Data quality for Aggregation and Dissemination of DOT Traveler Information: Best Practices

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Disclaimer

The opinions, findings and conclusions expressed in this presentation are those of the authors and not necessarily those of the Western States Rural Transportation Consortium, the California Department of Transportation, or Montana State University.
Abstract

Data quality for traveler information data has generally been handled on an ad-hoc basis, with little or no provision for error notification other than perhaps through user-reporting of observed errors. Weather-related systems such as MADIS, Mesowest and Clarus have applied quality checks to weather sensor data, but these checks don’t necessarily transfer to other sensor and data types. Further, these checks may not be applicable to department of transportation RWIS sites in the absence of data from additional sites. Some, including Caltrans District 2, have implemented measures of reliability based on network and file transfer performance. The District 2 Information Relay and the DRISI CWWP2 efforts have also included some checks for bad data in CCTV and other feeds. However, there do not appear to be unified, multi-dimensional approaches to data quality for aggregation and dissemination of DOT traveler information.

The goal of this project is to analyze and document existing system best practices for data quality for the aggregation and dissemination of state department of transportation traveler information.
Presentation Outline

• Problem(s)
• Need
• Objectives
• Survey (preliminary responses)
• Literature Search (in progress)
• Next Steps
• What We’re Doing
• Acknowledgements
Problem

The quality of data is a crucial consideration for the provision of traveler information. For example, is the data accurate, timely, and reliable?

- Drivers will make travel decisions based on up to date, correct, and accessible information which ultimately impacts the effectiveness of traffic management.
- Drivers are much less likely to access the information and make travel decisions based on information that is incorrect, stale, or untrustworthy. This can significantly diminish the effectiveness of traffic management efforts. Even worse, if drivers use incorrect information to make travel-related decisions, accidents, injury or even death could occur.
Examples of Problems with Traveler Information Data and Metadata

- Meta data – field element location, timestamps
- Old or frozen CCTV images
- Partial CCTV image, dark CCTV image
- Indication of camera being unavailable
- Duplicate data in different locations
- Misspellings on sign messages
- Camera settings visible to the public
- Color display (affects interpretation of road conditions)
- Incidents incorrectly located
- Chain-up control requirements
- RWIS data – e.g., surface temperature, error, missing, displaying a value when there is no sensor, depth and water level
- Incorrect data (temperature, precipitation, etc.)
Examples From the One Stop Shop
(oss.weathershare.org)
07/24/2015
What problems can we find on an arbitrary day?
This camera has been removed from service due to major construction or damage. Please check back monthly.

The web camera is temporarily under repairs. Your patience is appreciated.

There is no image available from this camera. Please try to access it later. If you receive this message after an hour, it might take us more than one day to repair the problem.

This camera is currently offline for repair. We are working to get the camera back online as quickly as possible, but it will be longer than one day.

Image Currently Unavailable

Image unavailable due to Construction
No Stream

© WSDOT Jul 24, 2015 8:18 AM PDT

Source: WSDOT

Source: ODOT
SR18 / Arrowbear Dr
Updated: 9:45 AM MDT - Fri, Jul 24 2015
Type: 1125-Traffic Hazard
Detail:
10:05 AM MDT - Fri, Jul 24 2015: [1] SPILL CONTINUES INTO THE ARTIC CIRCLE - TRYING TO PUT A CONE OUT IN ALL THE LEFT HAND CURVE TO KEEP YEHS OUT OF IT
10:03 AM MDT - Fri, Jul 24 2015: [9] 1039 B5032
9:51 AM MDT - Fri, Jul 24 2015: [7] 101-10 ENRT TO SLOW DOWN TRAFFIC
9:46 AM MDT - Fri, Jul 24 2015: [1] OIL SPILL
Responding Officer Status:
10:10 AM MDT - Fri, Jul 24 2015: Unit Enroute
9:50 AM MDT - Fri, Jul 24 2015: Unit At Scene
9:50 AM MDT - Fri, Jul 24 2015: Unit Assigned
9:46 AM MDT - Fri, Jul 24 2015: Unit Assigned
9:46 AM MDT - Fri, Jul 24 2015: Unit Assigned

