NARSTO
OperatoSTI
Site OpTim Dye

Sensor Met One
Serial U2679
Ran0 - 100Percent

Model: 08-3C-0-6
Sensor 2 Meters

Logger:Odessa
Logger s/n:

Last calibration date

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

RH/DP Audit Point	%RH Input	Deg C Input	% RH Chart	Deg C Chart	Deg C Diff. Chart	%RH DAS	Deg C DAS	Deg C Diff. DAS
1	36.5	10.1	#N/A	#N/A	#N/A	58.0	11.8	1.7

Criteria: +/- 1.5 degree Celsius

Comments: Did not meet audit criterion.

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: Temecula
Date: June 21-23, 1997
Measurements Group: Sonoma Technology, Inc.
Radar Profiler: Radian Inc. Model Lap-3000
Audit Sodar: AeroVironment Model 2000

Overall Difference Radar Profiler - Sodar	Wind Speed (m/s)
Average:	-1.7
Maximum:	9.7
Minimum:	-19.4
Standard Deviation:	4.4
Root Mean Square (RMS):	4.8

		Wind Speed Difference (m/s, Radar Profiler - Sodar) Level (m)								
Date	Hour	110	165	220	275	330	385	440	495	543
06/21/97	14:15	3.5	2.4						-3.9	
	15:15	1.5	-0.5					0.0	-3.5	-17.0
	16:15	-1.7	0.0					-0.3	-7.9	-16.4
	17:15	-3.9	-2.9		-0.4		9.7	0.7		
	18:15	-3.4					5.0	0.6	-9.0	-1.4
	19:15	-6.3			-2.9		-1.8	0.5		-2.8
	20:15	-6.6		-1.6	-4.7		-2.9	0.3		
	21:15	-6.1			-3.5		-4.4	-3.9		
	22:15	-16.0	0.8	-2.5	-1.9		-5.4	-7.0	-0.9	
	23:15	4.7	-1.1	-3.4			-3.5		-2.7	-0.7
06/22/97	0:15	2.2	-0.7						-3.9	
	1:15	-2.1	-0.6	-4.3						
	2:15	-2.6	-0.5							0.8
	3:15	-2.8				-7.1	8.6			0.7
	4:15	-3.3		-0.5		-8.0	5.6			-0.2
	5:15			-2.6	-1.2		5.1	0.7		-0.5
	6:15	-12.0		-1.8			4.5	-0.3		-5.6
	7:15		3.8	-1.2	-2.8		3.9	-5.2	-0.5	-4.5
	8:15	2.7	0.8				6.8		-2.2	-7.8
	9:15	1.5	2.0	-2.3			3.9			-7.5
	10:15	-3.5	0.9	-2.3			0.0			-8.1
	11:15		-0.4				4.3	-0.3		-0.2
	12:15		0.2		0.6		1.1	0.4		
	13:15	-5.4	-1.7		-2.6		-1.1	-0.7		-3.1
	14:15	-5.0			-1.8	5.4	0.6	-0.6		-7.5
	15:15				-3.2	0.5	1.8	-3.4	-3.5	
	16:15		0.7	-1.6	-5.4	0.0	2.1		-9.5	
	17:15	8.4	-3.2	-2.1		-2.9	3.1			
	18:15	3.8	-2.7	-5.5		-3.9	2.7			
	19:15	-1.9		-3.4		-3.5		-0.3		
	20:15	-3.9				-6.7		-1.4		
	21:15	-6.4				-11.5		-2.2		
	22:15						2.8	-2.7		
	23:15	-11.3		-2.0		4.9	2.1	-0.8		
06/23/97	0:15			-1.2		1.3	0.3	-4.7	-6.6	
	1:15		0.8	-1.1		-0.8			-19.4	
	2:15	9.6	-1.0	-1.5		-1.7			-18.3	
	3:15	8.6	-3.6			-3.1				
	4:15	0.4	-3.7	-5.6		-5.2				
	5:15	-0.1						-0.9		4.4
	6:15	-0.4					-0.7	-1.8		1.1
	7:15	-2.2					0.4			
	8:15	-3.9		-0.8			1.9			
	9:15	-6.6		-2.0		3.1	1.1	-0.7		
	10:15		-1.5			-2.4	-0.2	-0.5		
	11:15		-0.7			-2.7				
	12:15		-1.4							
	13:15	5.7	-8.3	-0.8				-1.5		
	Average:	-1.8	-0.8	-2.3	-2.5	-2.3	1.9	-1.3	-6.6	-4.0
	Maximum:	9.6	3.8	-0.5	0.6	5.4	9.7	0.7	-0.5	4.4
	Minimum:	-16.0	-8.3	-5.6	-5.4	-11.5	-5.4	-7.0	-19.4	-17.0
	Std Dev:	5.6	2.3	1.4	1.7	4.4	3.5	2.0	5.9	5.7
	RMS:	5.9	2.4	2.7	3.0	4.8	3.9	2.4	8.7	6.8

