A. Resource

Documents. www.sicop.net/documents.htm

DTN Weather Center. www.dtnweather.com (Officially changing name to Meteorlogix in October 2002 - www.meteorlogix.com/industry/transportation.cfm)

Environmental Sensor Station Standards for the Roadway: Standards Application Package. ITS/Operations Resource Guide 2002 (FHWA-OP-02-007). 2002.

FHWA Road Weather Management Program. Maintenance Decision Support System (MDSS) Project. June 11, 2001.

FORETELL Field Operational Test. www.ops.fhwa.dot.gov/Weather/FORETELL/foretell.htm

Gallatin National Forrest Avalanche Center. www.mtavalanche.com

Integrating NTCIP Compliant Hardware. www.enterprise.prog.org/inch.htm#anchor121344

ITS Standards. www.its-standards.net

Let It Snow: Winter Road Maintenance Products and Technologies. ITS/Operations Resource Guide 2002 (FHWA-OP-00-012). 1998.

Manual of Practice for an Effective Anti-Icing Program: A guide for Highway Maintenance Personnel. http://www.fhwa.dot.gov////////reports/mopeap/mop0296a.htm - eap1

MDT Maintenance. www.mdt.state.mt.us/departments/maintenance/goals_objectives.html

MDT Montana Traveler Information. www.mdt.state.mdt.us/travinfo/winter_frame.html

MDT Survey of Road Weather Information Sources. www.coe.montana.edu/ME/faculty/larson/WTI/weathersurvey.asp

Meso West. www.met.utah.edu/jhorel/html/mesonet/

Meteorlogix. www.meteorlogix.com (previously DTN – officially changing October 2002)

Nelson, Gary G. *Road Weather Requirements: Executive Summary*. September 2001.

NTCIP Simple Transportation Management Framework. NEMA Standards Publication TS3.2-1996 – Amendment 1. AASHTO, ITE, and NEMA, November 2, 1999.

NTCIP. www.ntcip.org

Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM). Federal Meteorological Handbook No. 1: Surface Weather Observations and Reports. FCM-H1-1995. http://www.ofcm.gov/fmh-1/fmh1.pdf. 1995.

Proceedings of the Workshop on Strategy for Providing Atmospheric Information. ITS/Operations Resource Guide 2002. 2002.

Washington State DOT rWeather. www.wsdot.wa.gov/rweather/

RWIS Integration and Data Sharing. www.enterprise.prog.org/rwisworkplan.htm

Road Weather Maintenance Decision Support System (MDSS). www.rap.ucar.edu/projects/rdwx_mdss.

Saving Lives, Improving Transportation Efficiency – Weather Information for Surface Transportation. ITS/Operations Resource Guide 2002. 2001.

Southwest Montana Forecast Info. www.coe.montana.edu/wti/snow_ice/

Standing International Road Weather Commission www.bham.ac.uk/geography/met/sirwec/intro.htm

Strong, Chris, Robb Larson and Alan McAllistar. *Oregon Department of Transportation Intelligent Transportation Systems Maintenance Plan.* Western Transportation Institute, Montana State University – Bozeman, 1999.

STWDSR Stakeholder website. www.mitretek.org/its/stwdsrt

Surface Transportation Weather Decision Support Requirements. ITS/Operations Resource Guide 2002. 1999-2002.

Swedish National Road Transport Research Institute. http://www.vti.se/info/rapporter/edetalj.asp?RecID=1656&Lang=E

The COMET Outreach Program. www.comet.ucar.edu/outreach/fhwa.htm

TMC Standardization Plan. www.dot.ca.gov/hq/traffops/itsproj/tmcsp

Weather Information for Surface Transportation: A White Paper on Needs, Issues, and Actions. ITS/Operations Resource Guide 2002. 1998.

Weather Maintenance Virtual Clearinghouse. www.fhwa.dot.gov/winter/

http://www.100topweathersites.com/

www.4.nas.edu/trb/crp.nsf/All+Projects/NCHRP+6-13

www.weather.com

Contact Information

Organization	Name	Email	Position	
District 1	Steven Bradley	sbradley@dot.ca.gov	TMC	
District 1	Bill Richards	william_richards@dot.ca.gov	TMC	
District 1	Nick Motto	Nick_motto@dot.ca.gov	Maint Sup	
District 1	John Carson	Jcarson01@dot.ca.gov	Traffic Ops	
District 1	Marty Van Zandt	Martin_van_zandt@dot.ca.gov	Maint Ops	
District 2	Wally Snell		TMS	
District 2	Brian Adams	Brian_adams@dot.ca.gov	Superintendent	
District 2	Clyde Aker	Clyde_aker@dot.ca.gov	Area Superintendent	
District 2	Milt Apple	Milt.apple@dot.ca.gov	Superintendent	
District 2	Russ Wenham	Russ.wenham@dot.ca.gov	Deputy Dist. Director	
District 2	Jim Scott	James.scott@dot.ca.gov	Maintenance Supervisor	
District 3	Jim Edson		Maintenance – Kingvale	530-426-76008
District 3	Rusty Grout		Maintenance – Nevada City	530-265-4290
District 3	Georgia Parsons		Maintenance – Kingvale	530-582-5053
District 3	Dale Buchanan		Maintenance – Headquarters	916-653-8782
District 3	Markus Heiman		Operations – Regional TMC	(916) 859-7979
District 3	Brain Simi	Brian_Simi@dot.ca.gov	TMC	
District 3	Ron Bronc		TMC	
District 3	Pete Acevedo		TMC	
District 4	Ricardo Alejandre			510-286-3781
District 4	Paul Parecadan		Maintenance Supervisor	510-286-4507
District 4	Danny Robbles			925-606-4473
District 4	Yvette Bidegain			510-286-4554
District 4	Hector Garcia		TMC Systems	
District 5	Scott Eades		Operations Coordinator	(805) 549-3612
District 6	Sergio Venegas	Sergio.venegas@dot.ca.gov	TMC support	559-445-5483
District 6	David Martinez		TMC operator	559-445-6166
District 6	Ralph Caigiano			559-445-6166
District 6	John Reynolds			559-488-4152
District 6	Diana Gomez	Diana.Gomez@dot.ca.gov	TMC Support	
District 6	Anthony Lopez	Anthony.r.lopez@dot.ca.gov	TMC support	

Organization	Name	Email	Position	
District 7	Jerry Holcombe		Caltrans Superintendent	
District 7	Lee Benjamin		CMS	
District 7	Chris Erskine	Chris_erskine@dot.ca.gov	CSM	
District 7	Dennis Stubblefield		CHML	
District 7	Chuck Webster	Chuck_Webster@dot.ca.gov		
District 7	Tom Pellerman		CMS	
District 8	Bob Sutton	Bob.sutton@dot.ca.gov	Maintenance Superintendent	760-249-3251
District 8	Tom Ainsworth	Thomas.ainsworth@dot.ca.gov	Freeway Systems	909-383-4565
District 8	Alan Kirst	Allen.kirst@dot.ca.gov	TMC Ops Manager	909-383-6446
District 8	Steve Pucket			909-383-4286
District 8	Martin Squires		Electrician II	
District 8	Paul Glass	Paul_glass@dot.ca.gov	North Region Contracts	
District 8	Bob Jeannotte	Bob_jeannotte@dot.ca.gov	Electrical Design	
District 9	Phil Graham	Phil_graham@dot.ca.gov	TE Electrical	
District 9	Bob Rubinstein	Robert_rubinstein@dot.ca.gov	Transportation Engineering Tech	
District 9	Jon Patzer	Jon_patzer@dot.ca.gov	Transportation Electrical Engineer	
District 11	Mark Ross		Station Supervisor	619-445-2673
District 11	Coy Hudson		Lead	619-445-2673
District 11	John Philips			619-445-2673
District 11	Jim Larson			619-445-2673
District 11	Karen Wallace		TMC	858-467-3203
District 11	Anupkumar Khant		TEE Traffic Ops	858-467-3058
Montana DOT	Mike Bousliman	mbousliman@state.mt.us	Operations Manager	(406) 444-6159
Minnesota DOT	Curt Pate		RWIS Coordinator	(651) 297-1798
Nevada DOT	Rick Nelson	rnelson@dot.state.nv.us	District Engineer (D2)	(775) 834-8300
Oregon DOT	Chuck Larson		State RWIS Coordinator	(503) 986-4486
Utah DOT	Steve Conger	sconger@dot.state.ut.us	State RWIS Coordinator	(801) 887-3735
Iowa DOT	Diane McCauley		Maintenance	(515) 233-1371
Virginia DOT	Daniel Roosevelt	rooseveltds@vdot.state.va.us	Research Scientist	(434) 293-1924
Washington DOT	William W. Brown	wwbrown@u.washington.edu	Research Coordinator, rWeather Project Manager	(206) 616-9183
Idaho DOT	Brian Breen			(208) 334-8417

Roadside Weather Information System

(from Caltrans TMS Baseline Inventory Final Draft June 11, 2001)

System/Application

RWIS consists of remote meteorological measurement stations strategically positioned alongside the highway that provide local pavement and atmospheric data.

At each station, sensing devices are placed in the highway sub-grade, on the road surface, and above the road on towers, some as tall as 33 feet high. At the tower's height, collection and reporting of weather data such as air temperature, precipitation, and wind speed and direction is accommodated. Road sensors identify if the road is wet, dry, frost or snow covered, icy, and the chemical concentration. Some of the stations have video cameras installed that can relay visual information about weather and road conditions such as fog, rain and snow.