US 395 / Point Ranch Rd
Area: Bridgeport
Updated: 9:05 AM MDT - Fri, Jul 24 2015
Type: 1125A-Animal Hazard
Detail:
9:07 AM MDT - Fri, Jul 24 2015: [1] SHEEP ON RDWY
Source: CHP

I-5 S Jno A12
Area: Yreka
Updated: 9:38 AM MDT - Fri, Jul 24 2015
Type: 1125A-Animal Hazard
Detail:
9:36 AM MDT - Fri, Jul 24 2015: [3] WIRY COAT, RUNNING AROUND IN CD
9:38 AM MDT - Fri, Jul 24 2015: [1] DOG IN CD
Responding Officer Status:
9:46 AM MDT - Fri, Jul 24 2015: Unit Cleared
9:45 AM MDT - Fri, Jul 24 2015: Unit At Scene
9:45 AM MDT - Fri, Jul 24 2015: Unit At Scene
9:41 AM MDT - Fri, Jul 24 2015: Unit Enroute
9:41 AM MDT - Fri, Jul 24 2015: Unit Assigned
9:40 AM MDT - Fri, Jul 24 2015: Unit Assigned

SR-99 N / Sr99 N Skyway Rd E Onr
Area: Chico
Updated: 9:45 AM MDT - Fri, Jul 24 2015
Type: 1125-Traffic Hazard
Detail:
Responding Officer Status:
9:52 AM MDT - Fri, Jul 24 2015: Unit Assigned
Source: CHP
I-5 - Richards
Station ID: CA-509015
10:00 AM MDT - Fri, Jul 24 2015

Atmospheric Data:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Temperature</td>
<td>86.2°F</td>
</tr>
<tr>
<td>Wind Speed</td>
<td>4.97 mph</td>
</tr>
<tr>
<td>Wind Gust</td>
<td>9.94 mph</td>
</tr>
<tr>
<td>Wind Direction</td>
<td>188°</td>
</tr>
<tr>
<td>Max Wind Direction</td>
<td>80°</td>
</tr>
<tr>
<td>Dewpoint</td>
<td>55.0°F</td>
</tr>
<tr>
<td>Humidity</td>
<td>67.0%</td>
</tr>
<tr>
<td>Visibility</td>
<td>1.04 mi</td>
</tr>
</tbody>
</table>

Road Sensor 0:
Updated: 10:00 AM MDT - Fri, Jul 24 2015

<table>
<thead>
<tr>
<th>Surface Condition</th>
<th>Wet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical</td>
<td>255</td>
</tr>
</tbody>
</table>

Road Sensor 1:
Updated: 10:00 AM MDT - Fri, Jul 24 2015

<table>
<thead>
<tr>
<th>Surface Condition</th>
<th>No Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical</td>
<td>255</td>
</tr>
</tbody>
</table>

Source: CALTRANS
Need

• There is erroneous data in existing feeds.
  – Many errors at an arbitrary time.
• We believe data quality has generally been handled on an ad hoc basis.
• We believe this is a systemic problem with many failure points.
• Caltrans and WSRTC are working on data quality relative to QuickMap and the One-Stop-Shop, among other projects such as WeatherShare. They feel it is a critically important issue that needs to be addressed.
• Other state DOTs anticipate benefit from this work.
Project Objective

The goal of this project is to analyze and document existing system best practices for data quality for the aggregation and dissemination of state department of transportation traveler information.

- Survey of DOT Practitioners
- Literature Search
- Document best practices (if found)
Survey of DOT Practitioners

Investigating the accuracy of data and metadata, what quality control measures are used, and how the data is handled throughout the process from collection to dissemination.

• How is the traveler information provided?
• What is done to make sure the information is right?
• How are errors/problems detected and fixed?
Survey

• Introductory email to identified contacts or general (traveler) information contact.
• Telephone interview or written responses.
• Contacted state DOTs in the Western States Region.
• Interviewed those responsible for traveler information for the state.