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Direction Comparison

Site: Temecula
Date: June 21-23, 1997
Measurements Group: Sonoma Technology, Inc.
Radar Profiler: Radian Inc. Model Lap-3000
Audit Sodar: AeroVironment Model 2000

Overall Difference Radar Profiler - Sodar	Wind Dir. (deg)
Average:	-1
Maximum:	139
Minimum:	-98
Standard Deviation:	36
Root Mean Square (RMS):	36

		Wind Dir. Difference (deg, Radar Profiler - Sodar) Level (m)								
Date	Hour	110	165	220	275	330	385	440	495	543
06/21/97	14:15	8	7						8	
	15:15	2	-7					-8	1	114
	16:15	13	-7					8	0	102
	17:15	6	8		61		9	-2		
	18:15	10					-16	-8	7	-49
	19:15	10			100		6	-4		-98
	20:15	4		-37	102		5	-25		
	21:15	6			96		-6	-61		
	22:15	-16	31	0	58		-12	-62	-6	
	23:15	-4	21	34			-9		-12	-52
06/22/97	0:15	-4	10						-19	
	1:15	9	13	2						
	2:15	12	23							-23
	3:15	11				0	-39			-13
	4:15	16		-71		3	-13			-17
	5:15			-83	97		5	-41		-10
	6:15	-20		-94			-1	-59		-35
	7:15		56	-61	59		-7	-66	-28	-43
	8:15	-4	25				-43		-43	-33
	9:15	-12	18	-47			-5			-13
	10:15	-1	77	-61			-11			-28
	11:15		39				30	-39		6
	12:15		-3		22		-16	-45		
	13:15	-1	-5		14		-7	-20		19
	14:15	5			58	11	9	-21		19
	15:15				139	9	-8	-83	61	
	16:15		15	-51	74	20	-11		52	
	17:15	4	14	-76		8	39			
	18:15	-19	35	1		5	55			
	19:15	-13		-43		-3		17		
	20:15	-13				-14		18		
	21:15	-9				-19		21		
	22:15						-5	-1		
	23:15	-19		-64		-8	18	-1		
06/23/97	0:15			-45		-26	25	-39	32	
	1:15		-4	-41		-4			50	
	2:15	25	9	-38		0			61	
	3:15	-19	13			-4				
	4:15	-6	-4	9		1				
	5:15	-9						3		3
	6:15	-8					-19	21		8
	7:15	-1					3			
	8:15	-12		-30			32			
	9:15	-25		-40		-13	36	35		
	10:15		5			3	16	-2		
	11:15		2			8				
	12:15		-2							
	13:15	15	-60	-16				-8		
	Average:	-2	12	-39	73	-1	2	-17	12	-7
	Maximum:	25	77	34	139	20	55	35	61	114
	Minimum:	-25	-60	-94	14	-26	-43	-83	-43	-98
	Std Dev:	12	24	33	36	11	22	31	34	49
	RMS:	12	27	50	81	11	21	35	35	49

SCOS97-NARSTO Audit Report
Radar Profiler - Rawinsonde Wind Comparison

Site: Temecula
Date: June 21-23, 1997
Measurements Group: Sonoma Technology, Inc.
Radar Profiler: Radian Inc. Model Lap-3000
Audit Rawinsonde: VIZ Model W-9000

High Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	0.6
Maximum:	2.9
Minimum:	-2.7
Standard Deviation:	1.4
Root Mean Square:	1.4

High Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	-3
Maximum:	18
Minimum:	-47
Standard Deviation:	14
Root Mean Square:	14

Low Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	
Maximum:	
Minimum:	
Standard Deviation:	
Root Mean Square:	

Low Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	
Maximum:	
Minimum:	
Standard Deviation:	
Root Mean Square:	