A remote multi-sensor meteorological station consists of:

SENSORS

- Dual-axis forward-scatter Visibility Sensor
- Wind Vane
- Rain Gauge
- Barometer
- Pavement Surface
- Subsurface Temperature Probe
- Present Weather Sensor – precipitation classifier, precipitation rate meter, and close range visibility sensor
- Day/Night Detector
- Anemometer (wind speed)
- Temperature and Relative Humidity probe
- Ice Sensors
- Aluminum 30 foot Fold-over Tower

OTHER COMPONENTS FOR COMPLETE RWIS

- Video Cameras and interface equipment that provide still frame monochrome video images from each RPU
- Peripheral devices for the display of sensor information
- Remote Processing Units (RPU) for data collection, storage and transmission of sensor information
- Central Processing Unit (CPU) upgrade to Network Server (NS) for collection and storage of all sensor information

Network Server (NS) Connection

The NS collects sensor data from all RPU's in the entire system, processes and stores the information in an industry standard Relational Database Management System (RDBMS). The NS is an IBM-compatible computer with sufficient processing power and capacity to:

- Collect all sensor data from the RPU's in the system (including existing RPU installations).
- Permit all users to access the RWIS data simultaneously.
- Exchange data from this system with similar RWIS systems in other states or jurisdictions.
- Store historical data from the sensors for several winter seasons.

The NS is able to execute data collection, delivery, and exchange via a permanent network connection to the WAN/LAN or Public Data Network connection available. Example existing equipment could include the following:

Pentium PRO 200 Mhz processor, 128 MB Ram, 4.3 GB Hard drive, SCSI Hard drive bus, 4.3 GB Mirror drive, SCSI 3 Controller, 4 GB Internal tape drive, 1.44 MB disk drive, CD Rom, 512 K Internal Cache, 2 MB Video memory, 17 inch Display monitor, Network Interface card, Un-interrupted power supply, Maximum RAM capacity 512 MB.

Communications

Each RPU processes the output from the sensors, stores the data temporarily, and then sends the data to the NS by telephone and via communication interface ports on the RPU. Data exchange utilizes network protocols. The NS stores the data in a database for access by Graphical User Interface (GUI) software. The GUI displays the sensor and video data in a Windows-based map data display format. Currently new hardware is required to be capable of software conversion to National Transportation Communications for Intelligent Transportation Systems Protocol (NTCIP); (AASHTO) for RWIS communications.

Primary Business Process

Traffic Management

With RWIS information, Traffic Operations and Maintenance staff makes more informed decisions during winter storms. RWIS equipment and computer programs monitor air and pavement temperature to make forecasts regarding how the winter storms may impact the highways. The road sensors inform maintenance managers about road conditions and existing concentrations of de-icing chemicals, such as salt, to help them determine when the road surface will freeze. This gives the Maintenance crews opportunities to utilize alternate de-icing chemicals, make optimal use of materials and staff, and practice anti-icing techniques developed through years of research. Snow plow routes and equipment assignments are determined by the regional maintenance engineers using the winter storm maintenance standards. Anti-icing strategies may be developed and implemented using available RWIS and weather forecasts, in combination with accepted anti-icing techniques.

Information is also sent to the Traffic Management Center (TMC) to assist in dispatching, activating a Changeable Message or a Highway Advisory Radio with a pre-selected message, or updating a website for informing motorists of current roadway conditions.

Secondary Business Process

Traveler Information

RWIS information is used by the California Highway Information Network (CHIN) to provide motorists the current information on highway conditions by phone numbers 24 hours a day. Caltrans also provides up-to-date highway information on the Internet at http://www.dot.ca.gov/hq/roadinfo. RWIS information is also used by the Highway Advisory Radios (HAR) along many routes to provide motorists with local road and traffic information.

Business Users

Caltrans

Caltrans has been given statutory authority for the planning, design, construction, operation, and maintenance of California's State Highway System. A key component of the maintenance of certain highways is the control of snow and ice. Maintenance forces strive to provide a safe travel way during winter conditions while keeping traffic delays to a minimum. There is the traveling public's expectation that high levels of service are to be maintained even though a route is subject to snow and ice conditions.

In response to requirements of Assembly Concurrent Resolution 96 (Waters), Caltrans evaluated several alternatives to deicing salt. RWIS's provision of real-time, local pavement and atmospheric information enables more precise control of deicer application timing, as well as determination of appropriate staffing levels, chain controls and traffic management while a storm passes through the area.

Use of RWIS results in more efficient highway maintenance and operations, avoiding unneeded trips and reducing the amount of material used, which in turn saves CA/DOT—and taxpayers—millions of dollars.

Public

By reporting on a relatively small area, the system can give drivers detailed information about conditions in their immediate vicinity. The system also provides statewide data and can, for example, track a storm and predict when it will hit a specified area.

Project Approvals

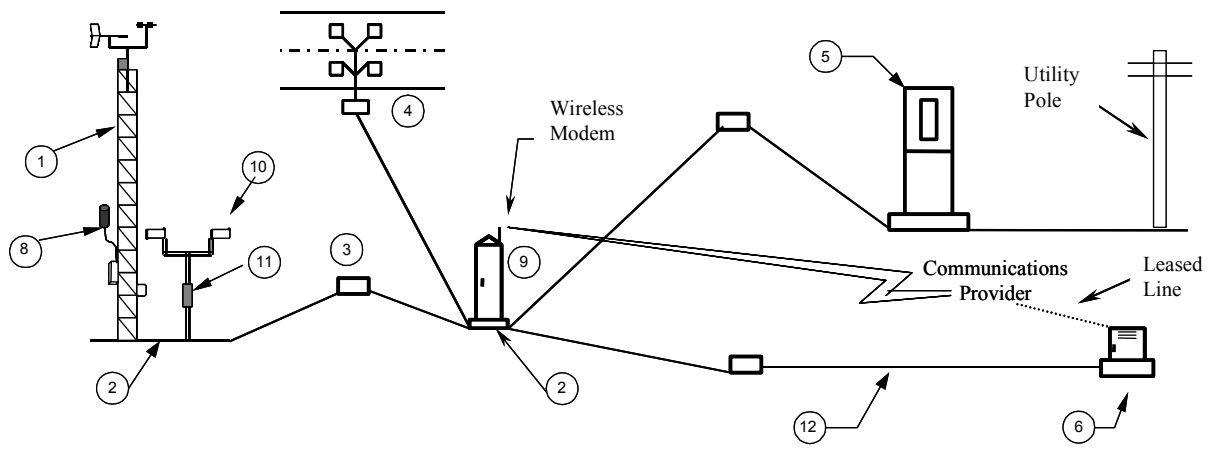
The development of Roadway Weather Information System projects follow the Caltrans Project Development Procedures process.

The scope is first defined at a high level as part of the larger regional transportation plan addressing all transportation improvements envisioned over the next 20 years. The District then selects a portion of

the plan (projects) based on priorities, funding availability, etc. The District then prepares a Project Initiation Document to define the scope of the project, what issues will need to be addressed, and estimate the cost for programming. The District Director approves the Project Initiation Documents.

Programming authority is vested with the California Transportation Commission for SHOPP and Interregional STIP funds. The region holds the authority for programming Regional STIP, local measure and most Federal funds (including CMAQ and STP). This phase would include a Project Approval/Environmental Clearance Document, plans/construction specifications/engineer's estimates (PS&E) and bid documents. The project is then advertised and a delegate of the Caltrans Director approves a construction contract. The contractor, under inspection by Caltrans, fulfills the requirements of the contract.

As with all capital improvements, the costs to support the project after construction is completed are funded through the BCP process. Each year, Caltrans Divisions of Maintenance and Traffic Operations would prepare BCPs to address the needs of increased inventory. The Department of Finance, as part of the yearly budget process, would approve these BCPs.



TYPICAL ROADSIDE WEATHER INFORMATION SYSTEM (RWIS)

CONSTRUCTION

1. Weatherstation with Anemometer (wind speed) and rain gauge.
2. Foundations.
3. Pull Boxes.
4. Traffic Loops
5. Service Meter Enclosure.
6. Telephone Demarcation Cabinet (TDC).

HARDWARE

8. Radiation Shield (temperature)
9. Controller Cabinet Input/Output files, Power Dist. Assembly , Modem
10. Visibility Sensor
11. Network Controller
12. Conduit and Wiring

SOFTWARE/OTHER

13. Sign View, TMS, Weather Vendor Software
14. Maintenance Agreement Contract.

Source: Caltrans TMS Baseline Inventory Final Draft 6/11/2001

Implementation Cost per Unit ($K)				
TOS/TMC	CT			
Element	Staff	Construction	Hardware	Software
RWIS	25.0	20.0	22.0	3.0

Annual Maintenance and Support Costs per Unit (in $K)						
CT	Maintenance	Support	Software	Hardware	Staff	Materials &
Staff	Contract	Contract	Lifecycle	Lifecycle	Training	Equipment
2.5	0.0	0.0	0.1	0.2	0.1	0.25

Assumptions

- Costs are estimated through the WBS for District Projects.
- Construction costs were based on the contract cost data established through the District Database.
- Annual Maintenance and Field Support Cost estimated by District Historical Data.
- Software in the field has to be upgraded along with the central software, accounting for the software lifecycle cost.
- The Division of Maintenance provides materials and equipment cost.
- Hardware and Software lifecycle is 10 years.