Interviewed:
- California
- Idaho
- Montana
- Nevada
- Oregon
- Utah
- Washington

Other Contacts:
- Arizona
- Colorado
- New Mexico
- Wyoming
Some General Responses

• All those surveyed have been forthcoming in their responses and are very interested in the project. There was some agreement that the problem may be endemic.

• Many mentioned the Real-Time System Management Information Program (Section 1201 SAFETEA-LU, 23 CFR 511)

• Some mentioned data ownership.

• Some mentioned a need to clarify where the DOT should be in the traveler information environment.
Some General Responses

- There are varying levels and complexity of ITS deployments and associated traveler information around the region and within individual states.
  - Funding
  - Personnel
  - Need
- There is a lack of automation. (CA)
- There are no statewide defined procedures for data quality control and issue resolution. (CA)
1. How do you find out about problems with your traveler information data or metadata? What do you do (as the individual responsible for traveler information) in regard to these things?
   a. Who finds out?
   b. Is it an automatic or manual process?
   c. Describe the process.
   d. If it is done manually, who does it and how often?
   e. How are problems resolved?
   f. How long does it take to resolve a problem?
   g. What issues have you had, if any, with data quality and traveler information? (Describe.)
Survey

Issues include:

- CMS feeds (e.g., misspellings or typos, wrong abbreviations, multicultural challenges, sign limitations)
- Equipment failure or equipment end of life
- Cameras: offline, communications, power issues, potential old or partial picture, pixels out.
- Field element location
- Timeliness (e.g., old or stale information, miss a winter road report, wrong start date on construction project)
- Operator input error
- Sensors, sensor calibration
- Connectivity & Communications
- Missing information regarding an incident, construction, lane closures, etc.
Find out about issues/problems via:

- Public call in, email, social media
- Auto alerts, software
- Third party vendor
- Operations personnel
- 511 phone line comment module
- Data owners

Who finds out?

- Depends on the problem. (RWIS, communications, software, etc.)
- Traveler information person, state communications office
- TMC, TOC
- Operations personnel, dispatch, district office
- Third party vendor
- ITS Maintenance, Regional ITS personnel
- IT Maintenance
- In one state, RWIS techs monitor their own equipment.
Process

- **Depends on the problem, and how/by who the problem is discovered.**
  - Public calls in, problem directed to the appropriate person.
  - If camera down or image is stale, auto alert sent to phone.
  - Software indicates that data files are not up to date, email, text, phone call to TMC.
  - Third party vendor checking for readings outside thresholds, automatically generates service report. Notifications sent to the DOT contact.
- **Elements and data feeds are checked more closely after system changes.**
- **When a data station or chain of data is lost, then it is filtered and flagged as “bad.”**
- **In one case, the state patrol and maintenance are relied upon for reporting issues with VMS.**
Level of automation ranges from completely manual, to combination automatic and manual, to mostly automated.

- Depends on resources (staff, funding) as well as type and complexity of systems.
- Desire for more automated quality control.

Regarding manual quality control processes:

- A) Human observations 7 days/week, a couple times per day. B) One time per day, one or two people look at each CCTV image. C) One staff following each week.
- Traveler information coordinator checks when a series of problems occur over a short period of time. CA: responsive mode.
- Read twice, post once. Those entering data manually are “self-policing and embarrassed if they make a mistake.”
- Several states emphasized the importance of training for consistency and accuracy.
- Manual data entry process simplified as much as possible.
- Even manual entries have canned information that can be used.
- Spell checker functionality.
Resolving problems
• Depends on the problem.
• Operator interaction – fix or take out of service.
• Define the problem and then hand off to subject matter expert and/or a technician.
• Issue work order.
• Notify third party vendor.
• Maintenance contractors, regional ITS personnel, IT maintenance, technicians, etc.
• Close communications between maintenance and law enforcement during incidents.
  – In California, urban areas/regions (MPOs) have their own internal processes so the DOT is not directly monitoring the data feeds.
  – One state specifically mentioned system redundancy.
  – One state indicated that “one user can start/stop everything; everyone knows what to do and can fix it themselves.”
  – One state said that they have no dedicated RWIS maintenance people. In rural areas, secondary road elements have a lower priority.
How long does it take to resolve a problem?