WS Difference (m/s)		
Altitude	6/23/97 1300	6/24/97 0900
639		
735		
832		2.0
928		0.9
1024		2.9
1120		0.9
1216		-0.1
1313		-0.2
1409		-1.0
1505	-0.6	-0.4
1601	-0.4	
1697	0.5	
1794		
1890	-0.4	
1986		1.4
2082		1.0
2178		1.2
2275		2.5
2371		2.4
2467		
2563		1.1
2660		-0.1
2756		-2.7
2852		
2948		
3044		
3141		
3237		
3333		
Average:	-0.2	0.7
Maximum:	0.5	2.9
Minimum:	-0.6	-2.7
Std Dev:	0.5	1.4
RMS:	0.5	1.6

WD Difference (deg)		
Altitude	6/23/97 1300	6/24/97 0900
639		
735		
832		4
928		-11
1024		-15
1120		-23
1216		-47
1313		-12
1409		-6
1505	18	0
1601	9	
1697	-7	
1794		
1890	-1	
1986		6
2082		8
2178		10
2275		11
2371		0
2467		
2563		-4
2660		-6
2756		1
2852		
2948		
3044		
3141		
3237		
3333		
Average:	5	-5
Maximum:	18	11
Minimum:	-7	-47
Std Dev:	11	15
RMS:	11	15

Comments:

WS Difference (m/s)		
Altitude	6/23/97 1300	6/24/97 0900
110		
165		
220		
275		
330		
385		
440		
495		
543		
Average:		
Maximum:		
Minimum:		
Std Dev:		
RMS:		

WD Difference (deg)		
Altitude	6/23/97 1300	6/24/97 0900
110		
165		
220		
275		
330		
385		
440		
495		
543		
Average:		
Maximum:		
Minimum:		
Std Dev:		
RMS:		

Comments:

1. Rawinsonde data below 600m was not available from the 1300 flight.
2. For the 0900 flight, wind speeds in the low mode range were less than 2.0 m/s.

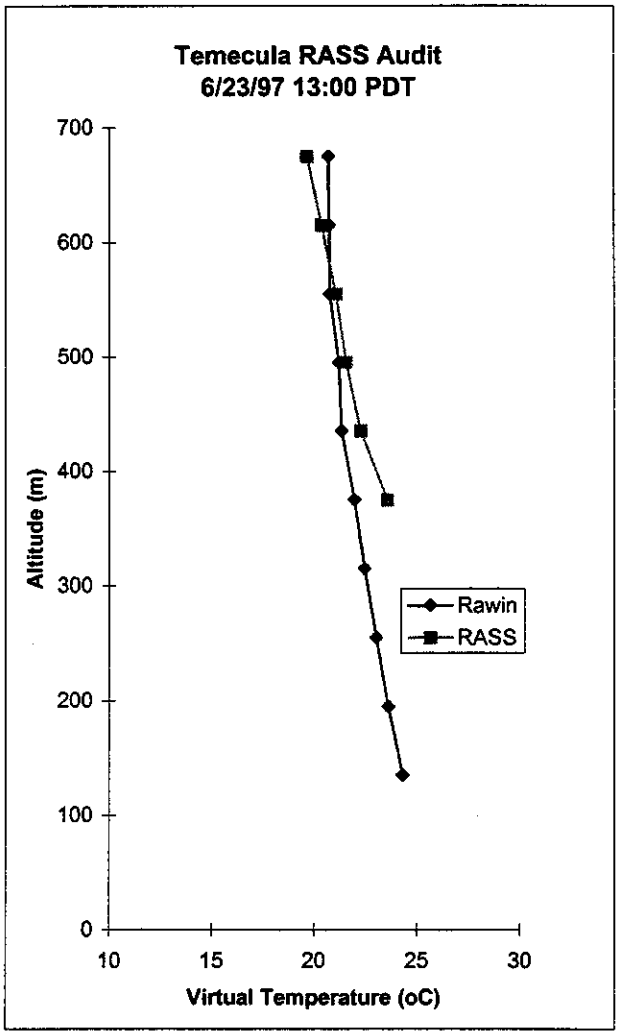
SCOS97-NARSTO Audit Report

Date: 6/23/97
Start: 3:00 PDT
End: 3:15 PDT
Key Person: Tim Dye
Auditor: Alex Barnett