B. RWIS Site Inventory

Data Dictionary

Category	Column Name		Suggested Values
General Information	ID		Numeric
	DIST		1-12
	CO		3-Char
	RTE		Numeric
	Pre		Char
	POSTMILE		Numeric
	Suff		Char
	LOCATION		Description of Location
	STATUS		Proposed, Programmed, Existing/Operational, Existing/Non-Operational
Proposed ONLY	FUNDED		Y, N
	Proposed Status		Under construction, in design, planning
Installation Information	Manufacturer		SSI, Vaisala, etc.
	Installation Date		Date
	Power Type		AC, Solar, etc.
	Frequency of Maintenance		x months
	Primary Use		winter maintenance, fog detection, visibility detection, ice detection, etc.
	Access from Central Computer?		Y, N (Can data be accessed through a user interface at district office or maintenance station)
	Tower Height		30 feet, etc.
	Tower Location		NB, SB, EB, WB
Forecasts	Forecast Available?		Does Caltrans receive a site-specific forecast (Y, N)
	Forecast Provider		Contractor who provides site forecast (SSI, etc.)
Collected Data	Air Temp		Y, N
	Wind Dir/Speed		Y, N
	Precipitation Classifier		Y, N
	Precipitation Rate		Y, N
	Close-range Visibility		Y, N
	Ice sensor		Y, N
	Chemical Concentration		Y, N
	Visibility		Y, N
	Humidity		Y, N
	Rain Gauge		Y, N
	Camera Image		Y, N
	Pavement Surface Temp	NB/EB Lane #s	List lane numbers with sensors
		SB/WB Lane #s	List lane numbers with sensors
	Subsurface Temp	NB/EB Lane #s	List lane numbers with sensors
		SB/WB Lane #s	List lane numbers with sensors
	Other		Describe any other items
Comments			Describe any other comments

ID	DIST	CO	RTE	Pre	PM	Suff	Location	Status	Funded	Verified?	Sys Stat	Manufacturer	Inst Date	Power	Maintenance	Primary	Central	T_Height	T_Loc
101	1	HUM	101	R	128.9		Boyes Creek Viaduct	Existing		Y									
102	1	Men	101	R	9.5		Hopland OH	Proposed	1	N									
104	1	Men	101		41.2		Ridgewood Summit	Proposed	1	N									
105	1	Men	101		82.2		Rattlesnake Sand House	Proposed	1	N									
106	1	HUM	101	R	133.3		Near Sandhouse	Proposed	1	N									
107	1	HUM	299	R	29.1		Berry Summit	Proposed	1	N									
201	2	SHA	5		36		SOUTH OF GILMAN ROAD	Existing		Y									
202	2	SIS	5		2.62		Central Dunsmuir IC	Existing		Y		SSI	1992	110V	ANNUAL	WM CON	YES	30'	SB
203	2	SIS	5		14.45	R	Black Butte summit	Existing		Y		SSI	1992	110V	ANNUAL	WM/CON	YES	30'	SB
204	2	SIS	5		22.2		Weed Interchange	Existing		Y		SSI	1992	110V	ANNUAL	WM/CON	YES	30'	NB
205	2	SIS	89		29.25		Snowmans Hill Summit	Existing		Y		SSI	1999	110V	ANNUAL	WM/CON	YES	30'	SB
206	2	SIS	97		52		Near Dorris Hill	Existing		Y									
207	2	TRI	299		48		Oregon Mountain near the summit	Existing		Y		SSI	1999	110V	ANNUAL	WM/CON	YES	30'	
208	2	TRI	299		69.7		Buckhorn Sandhouse	Existing		Y		SSI	1999	110V	ANNUAL	WM/COM	YES	30'	WB
209	2	TRI	3		18.67		AT HAYFORK SUMMIT	Proposed	0	N									
210	2	TRI	3		83		SCOTT MOUNTAIN SUMMIT	Proposed	0	N									
211	2	SIS	3		8.5		NEAR CALLAHAN	Proposed	0	N									
212	2	SHA	5	R	26.03		NEAR THE FAWNDALE INTERCHANGE	Proposed	0	N									
213	2	SHA	5	R	30.5	L	NEAR PACKERS BY S/B ON	Proposed	0	N									
214	2	SHA	5		45.54		NEAR DOG CREEK	Proposed	0	N									
215	2	SIS	5		25.7		Near Weed Airport	Proposed	1	N									
216	2	SIS	5		52.77		ANDERSON GRADE SUMMIT	Proposed	0	N									
217	2	SIS	5		61		NEAR HORNBROOK	Proposed	0	N									
218	2	SIS	5		68.33		NEAR HILT ROAD OC	Proposed	0	N									
219	2	TEH	32		16		NEAR DEER CREEK	Proposed	0	N									
220	2	TEH	36		82.2		MINERAL MAINTENANCE STA	Proposed	0	N									
221	2	LAS	36		11.5		Fredonyer Pass West Side	Proposed	1	N									
222	2	LAS	36		14.1		Fredonyer Pass East Side	Proposed	1	N									
223	2	TEH	36		87.79		MORGAN SUMMIT	Proposed	0	N									
224	2	TRI	36		10.26		SOUTH FORK MOUTAIN	Proposed	0	N									
225	2	TEH	36		73		NEAR BATTLE CREEK VISTA POINT	Proposed	0	N									
226	2	LAS	44		0		AT THE COUNTY LINE	Proposed	0	N									
227	2	SHA	44		50.52		ESKIMO HILL	Proposed	0	N									
228	2	LAS	44		14.53		NEAR BOGARD REST AREA	Proposed	0	N									
229	2	SHA	44		37.05		STARLITE PINES ROAD	Proposed	0	N									
230	2	BUT	70		35.26		NEAR JARBO GAP	Proposed	0	N									
231	2	PLU	70		55.24		LEE SUMMIT	Proposed	0	N									
232	2	PLU	70		70.68		NEAR THE SANDHOUSE	Proposed	0	N									
233	2	PLU	89		29.6		NEAR CANYON DAM	Proposed	0	N									
234	2	SHA	89		11		NEAR THE HAT CREEK RANGER STATION	Proposed	0	N									
235	2	SHA	89		36.89		NEAR RED HILL CUT	Proposed	0	N									
236	2	SIS	89		3.23		DEADHORSE SUMMIT	Proposed	0	N									
237	2	SIS	97		29.91		MT HEBRON SUMMIT	Proposed	0	N									
238	2	SIS	97		49.83		DORRIS INSPECTION STA	Proposed	0	N									
239	2	MOD	139		27.91		NEAR TIONESTARD	Proposed	0	N									
240	2	LAS	139		20.46		NEAR WILLOW CREEK HILL	Proposed	0	N									
241	2	SHA	299		0.03		BUCKHORN SUMMIT	Proposed	0	N									
242	2	LAS	299		8.27		Near Big Valley Mountain Summit	Proposed	1	N									
243	2	MOD	299		50.2		CEDAR PASS SANDHOUSE	Proposed	0	N									
244	2	SHA	299		8.72		CLEAR CRK	Proposed	0	N									
245	2	SHA	299		14.49		SHASTA DIVIDE	Proposed	0	N									
246	2	SHA	299		68.17		HATCHET MT SUMMIT	Proposed	0	N									
247	2	MOD	299		12.73		ADIN MOUNTAIN SUMMIT	Proposed	0	N									
248	2	LAS	395		132.09		Near Sage Hen Summit	Proposed	1	N									
249	2	LAS	395		5.7		NEAR JUNCTION OF ROUTES 70/395	Proposed	1	N									
250	2	LAS	395		51.5		NEAR JANESVILLE	Proposed	1	N									
301	3	Sac	5		24.8		South end American River Br. (Richard Bld.)	Existing		Y		Vaisala	2001	120 vac	180 days	Weather Info.	RTMC	12 m	SB Off
302	3	Yol	5		0.4		West of Sacramento River (Yolo Bypass)	Existing		Y		Vaisala	2001	120 vac	180 days	Weather Info.	RTMC	12 m	C/M
303	3	Yol	50		2.4		Jefferson Blvd.	Existing		Y		Vaisala	2001	120 vac	180 days	Wind	RTMC	12 m	EB
304	3	Sac	51		3		North of American River Br (Exposition Blvd)	Existing		Y		Vaisala	2001	120 vac	180 days	Weather Info.	RTMC	12 m	SB
305	3	Yol	80		5.7		West end of Yolo Causeway (Webster UC)	Existing		Y		Vaisala	2001	120 vac	180 days	Weather Info.	RTMC	12 m	EB
306	3	Yol	80		8.9		East end of Yolo Causeway (West Capital)	Existing		Y		Vaisala	2001	120 vac	180 days	Weather Info.	RTMC	12 m	WB
307	3	Sac	80	M	0.4		East of Sacramento River (Bryte Bend Br)	Existing		Y		Vaisala	2001	120 vac	180 days	Wind	RTMC	12 m	C/M
308	3	Sac	99		8.8		McConnell OH	Existing		Y		Vaisala	2001	120 vac	180 days	Weather Info.	RTMC	12 m	SB
309	3	ED	50		66.8		Echo Summit (CT Maintenance Station)	Existing		Y		SSI	1998	120 vac	180 days	Weather Info.	KV / Scanweb	12 m	WB
310	3	Pla	80		53.3		Blue Canyon	Existing		Y		SSI	1997	120 vac	180 days	Weather Info.	KV / Scanweb	12 m	EB Off
311	3	Pla	80	R	63.5		Cisco	Existing		Y		SSI	1997	120 vac	180 days	Weather Info.	KV / Scanweb	12 m	EB
312	3	Nev	80	R	5.1	R	Castle Peak (Boreal)	Existing		Y		SSI	1997	120 vac	180 days	Weather Info.	KV / Scanweb	12 m	EB On
313	3	Nev	80	R	9.1	R	Donner Lake Inter Change (DLI)	Existing		Y		SSI	1997	120 vac	180 days	Weather Info.	KV / Scanweb	12 m	WB On
314	3	Pla	267		6.67		Brockway Summit (Mt Watson Rd)	Existing		Y		SSI	1998	120 vac	180 days	Weather Info.	KV / Scanweb	12 m	SB
315	3	Pla	89		10.42		Rampart Dr.	Existing		Y		Vaisala	2001	120 vac	180 days	Weather Info.	Tahoe City MS	12 m	SB
316	3	Pla	28		3		Dallar Point	Existing		Y		Vaisala	2001	120 vac	180 days	Weather Info.	Tahoe City MS	12 m	WB