- Depends on the problem.
- “Most within two hours. Some that are more complicated take up to a week.”
- “…, once detected, less than one minute (fast, seconds). 24-48 hours.”
- “If it is just a reboot then it is fast. If a camera is broken, then it takes longer. Pretty quick. Takes priority.”
- “Communications issues – relatively short time, less than one hour. If device failure, days to a week.”
- “One minute to days or weeks.”
- “Ten minutes to one week.”
- “Data feed, fixed within 10 minutes. Quite often the public might not even know there was a problem. One to three days for other issues.”
2. What quality dimensions are used to characterize the traveler information system/site performance? Describe.
   a. E.g., accuracy, timeliness, reliability.
      i. Accuracy – is the data correct and how do you know it is correct?
      ii. Timeliness – is the data made available in a timely fashion and is the data current?
      iii. Reliability – percent up-time (the percentage of time the data meeting criteria i and ii is available for use).
Quality Dimensions

• Most states mentioned the Real-Time System Management Information Program (Section 1201 SAFETEA-LU, 23 CFR 511) and the challenges associated with meeting its reporting requirements.
  – Includes minimum requirements.
  – There are no specific metrics or definitions for data quality for RWIS or CMS.
  – As one state said, “This has been problematic - how to measure accuracy of … incident data…”we're reporting what we know but how do we know if that's all.”
  – The requirement can be met, but if the quality of the information can't be quantified or defined, you can meet the requirement with garbage data.

• One state indicated that characterizing system/site performance was an “operations thing” and that there was no formal process.
• Another state said they collect public feedback and do a public survey every two years.
• “If it isn’t measured, then it isn’t fixed.”
• California indicated a need for a data governance model and a common statewide standard.
Quality Dimensions

Accuracy
- Visual confirmation.
- Check portable license plate readers/travel times one to three times per year.
- No way of tracking through 511.
- District centric.

Timeliness
- **Update times based on federal requirements.**
- Many data feeds updated every 15 minutes.
- “Very good.”
- Valid image every 20 minutes.
- CMS update every 5 minutes or are blank depending on time of day. Do not keep track as there are too many elements to monitor. Do check situationally.
- “**We are very short on metrics for traveler information performance measures. We do not have any metrics on the time it takes to disseminate information. This would be a great improvement in our department.**”
- “Supposed to be 85% up.”
Quality Dimensions

- **Reliability**
  - “Recently, traveler information system is “exceedingly reliable” and near 100%. Data entry is 98% reliable. Downtime is usually for scheduled maintenance, server or system upgrades.”
  - “We have some metrics for this through an asset management program. The reliability metrics are mostly hardware related and not message related.”
  - One region (in one state) indicated upper 90’s for reliability.
  - One state compiles a database of outages with the number of devices and uses it to extrapolate percent up and down time.
  - CFR minimums and general guidelines. This metric is required for federal funding requests.
  - A need to automate and define metrics.
  - 75% statewide considered “good”, but terrible to traveler information staff.
  - “Want to do timestamps.”
  - Copper theft an issue.
  - Funding an issue.
Survey

3. What other quality control processes are in place to ensure proper operation of field elements AND provision/dissemination of their associated data?
   a. E.g., verification of CMS messages with a CCTV camera; ground truthing and sensor calibration; user reporting of errors; etc.
   b. Status messages (i.e., camera down for maintenance, flag weather sensor readings to indicate if they are questionable or bad.)
Other Quality Control Processes