Site Name: Temecula
Project: Upper-Air Audits
Measurement Org.: STI

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
675	19.7	20.7	-1.0
615	20.4	20.8	-0.4
555	21.1	20.8	0.3
495	21.6	21.2	0.4
435	22.3	21.4	0.9
375	23.6	22.0	1.6
315	-950	22.5	NA
255	-980	23.1	NA
195	-980	23.7	NA
135	-980	24.3	NA



Results Summary

Min. Diff. :	-1.0
Max Diff. :	1.6
Ave. Diff. :	0.3
Std. Dev. :	0.9

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	1057525
Td offset (oC):	2.2
RH offset (%)	-8.0
Sonde Pressure (mb):	976.4
Ref Pressure (mb):	976.6
Difference (mb):	-0.2

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and RH offsets were included in the Tv calculations.

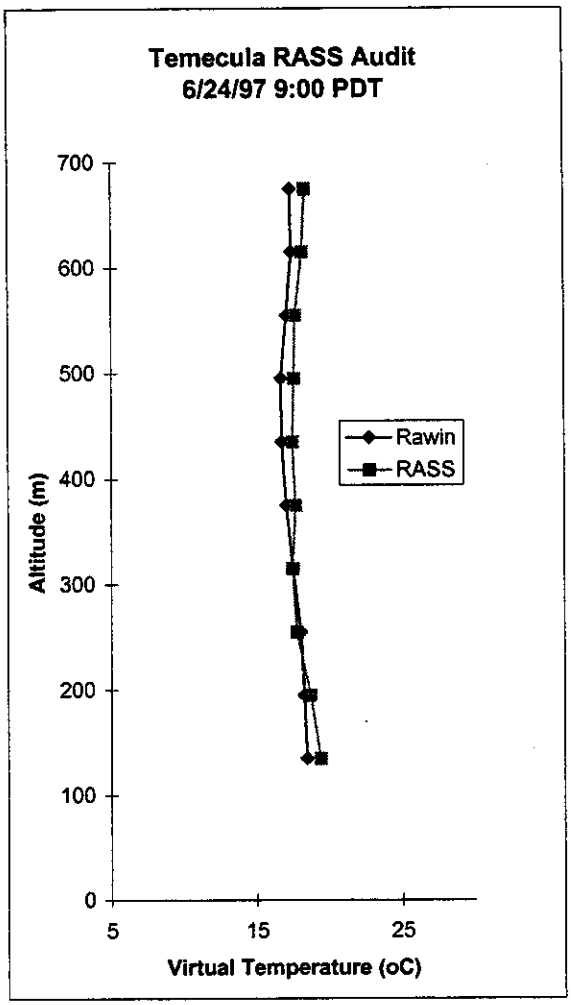
SCOS97-NARSTO Audit Report

Date: 6/24/97
Start: 9:00 PDT
End: 9:25 PDT
Key Person: Tim Dye
Auditor: Alex Barnett

Site Name: Temecula
Project: Upper-Air Audits
Measurement Org.: STI

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
675	18.4	17.4	1.0
615	18.2	17.5	0.7
555	17.7	17.1	0.6
495	17.6	16.7	0.9
435	17.5	16.8	0.7
375	17.7	17.1	0.6
315	17.5	17.5	0.0
255	17.8	18.1	-0.3
195	18.7	18.3	0.4
135	19.4	18.5	0.9



Results Summary

Min. Diff. :	-0.3
Max Diff. :	1.0
Ave. Diff. :	0.6
Std. Dev. :	0.4

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	1157694
Td offset (oC):	0.4
RH offset (%)	-5.0
Sonde Pressure (mb):	977.0
Ref Pressure (mb):	978.0
Difference (mb):	-1.0

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and RH offsets were included in the Tv calculations.

THERMAL (TML)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Thermal (TML)
Audit Dates:	June 19, 1997
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Tim Dye, Randy Bazua
Auditor:	Robert A. Baxter

The purpose of this summary is to provide a preliminary report of any significant audit findings. The audit was performed immediately following the STI training of the site technician. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

The site is located in a slight depression near the Thermal Airport. The view around the site is relatively clear with power poles and trees being the primary obstructions.