ID	Forecast	Provider	Air Temp	Wind	Precip	Rate	Close Vis	Ice	Chem	Visibility	Humidity	Rain	Camera	Pav Temp Lane 1	Pav Temp Lane 2	Sub Lane 1	Sub Lane	Other	Comments
101																			
102																			
104																			
105																			
106																			
107																			
201																			
202	YES	SSI	Y	Y	N	N	N	Y	Y	N	Y	N	N	NB 2	SB 2		SB 2		WM = WINTER MAINTENANCE
203	YES	SSI	Y	Y	N	N	N	Y	Y	N	Y	N	N	NB 1	SB 2		SB 2		CON=SUMMER CONSTRUCTION
204	YES	SSI	Y	Y	N	N	N	Y	Y	N	Y	N	N	NB 2	SB 2		SB 2		
205	YES	SSI	Y	N	Y	Y	N	Y	Y	N	Y	N	N	NB 1	SB 1		SB 1		
206																			
207	YES	SSI	Y	Y	Y	Y	N	Y	Y	N	Y	N	N	EB	WB		?		TWO LANE ROAD
208	YES	SSI	Y	Y	Y	Y	N	Y	Y	N	Y	N	N	EB	WB		?		TWO LANE ROAD
209																			
210																			
211																			
212																			
213																			
214																			
215																			
216																			
217																			
218																			
219																			
220																			
221																			
222																			
223																			
224																			
225																			
226																			
227																			
228																			
229																			
230																			
231																			
232																			
233																			
234																			
235																			
236																			
237																			
238																			
239																			
240																			
241																			
242																			
243																			
244																			
245																			
246																			
247																			
248																			
249																			
250																			
301			Y	Y						Y	Y	Y	PT/ COLOR	NB 2	SB 1	NB 1			
302			Y	Y						Y	Y	Y		NB 2	SB 1		SB 1		
303			Y	Y						Y	Y	Y				EB 1 ?			
304			Y	Y						Y	Y	Y		NB 2	SB 1	NB 1			
305			Y	Y						Y	Y	Y	PT/ COLOR	EB 2	WB 1	EB 1			
306			Y	Y						Y	Y	Y	PT/ COLOR	EB 1	WB 2		WB 1		
307			Y	Y						Y	Y	Y				BN 1 ?			
308			Y	Y						Y	Y	Y	PT/ COLOR	NB 2 ?		NB 1 ?			
309			Y	Y		Y			Y	Y	Y	Y	FIX / B&W	EB 1	WB 1		WB 1		
310			Y	Y		Y			Y	Y	Y	Y		EB 3					LAT: N 39 17' 00.2", Long: W 120 42' 11.3", Altitude: 5348
311			Y	Y		Y			Y	Y	Y	Y		EB 1	WB 1				LAT: N 39 18' 32.7", Long: W 120 32' 40.5", Altitude: 5745
312			Y	Y		Y			Y	Y	Y	Y		EB 3		EB 1			LAT: N 39 20' 20.1", Long: W 120 20' 53.6", Altitude: 7300
313			Y	Y		Y			Y	Y	Y	Y			WB 3				LAT: N 39 19' 55.2", Long: W 120 17' 15.8", Altitude: 6503
314			Y	Y		Y			Y	Y	Y	Y	FIX / B&W	NB 1	SB 1		SB 1		LAT: N 39 15' 38.6", Long: W 120 04' 19.1", Altitude: 7248
315			Y	Y						Y	Y	Y	PT/ COLOR						LAT: N 39 09' 55.2", Long: W 120 10' 39.4", Altitude: 6259
316			Y	Y						Y	Y	Y	PT/ COLOR						LAT: N 39 11' 37.3", Long: W 120 06' 12.0", Altitude: 6666

ID	DIST	CO	RTE	Pre	PM	Suff	Location	Status	Funded	Verified?	Sys Stat	Manufacturer	Inst Date	Power	Maintenance	Primary	Central	T_Height	T_Loc
325	3	ED	50		38.7		Riverton Bridge	Proposed	0	Y									
326	3	Nev	80	R	8	R	Power Line	Proposed	0	Y									
327	3	Nev	80	R	8.7	R	Windy Point	Proposed	0	Y									
328	3	Pla	80		33.5		Colfax	Proposed	0	Y									
329	3	Pla	80		40		Gold Run	Proposed	0	Y									
330	3	Pla	80	R	58.7		Yuba Gap	Proposed	0	Y									
401	4	ALA	580		6.9		Altamont Pass	Existing		Y									
520	5	SCR	17		12.5		At/near summit	Proposed	0	Y									
521	5	MON	101	btwn	40	95	Btwn King City and Prunedale	Proposed	0	Y									
522	5	SLO	101		35		At/near Cuesta Grade Summit	Proposed	0	Y									
523	5	SB	101		44		Near the 1/101 Junction	Proposed	0	Y									
524	5	SB	154		20		West of summit	Proposed	0	Y									
525	5	SB	154		24.5		At/near summit	Proposed	0	Y									
526	5	SB	154		29		East of summit	Proposed	0	Y									
527	5	SCR	9		21		At/near summit	Proposed	0	Y									
528	5	MON	1		40		Near Big Sur	Proposed	0	Y									
529	5	SLO	41		50		Near Cottonwood Pass	Proposed	0	Y									
601	6	KER	5		48.18		N OF RTE 58	Existing		Y		SSI	1993	120 VAC	QUARTERLY	VISIBILTY	Y	30 ft.	NB
602	6	KER	5		70.46		S OF RTE 46	Existing		Y		SSI	1993	120 VAC	QUARTERLY	VISIBILTY	Y	30 ft.	NB
603	6	KIN	5		19.07		AT MILHAM AVE	Existing		Y		SSI	1993	120 VAC	QUARTERLY	VISIBILTY	Y	30 ft.	SB
604	6	FRE	5		11.44		SOUTH OF RTE 198	Existing		Y		SSI	1993	120 VAC	QUARTERLY	VISIBILTY	Y	30 ft.	NB
605	6	FRE	5		49.71		N OF PANOCHE RD	Existing		Y		SSI	1993	120 VAC	QUARTERLY	VISIBILTY	Y	30 ft.	SB
606	6	FRE	41		33.08		AT SAN JOAQUIN RIVER	Existing		Y		SSI	2000	120 VAC	QUARTERLY	VISIBILTY	Y	30 ft.	SB
607	6	KER	99		56.37		AT 13TH AVENUE	Existing		Y		SSI	1999	120 VAC	QUARTERLY	VISIBILTY	Y	30 ft.	SB
608	6	TUL	99		31.41		AT KINGS RIVER BRIDGE	Existing		Y		SSI	1995	120 VAC	QUARTERLY	VISIBILTY	Y	30 ft.	SB
609	6	FRE	99		6.72		AT FLORAL AVE	Existing		Y		SSI	1995	120 VAC	QUARTERLY	VISIBILTY	Y	30 ft.	NB
610	6	FRE	99		31.41		AT SAN JOAQUIN RIVER	Existing		Y		SSI	1995	120 VAC	QUARTERLY	VISIBILTY	Y	30 ft.	SB
611	6	MAD	99		11.72		AT FRESNO RIVER	Existing		Y		SSI	1995	120 VAC	QUARTERLY	VISIBILTY	Y	30 ft.	SB
612	6	MAD	152		7.3		AT ASH SOUGH BRIDGE	Existing		Y		SSI		120 VAC	QUARTERLY	ICE	Y	30 ft.	EB
613	6	KER	5		12.2		GRAPVINE	Proposed	0	Y	PLANNING								
614	6	KER	5		8.3	R	SO OF LEBEC	Proposed	0	Y	PLANNING								
615	6	KER	5		61.18		2 MI SO OF LERDO HWY	Proposed	0	Y	PLANNING								
616	6	FRE	5		62.61		N/O SHIELDS	Proposed	0	Y	PLANNING								
617	6	KER	5		29.9		6 MI SO OF RTE 223	Proposed	0	Y	PLANNING								
618	6	FRE	5		30.7		N/O RTE 33/DERRICK	Proposed	0	Y	PLANNING								
619	6	KIN	5		25.08		S/O RTE 269	Proposed	0	Y	PLANNING								
620	6	KER	33		11.54		AT RTE 166	Proposed	0	Y	PLANNING								
621	6	FRE	33	R	10.81		AT JAYNE AVE	Proposed	0	Y	PLANNING								
622	6	KER	33		60.1		AT RTE 46	Proposed	0	Y	PLANNING								
623	6	FRE	41		21		AT ANNADALE	Proposed	0	Y	PLANNING								
624	6	MAD	41		44.26		ROAD 630 (SUGAR PINE RD)	Proposed	0	Y	PLANNING								
625	6	MAD	41		38.06		OAKHURST	Proposed	0	Y	PLANNING								
626	6	MAD	41		9.25		RTE 45	Proposed	0	Y	PLANNING								
627	6	FRE	41	R	5.99		AT ELKHORN	Proposed	0	Y	PLANNING								
628	6	KIN	41		39.97		AT RTE 198	Proposed	0	Y	PLANNING								
629	6	KIN	43		1.47		AT RTE 137 (COROCORAN)	Proposed	0	Y	PLANNING								
630	6	KER	46		50.89		AT RTE 43	Proposed	0	Y	PLANNING								
631	6	KER	58		51		AT LANDCO ROAD	Proposed	0	Y	PLANNING								
632	6	KER	58		64.9		E/O RTE 233	Proposed	0	Y	PLANNING								
633	6	TUL	63		21.56		AT RTE 201 (CONEJO AVE)	Proposed	0	Y	PLANNING								
634	6	KER	65		23.18		AT RTE 155 (GARCES HWY)	Proposed	0	Y	PLANNING								
635	6	TUL	65		18.2		AT RTE 190 (PORTERVILLE)	Proposed	0	Y	PLANNING								
636	6	TUL	99		18.28		AT RTE 190	Proposed	0	Y	PLANNING								
637	6	TUL	99		48.7		AT MERRIT DR	Proposed	0	Y	PLANNING								
638	6	KER	99		15.9		S/O OF RTE 119	Proposed	0	Y	PLANNING								
639	6	MAD	99		22.72		RTE 152	Proposed	0	Y	PLANNING								
640	6	KER	99		2.66		AT RTE 166	Proposed	0	Y	PLANNING								
641	6	TUL	99		42.31		N/O RTE 198	Proposed	0	Y	PLANNING								
642	6	TUL	99		29.46		AT RTE 137 (TULARE AVE)	Proposed	0	Y	PLANNING								
643	6	KER	119		21.8		E/O OF RTE 5	Proposed	0	Y	PLANNING								
644	6	FRE	168		45.1		SHAVER LAKE MAINT STA	Proposed	0	Y	PLANNING								
645	6	FRE	168	R	27.36		AT LODGE RD	Proposed	0	Y	PLANNING								
646	6	KER	178		41.7		AT BODFISH	Proposed	0	Y	PLANNING								
647	6	KER	178		9.8		E/O OF RTE 184	Proposed	0	Y	PLANNING								
648	6	FRE	180		116.85		AT HUME RD	Proposed	0	Y	PLANNING								
649	6	FRE	180		83.88		AT COVE RD	Proposed	0	Y	PLANNING								
650	6	FRE	180		24.7		MENDOTA MAINT STA	Proposed	0	Y	PLANNING								
651	6	TUL	198		18.81		AT RTE 65 (ROAD 196)	Proposed	0	Y	PLANNING								
652	6	TUL	198		1.51		AT RTE 56	Proposed	0	Y	PLANNING								