- Operator observations and human interactions
- Review TMC logs
- Go through an extensive checklist at TMC shift change which includes a review of what is up and what is down.
- Check CMS messages:
  - CCTV camera
  - Public facing traffic website
  - Communications channel within the sign software
- One state indicated that they had “resisted” the concept of verifying CMS messages with a CCTV camera because the “software was better than that.” Instead, it is done remotely and logs checked for compliance.
- For another state, the “… software for displaying an error message for a broken camera does not trigger a work order or any other type of notification to the developers. We are working to fix this oversight. Also, no notification comes in when servers need to be reset to continue disseminating traveler information, which leaves finding errors to chance. This is an area that needs improvement.”
- “User reporting is ad-hoc.”
Other Quality Control Processes

- **Post status messages** (i.e., “Camera unavailable” or “Camera down for maintenance”)
- Two people in each TMC always looking at all of the ITS field elements.
- A contractor is tracking how often field elements are not available.
- Multiple images available at each RWIS site.
- **In one state, four times per month all data entry is tracked. A sample is taken and errors noted. Error frequency is about 2% - 98% or better accuracy.** Similarly, each TOC in another state has their own quality assurance processes which includes a monthly sample of incidents with a review of response relative to accuracy and procedure.
- **Contractor does remote calibration when needed.**
- **Rigorous testing of field elements as they are brought online before going live.**
- **Preventive maintenance on all RWIS systems.**
- Work with maintenance to look at something specific while in the field (i.e., frozen camera, bad bulbs, etc.). Very manual process.
- One state said they had no ITS solutions for processes such as CMS message verification, although section staff might verify a sign message.
Survey

4. Generally and briefly, how is DOT data used for traveler information handled from collection to dissemination? How does data get from the field to the public view (online, 511, TV/radio, social media)?
Traveler Information Data from Collection to Dissemination

- **California**: Data from field elements is aggregated in the district TMC (could be multiple systems) by respective ITS unit. The information is shared by publishing to the Commercial Wholesale Web Portal 2 (CWWP2). DOT traveler information office pulls the data from the portal and repackages it for the web page and the IVR phone system. The data is the same for Caltrans and the public.

- **Idaho**: Multiple sources of information, both auto feeds and manual entry, are all fed to a third party vendor which creates events. Outputs include 511 phone system, websites (mobile version, customizable high bandwidth version, low bandwidth version for commercial vehicle operators), link to transit operators, social media (Twitter), and a smart phone app. The data can be pushed to the public or the public can passively receive it.

- **Montana**: Drivers radio road conditions to division offices. Division/district staff enter the information into a database which disseminates it to various outlets (511, web, mobile, social media).

- **Nevada**: Central System Software collects information from ITS devices and populates the 511 system as well as public device interfaces. Data is published to an FTP site. With the newly created Nevada Data Exchange, devices are polled by the transportation management system, sent to the NDEX, and then distributed everywhere else.
Traveler Information Data from Collection to Dissemination

• **Oregon:** The system is highly automated and integrated, very little is done manually. Once the information is in the system, it goes everywhere (TripCheck, 511, TV). Those entries that are done manually are reviewed by a TOC operator before it goes out. When the TOC operator enters something, the TOC software builds the message for them and it can be edited or left as is.

• **Utah:** “UDOT’s traveler information outlets include Twitter, Facebook, 511 phone line, CMS, a website, a mobile website and a smartphone app. We also share camera feeds with local media. UDOT has a fiber optic network of over 1800 miles which helps get communication/messaging to rural devices.”

• **Washington:** In the Northwest Region, data is collected from the field and sent to the central server with central software which has multiple pulling and polling functions. The data is repackaged and published to a web accessible database that can be queried. The data is then pushed out to the various outlets. In the South Central region which is more rural, data from the mountain passes is manually collected and keyed in by operations personnel. It is then pushed to the public (i.e., 511 system) via the same database. RWIS/weather data are not on social media. The Twitter feed is automated for the Olympic and Southwest Regions.
Survey

5. Does the DOT have a data repository that allows public and/or third-party access to the raw data? How is the data accessible and how is it documented?

- Several states have some sort of publically accessible data repository.
- E.g., California’s Commercial Wholesale Web Portal 2 (CWWP2)
Survey

6. Any other relevant information you would like to share?

- “Trying to improve.”