SYSTEM AUDIT NOTES

1. Power was not yet installed. Power during the audit was provided from a long extension cord. To prevent instrument overheating, all instruments were turned off at the audit conclusion. Power is expected to be installed early during the week of June 23. No data will be collected until that time.
2. The backup battery on the data logger was not functional. If power is lost at the site then there will be a loss of surface meteorological data. The battery was replaced during the audit but the problem persisted. The data logger should be repaired as soon as possible.
3. The Zip drive used for data archival was not functional at the time of the audit. The appropriate software drivers should be installed and the operation rechecked.
4. The site operator lacked a fundamental understanding of computers. This hampered his understanding of the tasks to be performed and could lead to potential problems in data recovery. Certain tasks were removed from the SOPs to

minimize the chances of problems. The operator should carefully follow the instructions in the SOP and document the results of the checks in the site checklists. The SOPs provide a good step by step procedure for the needed checks and should always be the primary point of reference. More extensive training or selection of a new operator is recommended. If the existing operator is retained then a follow up review of the his capabilities should be performed in about two to four weeks.

5. The wind speed and wind direction sensors were not vertical. This was corrected during the audit.
6. The wind vane was not balanced. The vane was balanced during the audit.

POTENTIAL ACTIVE NOISE SOURCES

No problems noted.

POTENTIAL PASSIVE NOISE SOURCES

No problems noted.

ANTENNA LEVEL AND ALIGNMENT

No problems noted.

RADAR PROFILER PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RASS PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RADAR PROFILER DATA INTERNAL CONSISTENCY

The amount of data for review was limited because the site does not yet have power. The instruments were run on temporary power for the audit but will not be run continuously until permanent power and air conditioning are available. Power and air conditioning are expected early in the week of June 23. The data reviewed did look reasonable.

RASS DATA INTERNAL CONSISTENCY

1. Data are limited due to the lack of power at the site. Of the data obtained, it looks reasonable. The height range was increased during the audit from 12 gates (780

m) to 20 gates (1280 m). Consideration should be given to raising it to 1560 meters, as in the Riverside site.

2. Given the anticipated range of temperatures in the desert, the RASS range should be adjusted to measure temperatures above 44°C.

SURFACE METEOROLOGY PERFORMANCE AUDIT

1. The relative humidity sensor failed the audit criteria. The site effective dew point temperature was 4.7° high, which is outside of the ±1.5°C criteria. The site relative humidity was 5.9% higher than the calculated audit relative humidity. This is also outside of the manufacturers' specifications. The sensor should be repaired or replaced.
2. The wind direction vane was not balanced. It was balanced following the audit.
3. The battery backup in the data logger was not functional. When power is restored from a power failure the clock reset to midnight. In a power outage this could result in mislabeled data. The battery backup should be repaired.

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	Sonoma Technology, Inc./Radian
SITE NAME AND LOCATION:	Thermal (TML)
AUDITOR:	Robert A. Baxter
DATE:	June 19, 1997
KEY PERSON:	Tim Dye/Randy Bazua

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Radar Profiler	Radian Corp.	LAP-3000 Interface Receiver/ Modulator Profiler Monitor Antennas	NA	Lo 110 - 1429 m at 55 m inc. Hi 254 - 3525 m at 96 m inc.
Virtual Temperature	RASS	Radian Corp.	LAP-3000	NA	120 - 1260 m at 60 m inc. (see below)
	Audio amplifier	Peavey	CS-800X	NA	NA
10 m Wind Speed	Cup	Met One	010B		0 - 50 m/s
10 m Wind Direction	Vane	Met One	020B		0 - 540 degrees
2 m ambient temperature	RTD	Met One	060A	NA	-50 - 50 °C
2 m relative humidity	Solid State	Met One	083C	NA	0 - 100%
Data Logging	Digital	Odessa	DSM 3260	NA	NA

Comments: The RASS range was changed during the audit to about 1260 meters. The surface wind speed is reported in miles per hour.

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? No

Do any operating ranges differ from those specified in the SOP? See Below

Are there any significant differences between instrumentation on site and the SOP? No

Comments: The altitude and temperature operating range of the RASS should be increased further, if possible.

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Temperature cutoff switch	NA	NA	NA	NA
Modem	NA	NA	NA	NA
Gateway Computer and Monitor	NA	NA	NA	NA
Zip drive	Iomega	Parallel	NA	NA

Comments: Zip drive not functional at the time of the audit.