ID	Forecast	Provider	Air Temp	Wind	Precip	Rate	Close Vis	Ice	Chem	Visibility	Humidity	Rain	Camera	Pav Temp Lane 1	Pav Temp Lane 2	Sub Lane 1	Sub Lane	Other	Comments
325																			
326																			
327																			
328																			
329																			
330																			
401																			
520																			
521																			
522																			
523																			
524																			
525																			
526																			
527																			
528																			
529																			
601	Y	SSI	Y	Y	N	N	Y	Y	Y	N/A	Y	N/A	N/A	2		2			VENDOR OFFERS CT FORECAST,
602	Y	SSI	Y	Y	N	N	Y	Y	Y	N/A	Y	N/A	N/A	2		2			BUT CT DOES NOT PURCHASE.
603	Y	SSI	Y	Y	N	N	Y	Y	Y	N/A	Y	N/A	N/A		2		2		
604	Y	SSI	Y	Y	N	N	Y	Y	Y	N/A	Y	N/A	N/A	2		2			
605	Y	SSI	Y	Y	N	N	Y	Y	Y	N/A	Y	N/A	N/A		2		2		
606	Y	SSI	Y	Y	N	N	Y	Y	Y	N/A	Y	N/A	N/A		3		3		
607	Y	SSI	Y	Y	N	N	Y	Y	Y	N/A	Y	N/A	N/A		2		2		
608	Y	SSI	Y	Y	N	N	Y	Y	Y	N/A	Y	N/A	N/A		1		1		
609	Y	SSI	Y	Y	N	N	Y	Y	Y	N/A	Y	N/A	N/A	2		2			
610	Y	SSI	Y	Y	N	N	Y	Y	Y	N/A	Y	N/A	N/A		2		2		
611	Y	SSI	Y	Y	N	N	Y	Y	Y	N/A	Y	N/A	N/A		2		2		
612	Y	SSI	Y	Y	N	N	N/A	Y	Y	N/A	Y	N/A	N/A		2		2		
613																			ALL FUTURE WEATHER STATIONS WILL
614																			NEED TO MEET THE NTCIP STANDARD.
615																			
616																			CALL MARTHA STYER OR JEFF MCCRAE
617																			IN SACRAMENTO FOR STANDARDS.
618																			
619																			ANY FUTURE PLANNING FOR OUR DIST.
620																			WILL NEED TO MEET THE STATE
621																			STANDARDS. ANY EFFORTS OUTSIDE
622																			OF THE STANDARDIZATION WILL RESULT
623																			IN WASTED TIME. CT IS COMMITTED TO
624																			STANDARDIZE S/W, H/W AND FIRMWARE
625																			TO UTILIZE THE MODEL 2070.
626																			
627																			THE USE OF A SOLE SOURCE VENDOR
628																			(SSI) IS AN OPTION THAT IS BEING
629																			REVIEWED AT ALL LEVELS PRIOR TO
630																			APPROVAL , IF GRANTED.
631																			
632																			
633																			
634																			
635																			
636																			
637																			
638																			
639																			
640																			
641																			
642																			
643																			
644																			
645																			
646																			
647																			
648																			
649																			
650																			
651																			
652																			

ID	DIST	CO	RTE	Pre	PM	Suff	Location	Status	Funded	Verified?	Sys Stat	Manufacturer	Inst Date	Power	Maintenance	Primary	Central	T_Height	T_Loc
701	7	LA	5		5		Tejon Sand Shed	Existing		Y		SSI	33208	AC	As needed	Winter Season	Y	30 ft.	NB
702	7	LA	5		67.7		Whitaker Summit	Existing		Y		SSI	33208	AC	As needed	Winter Season	Y	30 ft.	SB
703	7	LA	5		73.5		Libre Canyon	Existing		Y		SSI	33208	AC	As needed	Winter Season	Y	30 ft.	SB
704	7	LA	5		84.4		Youngs Hill	Existing		Y		SSI	34304	AC	As needed	Winter Season	Y	30 ft.	SB
705	7	LA	5		88.6		Frazier Park Off ramp	Existing		Y		SSI	34304	AC	As needed	Winter Season	Y	30 ft.	SB
706	7	LA	14		54.5		Ave D of ramp	Existing		Y		SSI	34304	AC	As needed	Winter Season	Y	30 ft.	NB
707	7	LA	14		74		Vincent St on ramp	Existing		Y		SSI	34304	AC	As needed	Winter Season	Y	30 ft.	NB
708	7	LA	138		54.5		Big Rock Creek	Existing		Y		SSI	34304	Solar	As needed	Winter Season	Y	30 ft.	EB
720	7	LA	5		84			Proposed	0	Y									
721	7	LA	5		88			Proposed	0	Y									
722	7	LA	138		18			Proposed	0	Y									
723	7	LA	14		22			Proposed	0	Y									
724	7	LA	138		62			Proposed	0	Y									
725	7	LA	2		44			Proposed	0	Y									
801	8	RIV	10	R	24.1		AT VERBENA	Existing		N		SSi	Oct-99	Conv	2 per year	W/S	Y	30'	EB
802	8	RIV	10		29.98		AT ROUTE 62	Existing		N		SSi	Oct-99	Conv	2 per year	W/S	Y	30'	EB
803	8	RIV	10		33.92		AT INDIAN	Existing		N		SSi	Oct-99	Conv	2 per year	W/S	Y	30'	EB
804	8	RIV	10		38.72		AT DATE/PALM	Existing		N		SSi	Oct-99	Conv	2 per year	W/S	Y	30'	EB
805	8	RIV	10		43.7		AT RAMON	Existing		N		SSi	Oct-99	Conv	2 per year	W/S	Y	30'	WB
806	8	RIV	10		48.5		AT 38TH AVE	Existing		N		SSi	Oct-99	Conv	2 per year	W/S	Y	30'	WB
807	8	RIV	10		55		AT JEFFERSON	Existing		N		SSi	Oct-99	Conv	2 per year	W/S	Y	30'	WB
808	8	RIV	10		59.47		AT DILLION RD	Existing		N		SSi	Oct-99	Conv	2 per year	W/S	Y	30'	WB
809	8	SBD	15		11.6		AT DUNCAN CANYON	Existing		N		SSi	Apr-99	Conv	2 per year	S/F	Y	35'	NB
810	8	SBD	15		13		AT LYTLE CREEK	Existing		N		SSi	Apr-99	Conv	2 per year	S/F	Y	35'	NB
811	8	SBD	15		17.2		AT I-215	Existing		N		SSi	Apr-99	Solar	2 per year	S/F	Y	35'	SB
812	8	SBD	15		21.7		AT RTE138	Existing		N		SSi	Apr-99	Conv	2 per year	S/F	Y	35'	SB
813	8	SBD	15	R	25	R	AT CAJON PASS	Existing		N		SSi	Apr-99	Conv	2 per year	S/F	Y	35'	SB median
814	8	SBD	15	R	26.1	R	AT BRAKE CHECK AREA	Existing		N		SSi	Apr-99	Conv	2 per year	S/F	Y	35'	SB median
815	8	SBD	15		31.6		AT US 395	Existing		N		SSi	Apr-99	Conv	2 per year	S/F	Y	35'	NB
816	8	SBD	138		6.8		AT I-15	Existing		N		SSi	Apr-99	Conv	2 per year	S/F	Y	35'	WB
817	8	SBD	15		171		At Mountain Pass Mtce Station	Existing		Y		SSI	Dec-01	Conv	2 per year	S/F	Y	35'	In Yard
818	8	SBD	40				AT BARSTOW MTRE YARD	Proposed		Y	In Hq			Conv		Wind	Y	35'	In Yard
830	8	SBD	138		27			Proposed		Y									
831	8	SBD	15		6			Proposed		Y									
832	8	SBD	15		4			Proposed		Y									
833	8	SBD	15		1			Proposed		Y									
834	8	RIV	60		2			Proposed		Y									
835	8	RIV	215		26			Proposed		Y									
836	8	RIV	215		20			Proposed		Y									
837	8	SBD	18		5.5			Proposed		Y									
838	8	SBD	189		2.5			Proposed		Y									
839	8	SBD	18		31			Proposed		Y									
840	8	SBD	18		42			Proposed		Y									
841	8	SBD	38		51			Proposed		Y									
842	8	SBD	18		52			Proposed		Y									
843	8	SBD	38		35			Proposed		Y									
901	9	KER	58	R	58.1		Broome Rd.	Existing		N									
902	9	KER	58	R	94.2		Summit Rd. - Monolith OC	Existing		N									
903	9	KER	58	R	101		Cameron Rd.	Existing		N									
904	9	MNO	395		33		Crestview Flat	Proposed		Y									
905	9	MNO	395		63.5		Conway Summit	Proposed		Y									
906	9	INY	168		31		Westgard Pass	Proposed		Y									
907	9	INY	190		69		Townes Pass	Proposed		Y									
908	9	INY	395		30		Sage Flat Rd.	Proposed		Y									
909	9	KER	14		40		Red Rock Cyn	Proposed		Y									
910	9	MNO	6		32		CA/NV State Line	Proposed		Y									
911	9	MNO	395		88		Devil's Gate	Proposed		Y									
912	9	MNO	395		95		Walker Cyn	Proposed		Y									
913	9	MNO	395		24		395/203 JCT.	Proposed		Y									
1001	10	SJ	5		15.01		RWIS- Fog System	Existing		N						Fog			
1002	10	SJ	5		16.46		RWIS- Fog System	Existing		N						Fog			
1003	10	SJ	5		18.36		RWIS- Fog System	Existing		N						Fog			
1004	10	SJ	5		19.79		RWIS- Fog System	Existing		N						Fog			
1005	10	SJ	5		21.48		RWIS- Fog System	Existing		N						Fog			
1006	10	SJ	120		0.5		RWIS- Fog System	Existing		N						Fog			
1007	10	SJ	120		2.28		RWIS- Fog System	Existing		N						Fog			
1008	10	SJ	120		3.84		RWIS- Fog System	Existing		N						Fog			
1009	10	SJ	120		5.65		RWIS- Fog System	Existing		N						Fog			