- Many indicated future additions and improvements to their traveler information data and systems.
Survey

7. Is there anyone else that I should talk with, either within (state) or in other states?

- Some additional contacts were identified.

8. Would you like a copy of the project’s findings?

- All confirmed interest in the results of this project.
Literature Search

• Bounded by limiting the search to information on data quality within the transportation field.

• Real-Time System Management Information Program (1201)
  – “…establishes a real-time system management information program pursuant to Section 1201 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).”
  – “The Real-Time System Management Information Program is to provide the capability to monitor in real-time the traffic and travel conditions of the major highways across the U.S. and provide a means of sharing these data with state and local governments and with the traveling public.”
  – Established minimum requirements for real-time traffic and road condition information (construction activities, road or lane blocking incidents, road weather observations, travel times; information accuracy; information availability).
  – Methods for measuring accuracy or other quality metrics are not included. (E.g., how do you know the requirement is being met with “good” data versus “garbage” data?)
  – Does not define metrics for specific elements such as RWIS or CMS.
Real-Time System Management Information Program [1201] Section 511.309

• Minimum requirements for traffic and travel conditions made available by real-time information programs are:
  – Construction activities. The timeliness for the availability of information about full construction activities that close or reopen roadways or lanes will be 20 minutes or less from the time of the closure for highways outside of Metropolitan Areas and 10 minutes or less from the time of the closure or reopening for roadways within Metropolitan areas. Short-term or intermittent lane closures of limited duration that are less than the required reporting times are not included as a minimum requirement under this section.
  – Roadway or lane blocking incidents. The timeliness for the availability of information related to roadway or lane blocking traffic incident will be 20 minutes or less from the time that the incident is verified for highways outside of Metropolitan Areas and 10 minutes or less from the time that the incident is verified for roadways within Metropolitan areas.
  – Roadway weather observations. The timeliness for the availability of information about hazardous driving conditions and roadway or lane closures or blockages because of adverse weather conditions will be 20 minutes or less from the time the hazardous conditions, blockage, or closure is observed.
  – Travel time information. The timeliness for the availability of travel time information along limited access roadway segments within Metropolitan Areas will be 10 minutes or less from the time that the travel time calculation is completed.
  – **Information accuracy. The designed accuracy for a real-time information program shall be 85 percent accurate at a minimum, or have a maximum error rate of 15 percent.**
    – Information availability. The designed availability for a real-time information program shall be 90 percent available at a minimum.

Source: http://ops.fhwa.dot.gov/1201/factsheet/
Literature Search

- Studies involving data quality for specific elements or types of traveler information (e.g., CMS, travel times, RWIS, CCTV, etc.)
- Older studies from FHWA that define aspects of data quality and how to measure them.
- *Clarus* Quality Checking Algorithm Documentation Report
Next Steps

• Conduct interviews with remaining state DOTs.
• Continue literature search as appropriate.
What We’re Doing …
WeatherShare “Report a Problem”

Weather Station Problem Report Form

Classification: Wrong location

Email address: janus@coo.montana.edu

Description of the problem:
This station is in the wrong location. Castella and Gibson are north of Redding along I-5. 