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
Clock	NA	Analog	NA	NA
Level	NA	NA	NA	NA
Ladder	NA	NA	NA	NA
Hearing Protection	NA	NA	NA	NA
Tool Kit	NA	NA	NA	NA
Broom	NA	NA	NA	NA

Comments:

II. Sensor/Probe height and Exposure

A. Radar Profiler/RASS/Sodar

Variable	Value	Meet SOP (Yes/No)
1. Orientation	Radar -- 0° 10 m Vane -- 1°	Yes
2. Level	Radar -- <0.2°	Yes
3. Distance to closest obstruction	Various trees, not significant	Yes
4. Distance to closest active noise source	No significant active RF sources	Yes

Comments:

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 m	Yes
2. Distance to nearest obstacle	~20 m	see below
3. Is separation at least 10x obst. height?	No	see below
4. Are instruments on a rooftop?	No	NA
5. Is exposure 1.5x height above roof	NA	NA
6. Arc of unrestricted flow	360°	Yes
7. Height of temp sensor above ground	2 m	Yes
8. Distance of temp sensor from obst.	trailer -- ~12 m	Yes
9. Height of DP/RH sensor above ground	2 m	Yes
10. Distance of DP/RH sensor from obst.	trailer -- ~12 m	Yes
11. Are the distances 4x the obst. height?	Yes	Yes
12. Is the sensor shielded or aspirated?	Aspirated	Yes
13. Are the T/DP/RH abv representative terrain?	Yes	Yes
14. Are there significant differences between on-site equipment and the monitoring plan?	No	Yes

Comments: 1, 2. Tree to the northeast, should not affect the data quality.

The wind speed and wind direction sensors were not vertical at the time of the audit. This was corrected at the audit conclusion.

III. Operation

A. Radar Profiler, RASS and Surface Meteorology

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is all instrumentation operational?	Yes	Yes
2. Are all cables secure?	Yes	Yes
3. Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4. Are connections clean and rust free?	Yes	Yes
5. Are serial numbers available?	See below	NA
6. Do data system times agree with audit times. If not, what is the deviation?	No	See below
7. Is the printer functional?	No	Not used
8. Overall, is the site maintenance sufficient to meet the DQOs?	Yes	Yes

Comments: Permanent power was not yet available for the site. Temporary power was used during the audit.

5. Did not want to move profiling equipment to get serial numbers.

6. Upon arrival at the site the Odessa data logger clock was not on the correct time. The battery backup feature did not restore the clock to the proper time.

B. Radar Profiler/RASS/Sodar Settings

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Software version	POP 4	Yes
2. High mode pulse length	96 m	Yes
3. Low mode pulse length	54 m	Yes
4. RASS pulse length	59 m	Yes
5. Time zone	PST	Yes
6. Wind data consensus	55 min	Yes
7. RASS consensus	5 min	Yes

Comments:

	Wind Low Mode	Wind High Mode	RASS
First Gate	110 m	254 m	120 m
Last Gate	1429 m	3525 m	1260 m
Spacing	55 m	96 m	60 m
Full Scale Velocity	10.2	10.2	NA

Comments: The RASS range was changed during the audit to 1260 meters. It is recommend the RASS be operated to a higher altitude. In addition, given the anticipated range of temperatures in the desert, the RASS range should be adjusted to measure temperatures above 44°C.

B. Auxiliary Equipment

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	No	No
2. Is the site temperature recorded?	No	See below
3. Is the site temperature maintained at 20-30°C?	No	See below
4. Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5. Does the modem work?	Yes	Yes
6. Does the telephone work?	Yes	Yes
7. Is the site secure?	Yes	Yes
8. Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	No	No

Comments: 1, 2, 3, 8. Permanent power and A/C was not available yet for the shelter. When power is available the site will be left on and should function acceptably.

C. Station Check Procedures and Documentation

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Are the station logs present?	Yes	Yes
2. Are the station logs up to date?	Yes	Yes
3. Do station logs contain details as required by the SOPs?	Yes	Yes
4. Are routine checklists used?	Yes	Yes
5. Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6. Are the calibration forms present?	No	See below
7. Do the calibration forms contain details as required by the SOPs?	NA	NA
8. Are the SOPs present?	Yes	Yes
9. Are the instrument manuals present?	No	See below
10. Do the SOPs include quality control tests?	Yes	Yes
11. If quality control tests are included then how are the results of the tests documented?	Yes	See below
12. Has the site technician undergone training as specified in the SOPs?	Yes	No -- see below
13. Is the site visited twice weekly?	No	See below
14. Does the site technician understand the SOPs?	No	No

Comments: 6. Calibration records are maintained at STI and Radian.