ID	Forecast	Provider	Air Temp	Wind	Precip	Rate	Close Vis	Ice	Chem	Visibility	Humidity	Rain	Camera	Pav Temp Lane 1	Pav Temp Lane 2	Sub Lane 1	Sub Lane	Other	Comments
701	Y	SSI	Y	Y	Y	N	Y		Y	Y	Y	N	Y	1,2,3,4					
702	Y	SSI	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	1	4				
703			Y	Y	Y	N			Y		Y	N	Y	1	4		4		
704			Y	Y	Y	N	Y		Y	Y	Y	N	Y	1	1				
705	Y	SSI	Y	Y	Y	N		Y	Y		Y	N	N	1	4		4		
706			Y	Y	Y	N			Y		Y	N	Y	1	1	1			
707			Y	Y	Y	N			Y		Y	N	Y	1					
708			Y	Y	Y	N		Y	Y		Y	N	Y	1		1			
720																			
721																			
722																			
723																			
724																			
725																			
801	N		Y	Y						Y			Y						
802	N		Y	Y						Y			Y						
803	N		Y	Y						Y			Y						
804	N		Y	Y						Y			Y						
805	N		Y	Y						Y			Y						
806	N		Y	Y						Y			Y						
807	N		Y	Y						Y			Y						
808	N		Y	Y						Y			Y						
809	N		Y	Y	Y	Y				Y			Y						
810	Y	Scancast			Y			Y	Y					1,4		1			Bridge Deck Pavement Sensor in lane #4
811	N		Y	Y	Y	Y		Y	Y	Y	Y				1,4		4		
812	N		Y	Y	Y	Y		Y	Y	Y	Y		Y		1,4		4		
813	N		Y	Y	Y	Y		Y	Y	Y	Y		Y		1,4		4		
814	Y	Scancast	Y	Y	Y	Y		Y	Y	Y	Y		Y		1,4		4		
815	N		Y	Y	Y	Y		Y	Y	Y	Y			1,3	1	3	1		Bridge Deck Pavement Sensor in lane #1 or Rte 395 S/B
816	N		Y	Y	Y	Y		Y	Y	Y	Y				1		1		
817	Y	Scancast	Y	Y	Y	Y		Y	Y	Y	Y				1,3		3		
818	N		Y	Y	Y	Y				Y	Y								
830																			
831																			
832																			
833																			
834																			
835																			
836																			
837																			
838																			
839																			
840																			
841																			
842																			
843																			
901																			
902																			
903																			
904																			
905																			
906																			
907																			
908																			
909																			
910																			
911																			
912																			
913																			
1001																			
1002																			
1003																			
1004																			
1005																			
1006																			
1007																			
1008																			
1009																			

ID	DIST	CO	RTE	Pre	PM	Suff	Location	Status	Funded	Verified?	Sys Stat	Manufacturer	Inst Date	Power	Maintenance	Primary	Central	T_Height	T_Loc
1010	10	SJ	4		14.7		RWIS	Proposed	0	N									
1011	10	SJ	4		16.44		RWIS	Proposed	0	N									
1012	10	SJ	4		18.97		RWIS	Proposed	0	N									
1013	10	SJ	4		15.76		RWIS	Proposed	0	N									
1014	10	STA	5		24.61		RWIS	Proposed	1	N									
1015	10	STA	5		27.8		RWIS	Proposed	1	N									
1016	10	STA	5		20.61		RWIS	Proposed	1	N									
1017	10	SJ	5		25.24		RWIS	Proposed	0	N									
1018	10	STA	5		18.61		RWIS	Proposed	1	N									
1019	10	SJ	5		27.75		RWIS	Proposed	0	N									
1020	10	SJ	99		18.6		RWIS	Proposed	0	N									
1021	10	SJ	99		19.43		RWIS	Proposed	0	N									
1022	10	SJ	99		17.12		RWIS	Proposed	0	N									
1023	10	SJ	99		14.44		RWIS	Proposed	0	N									
1024	10	STA	99	R	1.45		RWIS	Proposed	1	N									
1025	10	STA	99	R	4.34		RWIS	Proposed	1	N									
1026	10	STA	99	R	6.36		RWIS	Proposed	1	N									
1027	10	STA	99	R	8.7		RWIS	Proposed	1	N									
1028	10	STA	99	R	10.9		RWIS	Proposed	1	N									
1101	11	SD	8		31.7		Viejas Creek	Existing		Y		Vaisala	1994	Solar	12 months	All	Y	30 ft	Center
1102	11	SD	8		42		Pine Valley Creek	Existing		Y		Vaisala	1994	Solar	12 months	All	Y	30 ft	WB Rt Shldr
1103	11	SD	8		48.8		Buckman Springs	Existing		Y		Vaisala	1994	Solar	12 months	All	Y	30 ft	WB Center Divide Left Shldr
1104	11	SD	8		57		La Posta Creek	Existing		Y		Vaisala	1994	Solar	12 months	All	Y	30 ft	EB Center Divide
1105	11	SD	8		61.1		Crest Wood Road	Existing		Y		Vaisala	1994	Solar	12 months	All	Y	30 ft	Center Divide
1106	11	IMP	8		3.08		Mountain Spring Road	Existing		Y		Vaisala	1994	Solar	12 months	All	Y	30 ft	WB Rt Shldr

ID	Forecast	Provider	Air Temp	Wind	Precip	Rate	Close Vis	Ice	Chem	Visibility	Humidity	Rain	Camera	Pav Temp Lane 1	Pav Temp Lane 2	Sub Lane 1	Sub Lane	Other	Comments
1010																			
1011																			
1012																			
1013																			
1014																			
1015																			
1016																			
1017																			
1018																			
1019																			
1020																			
1021																			
1022																			
1023																			
1024																			
1025																			
1026																			
1027																			
1028																			
1101	Y	Northwest Weather Net	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	EB 1 Sensor	WB 1 Sensor	N	N		Dew Point and Wind Gust Speed is available
1102	Y	Northwest Weather Net	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	EB 2 Sensor	WB 2 Sensor	N	N		
1103	Y	Northwest Weather Net	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	EB 1 Sensor	WB 1 Bridge Deck	N	N		
1104	Y	Northwest Weather Net	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	EB 1 + 1 Bridge Decl	WB 1 Sensor	N	N		
1105	Y	Northwest Weather Net	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	EB 1 + 1 Bridge Decl	WB 1 Sensor	N	N		
1106	Y	Northwest Weather Net	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	None	VB 1 + 1 Bridge Dec	N	N		

C. Survey Tally

California Department of Transportation
Survey of Road Weather Information Systems
Tally of All Responders

District	
District 1	4
District 2	7
District 3	3
District 4	1
District 5	2
District 6	4
District 7	4
District 8	4
District 9	1
District 10	0
District 11	2
District 12	2
Headquarters	3
Total	**37**