206 characters remaining

Submit Feedback

Return back to sensor display

User Feedback

Unresolved reports | Resolved reports | All reports | Logout

17 report(s), displaying 1 - 17

Mark as Resolved | Mark as Unresolved | Delete

<table>
<thead>
<tr>
<th>Rep. No</th>
<th>Date</th>
<th>Type</th>
<th>Station Name, ID</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>182</td>
<td>2013-01-29</td>
<td>15:36:54</td>
<td>GIBSON NEAR CASTELLA 105SW, 2107 enable</td>
<td>This station is in the wrong location, C...</td>
</tr>
<tr>
<td>181</td>
<td>2013-01-29</td>
<td>12:25:50</td>
<td>CW0234 Canyon County, 1-115 enable</td>
<td>wrong temp data, off 40 deg f.</td>
</tr>
<tr>
<td>179</td>
<td>2013-01-06</td>
<td>00:37:29</td>
<td>I-40 Barstow, 29 disable</td>
<td></td>
</tr>
<tr>
<td>178</td>
<td>2013-01-06</td>
<td>12:01:21</td>
<td>GIBSON NEAR CASTELLA 105SW, 2107 enable</td>
<td>This station is registering sub-freezing...</td>
</tr>
<tr>
<td>177</td>
<td>2012-11-28</td>
<td>14:45:01</td>
<td>GIBSON NEAR CASTELLA 105SW, 2107 enable</td>
<td>This looks like it may be in the wrong l...</td>
</tr>
<tr>
<td>176</td>
<td>2012-07-05</td>
<td>09:58:02</td>
<td>Oregon Mountain Summit, 30 disable</td>
<td>I am looking for local barometric data t...</td>
</tr>
<tr>
<td>175</td>
<td>2012-04-12</td>
<td>17:42:27</td>
<td>Snowmans Summit, 42 disable</td>
<td>downloading CSV data for Snowman Hill at...</td>
</tr>
<tr>
<td>174</td>
<td>2011-11-05</td>
<td>14:52:14</td>
<td>SOUTH LAKE TAHOE, 3604 disable</td>
<td>The elevation description of station 38 ...</td>
</tr>
<tr>
<td>173</td>
<td>2011-12-07</td>
<td>14:59:55</td>
<td>North Cushing Creek, 48 disable</td>
<td>I believe this station is shown in the w...</td>
</tr>
<tr>
<td>172</td>
<td>2011-05-18</td>
<td>16:35:36</td>
<td>RED SLUFF MUNI, 3607 disable</td>
<td>It has a negative amount of precipitation -0.004</td>
</tr>
<tr>
<td>171</td>
<td>2011-01-25</td>
<td>11:08:04</td>
<td>NAPA CORPORATION YARD, 1106 disable</td>
<td>temperature seems unusually low compared...</td>
</tr>
<tr>
<td>170</td>
<td>2011-02-17</td>
<td>14:50:18</td>
<td>MOUNT SHasta, 3663 disable</td>
<td>The Elevation description of station 36...</td>
</tr>
<tr>
<td>169</td>
<td>2010-12-19</td>
<td>14:17:17</td>
<td>CW8514 Ventura, 3717 disable</td>
<td>Rain data for 3Hr</td>
</tr>
<tr>
<td>168</td>
<td>2010-12-13</td>
<td>09:08:36</td>
<td>GIBSON NEAR CASTELLA 105SW, 2107 enable</td>
<td>Wrong location.</td>
</tr>
<tr>
<td>167</td>
<td>2010-04-19</td>
<td>16:52:37</td>
<td>WEED AIRPORT, 809 disable</td>
<td>Wind Direction is opposite of reality an...</td>
</tr>
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<td>166</td>
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<td>It says 212F ....I can't believe that's true!</td>
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# WeatherShare RWIS Station Quality Control Report

## RWIS Station Report

14 sensor(s), displaying 1 - 14

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<th>ID</th>
<th>Name</th>
<th>Lat</th>
<th>Lon</th>
<th>Elevation</th>
<th>District</th>
<th>County</th>
<th>Last Updated (UTC)</th>
<th>Sensor Name</th>
<th>Sensor Code</th>
<th>Sensor Value</th>
<th>QC 1</th>
<th>QC 2</th>
<th>QC 3</th>
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Download CSV
Logout
WeatherShare Quality Control Detail

Quality Control Detail

Exposition Blvd.- Sac - 51N @ Tribute : Temperature Sensor : 32 °F

Latitude: 38.59163 Longitude: -121.44535 Elevation: 26

QC Summary

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<tr>
<th>QC Level</th>
<th>Description</th>
<th>Valid At</th>
<th>Pass/Fail</th>
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Past Sensor Readings (6hr)

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Acknowledgements

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http://oss.weathershare.org
http://www.westernstates.org
http://www.westernstates.org/Projects/Default.html