9. Manuals are maintained at STI and Radian. If repairs are needed then the technician brings the manuals to the site.

11. Documentation of the QC test results were not specifically addressed. The QC test results should be placed in the maintenance checklist log.

12, 14. The site technician was trained but still lacks appropriate knowledge to effectively operate the site. Retraining or replacement of the operator is needed.

13. The site is visited every two weeks for routine maintenance. In between the visits the data are polled and reviewed daily.

D. Chain of Custody

1. Review paper work for chain of custody from field to data processing.	Comments: The site is inspected every two weeks with all data archived and paperwork forwarded to STI in pre addressed envelopes.
2. How are data stored?	Data are stored locally on the computer hard drives with CDF files downloaded on a daily basis.
3. How often are the data backed up?	All data (CDF, moments) are copied to Zip disks every two weeks and shipped to STI.

Comments:

V. Preventive Maintenance

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is preventive maintenance discussed in the SOPs?	Yes	Yes
2. Is preventive maintenance being performed?	Yes	Yes
3. Are field operators given special training in preventive maintenance?	Yes	Yes
4. Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	Yes	Yes
5. Are maintenance logs maintained and reviewed?	Yes	Yes

Comments:

VI. Overall Comments

Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1. Overall, is the station maintenance sufficient to meet the DQOs?	Yes	Yes
2. Does the siting meet the program objectives?	Yes	Yes
3. Overall, is the site technician trained as specified in the SOPs?	Yes	No
4. Does the QC program appear to be working?	See below	NA
5. Overall, does the meteorological data look reasonable?	Yes	Yes (see below)
6. Overall, does the data appear to meet the program objectives?	See below	See below

Comments: 3. The site operator lacked a fundamental understanding of computers. This hampered his understanding of the tasks to be performed and could lead to potential problems in data recovery. Certain tasks were removed from the SOPs to minimize the chances of problems. The operator should carefully follow the instructions in the SOP and document the results of the checks in the site checklists. The SOPs provide a good step by step procedure for the needed checks and should always be the primary point of reference. More extensive training or selection of a new operator is recommended. If the existing operator is retained then a follow up review of the his capabilities should be performed in about two to four weeks.

4. The procedures are in place for an appropriate QC program. However, as indicated above the technician does require retraining or replacement.

5, 6. Data are limited due to the lack of power at the site. Of the data obtained, it looks reasonable. The height range on the RASS was increased during the audit from 12 gates (780 m) to 20 gates (1280 m). Consideration should be given to raising it to 1560 meters.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Thermal	Instrument:	Radian LAP 3000
Date:	June 19, 1997	Receiver s/n:	NA
Time:	1100 PDT	Interface s/n:	NA
Measurements group:	STI	Firmware version:	POP 4
Key contact:	Tim Dye	System rotation angle:	301°
Audited by:	Bob Baxter	Measured orientation:	301°
Site longitude:	116° 10.00' W	Orientation difference:	0°
Site latitude:	33° 38.20' N	Array level:	< 0.2°
Site elevation:	NA	Beam zenith angle:	23.6°
Magnetic declination:	15° (appx)	Beam directions:	211°, 301° ind.

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
0	15	16	Top of tree at ~15 m.
30	45	15	Top of tree at ~20 m.
60	75	8	Utility trailer at ~15 m.
90	105	10	Light pole at ~50 m.
120	135	10	Tree at ~100 m.
150	165	4	Tree at ~300 m.
180	195	2	Shed at ~ 400 m.
210	225	10	Tree at ~ 60 m.
240	255	7	Tree at ~150 m.
270	285	4	Tree at ~ 500 m.
300	315	5	Tree at ~ 150 m.
330	345	5	Tree at ~ 200 m.