Primary Job Function	
Traffic Operations	11
RWIS System Maint	2
Management	6
Winter Maintenance	15

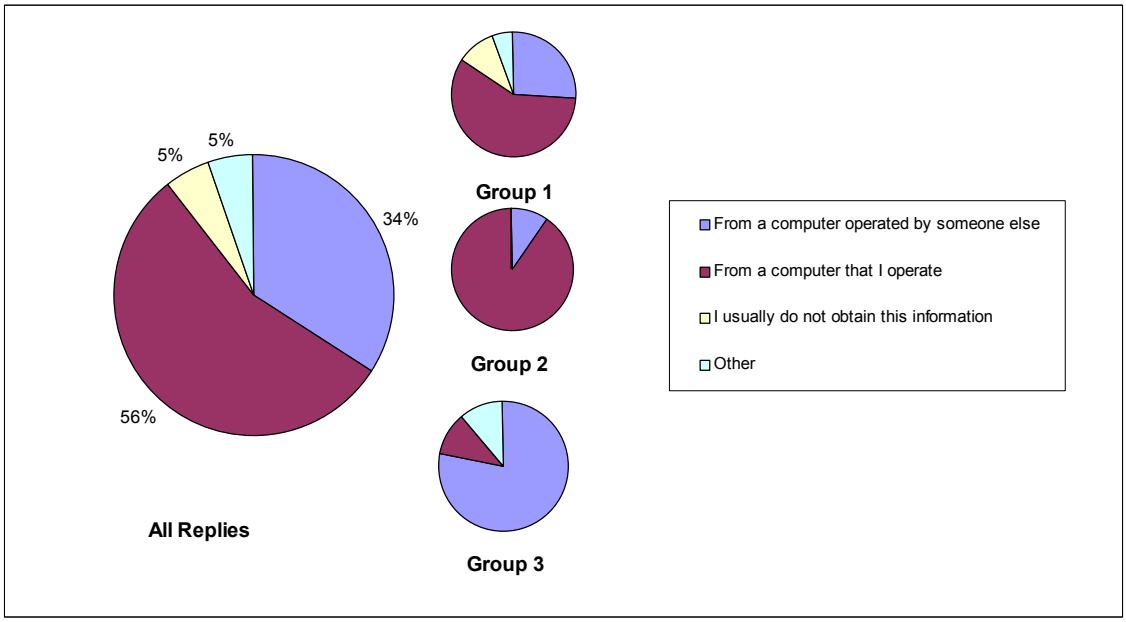
Other Primary Job Function
Manage District Maintenance and Traffic Operations
Review PS&Es and put into contracts
Program Advisor for Storm Damage
TMC Ops
TMC Support
Coordinate Repair Projects
PLAN AND SUPERVISE ALL LEVELS OF ROAD engineer
Maintenance Engineering Support
TMC

Title or Postion
Deputy District Director, Maintenance and Operations
Transportation Engr (Electrical)
Senior Transp Engineer
Area Superintendent
Snow & Ice Removal Coordinator
Associate Transportation Electrical Eng.
Transportation Engineer, Electrical
Senior Transportation Engineer
Maintenance Manager
Ct. Area Supt.
Chief, Office of Traffc Management
Storm Damage Coordinator
Senior Transportation Electrical Engineeer
CALTRANS MAINTENANCE SUPERVISOR
C.M.A.S.
Associate Transportation Electrical Engineer
Sr Trans Elec Engr
Transportation Engineer
Transportation Engineer

1. How do you usually obtain information from RWIS?

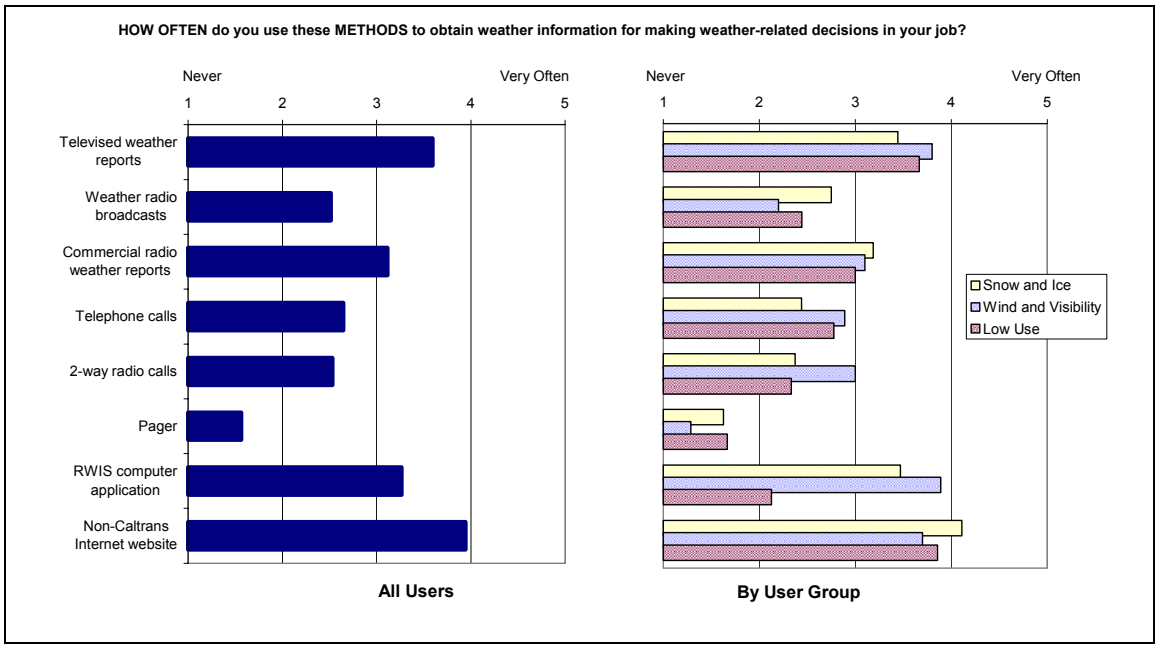
Verbally, by notes, or by printout, from a computer operated by someone else	13
From a computer that I operate	21
I usually do not obtain this information	2
Other:	2

RPU's page when conditions are ice or snow
Tell someone to show me the data. Data is currently not available.



2. HOW OFTEN do you use these METHODS to obtain weather information for making weather-related decisions in your job?

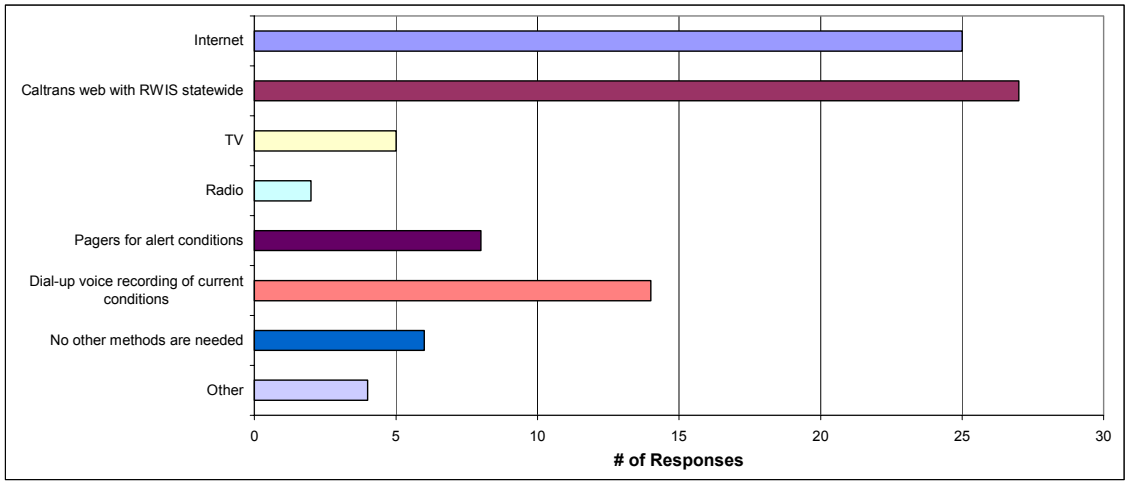
	Very Often 5	Often 4	Sometimes 3	Rarely 2	Never 1	Not Available	Rank	Mean	Stan Dev	# Resp
Televised weather reports	**38%** 14	**16%** 6	**19%** 7	**22%** 8	**5%** 2	0	2	3.59	1.34	37
Weather radio broadcasts	**14%** 5	**11%** 4	**14%** 5	**31%** 11	**29%** 10	0	7	2.51	1.40	35
Commercial radio	**17%** 6	**20%** 7	**34%** 12	**14%** 5	**14%** 5	0	4	3.11	1.28	35
Telephone calls	**6%** 2	**15%** 5	**29%** 10	**38%** 13	**12%** 4	0	5	2.65	1.07	34
2-way radio calls	**9%** 3	**15%** 5	**26%** 9	**21%** 7	**29%** 10	0	6	2.53	1.31	34
Pager	**3%** 1	**3%** 1	**9%** 3	**16%** 5	**69%** 22	1	8	1.56	1.01	32
RWIS computer	**38%** 13	**9%** 3	**18%** 6	**12%** 4	**24%** 8	2	3	3.26	1.64	34
Non-Caltrans Internet	**43%** 15	**23%** 8	**23%** 8	**9%** 3	**3%** 1	1	1	3.94	1.14	35
Other methods used:	5	3	5	0	2					
VAMS (DTN and WeatherData),	1									
DTN Service			1							
Subscription Weather broadcast		1								
Historical knowledge of what to		1								
NWS websites	1									
DTN Weather Service										
DTN	1									
DTN weather,		1								
This service is provided										
Satellite provided										
meteorlogix,Northwest	1									
No Comment	1	0	4	0	2					