Comments: RASS level is better than 0.5°.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND SPEED

Date: June 19, 1997
Start: 1545 PDT
Finish: 1709 PDT
Auditor: Bob Baxter

Site name: Thermal (TML)
Project: SCOS97-NARSTO
Operator: Radian/STI
Site Operator: T. Dye

Sensor Mfg: Met One
Sensor s/n: NA
K factor: 1.4
Range: 0 - 50 m/s
Logger: Odessa
Logger s/n: DSM-3260
Prop s/n: NA

Model: 010B
Sensor Ht.: ~10 m
Starting torque: 0.3 gm-cm
Starting Threshold: 0.46 m/s

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WS Calibration Point	M/S Input	M/S Chart	M/S Diff. Chart	M/S DAS	M/S Diff. DAS	% Diff. DAS
1	0.3	#N/A	#N/A	0.2	-0.1	#N/A
2	5.6	#N/A	#N/A	5.5	-0.1	-1.7
3	11.6	#N/A	#N/A	11.6	0.0	0.1
4	21.6	#N/A	#N/A	21.5	-0.1	-0.3
5	32.2	#N/A	#N/A	32.2	0.0	-0.1
6	42.9	#N/A	#N/A	43.0	0.1	0.3

Pass/Fail Criteria: +/-.25 m/s; ws <= 5 m/s
+/- 5%; ws > 5 m/s

Comments: Data logger reports in miles per hour.
Sensor passed.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND DIRECTION

Date: June 19, 1997
Start: 1545 PDT
Finish: 1600 PDT
Auditor: Bob Baxter

Site name: Thermal (TML)
Project: SCOS97-NARSTO
Operator: Radian/STI
Site Operator: T. Dye

Sensor Mfg: Met One
Serial No.: NA
K Factor: 28.4
Range: 0 - 540°
Logger: Odessa
Logger s/n: DSM-3260

Model: 020B
Sensor Ht.: ~10 m
Starting torque: 2.5 gm-cm
Starting threshold: 0.30 M/S

Last calibration date: unknown

Crossarm: 1 deg true

Cal. Factors

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WD Audit Point	Degrees Reference	Corrected Degrees Reference	Degrees Chart	Diff. Chart Deg.	Degrees DAS	Linearity	Total Diff DAS Deg.
Orientation	1.0				358.0		-3.0
1	0	361.0	#N/A	#N/A	358.0	-0.5	-3.0
2	90	91.0	#N/A	#N/A	87.0	-1.5	-4.0
3	180	181.0	#N/A	#N/A	179.0	0.5	-2.0
4	270	271.0	#N/A	#N/A	270.0	1.5	-1.0
5							
6							
7							
8							
9							
10							
11							
Avg difference:							-2.5
Maximum difference:						-1.5	-4.0

Criteria: Orientation: +/- 2 degrees
Linearity: +/- 3 degrees
Maximum Difference: +/- 5 degrees

Comments: Sensor passed criteria.
Sensor was no completely vertical, it was corrected after the audit.
Vane was not balanced, it was corrected during the audit.

SCOS97-NARSTO AUDIT RECORD
AMBIENT TEMPERATURE

Date: June 19, 1997
Start: 1730 PDT
Finish: 1750 PDT
Auditor: Bob Baxter

Site name: Thermal (TML)
Project: SCOS97-NARSTO
Operator: Radian/STI
Site Operator: T. Dye

Sensor Mfg: Met One
Serial No.: NA
Range: -50 - 50 Deg C

Model: 060A
Sensor Ht.: ~10 m

Logger: Odessa
Logger s/n: DSM-3260

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	2.7	#N/A	#N/A	2.5	-0.2
2	22.4	#N/A	#N/A	22.4	0.0
3	42.4	#N/A	#N/A	42.4	0.0

Criteria: +/- 0.5 degree Celsius

Comments: Sensor passed

SCOS97-NARSTO AUDIT RECORD
RELATIVE HUMIDITY (DEW POINT TEMPERATURE)

Date: June 19, 1997
Start: 1717 PDT
Finish: 1717 PDT
Auditor: Bob Baxter

Site name: Thermal (TML)
Project: SCOS97-NARSTO
Operator: Radian/STI
Site Operator: T. Dye

Sensor Mfg: Met One
Serial No.: NA
Range: 0 - 100 Percent

Model: 083C
Sensor Ht.: ~10 m (on bldg)

Logger: Odessa
Logger s/n: DSM-3260

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

RH/DP Audit Point	%RH Input	Deg C Input	% RH Chart	Deg C Chart	Deg C Diff. Chart	%RH DAS	Deg C DAS	Deg C Diff. DAS
1	16.1	10.2	#N/A	#N/A	#N/A	22.0	14.9	4.7

Criteria: +/- 1.5 degree Celsius

Comments: Sensor failed criteria.