3. If other methods for delivery of weather information were provided, which would be desirable? (Select any that apply)

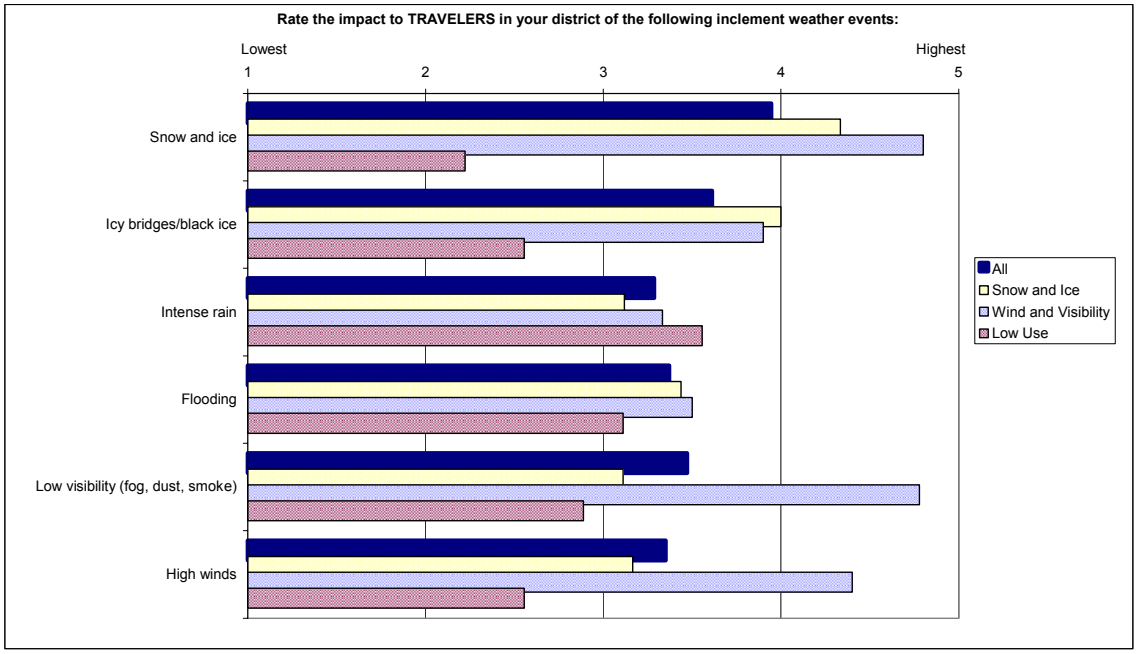
Internet (commercial sites or other states or	25
Caltrans web site including all RWIS statewide	27
TV	5
Radio	2
Pagers that deliver brief weather message under	8
Dial-up RWIS voice recording of the current	14
No other methods are needed	6
Other:	4

Personally-customizable VAMS website, e-mail and pager. Customizable by geographic region and alert
cell phone notification from field locations RPU's
thru 511
Satellite weather systems DTN



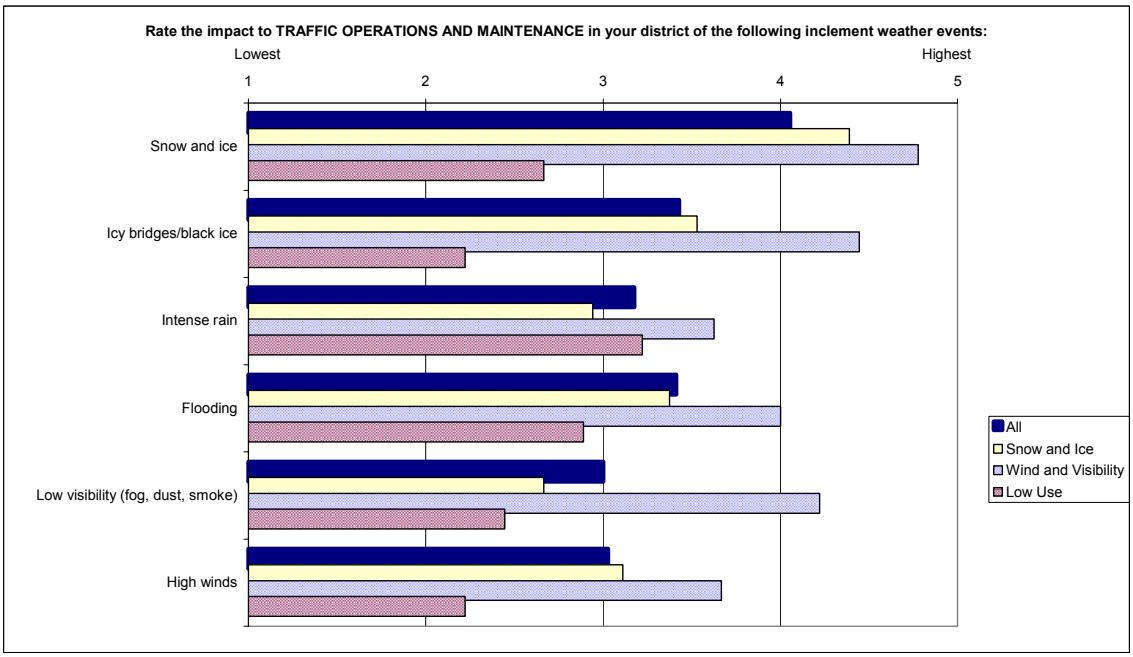
4. Rate the impact to TRAVELERS in your district of the following inclement weather events:

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Snow and ice	**59%** 22	**11%** 4	**8%** 3	**8%** 3	**14%** 5		1	3.95	1.51	37
Icy bridges/black ice	**39%** 14	**22%** 8	**17%** 6	**6%** 2	**17%** 6		2	3.61	1.48	36
Intense rain	**11%** 4	**31%** 11	**37%** 13	**14%** 5	**6%** 2		6	3.29	1.05	35
Flooding	**23%** 8	**20%** 7	**31%** 11	**23%** 8	**3%** 1		4	3.37	1.17	35
Low visibility (fog, dust, smoke)	**31%** 11	**14%** 5	**31%** 11	**22%** 8	**3%** 1		3	3.47	1.23	36
High winds	**27%** 10	**22%** 8	**22%** 8	**19%** 7	**11%** 4		5	3.35	1.36	37
Other:	1	2	0	0	1					
Blizzard/whiteout										
Dust related to high wind conditions		1								
Slides	1									
Blowing dust in AV valley		1								
No Comment	0	0	0	0	1					



5. Rate the impact to TRAFFIC OPERATIONS AND MAINTENANCE in your district of the following inclement weather events:

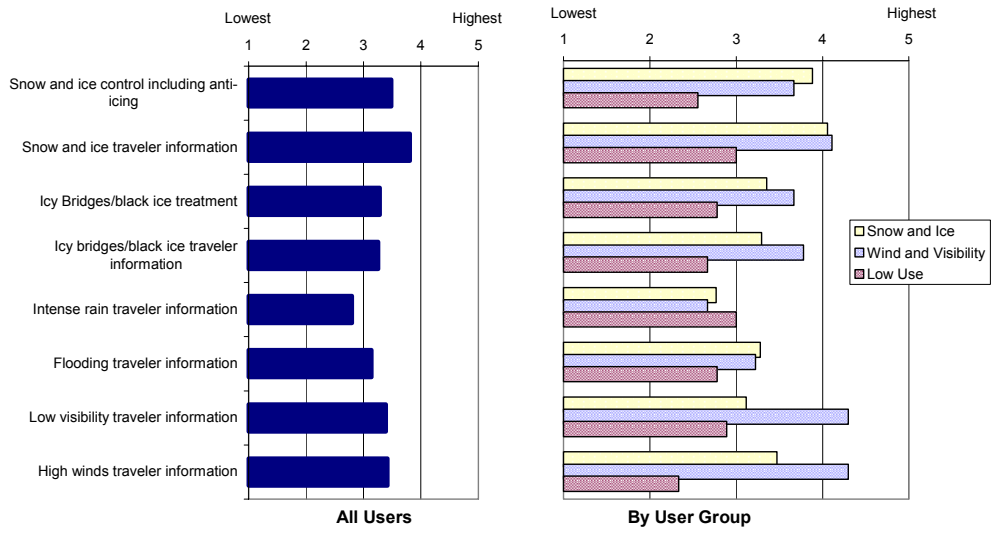
	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Snow and ice	**56%** 20	**25%** 9	**3%** 1	**3%** 1	**14%** 5		1	4.06	1.41	36
Icy bridges/black ice	**20%** 7	**43%** 15	**14%** 5	**6%** 2	**17%** 6		2	3.43	1.36	35
Intense rain	**12%** 4	**21%** 7	**47%** 16	**15%** 5	**6%** 2		4	3.18	1.03	34
Flooding	**12%** 4	**38%** 13	**29%** 10	**21%** 7	**0%** 0		3	3.41	0.96	34
Low visibility (fog, dust,	**14%** 5	**17%** 6	**28%** 10	**39%** 14	**3%** 1		6	3.00	1.12	36
High winds	**8%** 3	**28%** 10	**31%** 11	**25%** 9	**8%** 3		5	3.03	1.11	36
Other:	2	0	0	0	1					
Blizzard/whiteout	1									
Slides	1									
No Comment	1	0	0	0	1					



6. Rate the potential usefulness of RWIS and VAMS for the following functions

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Snow and ice control including anti-icing	**26%** 9	**29%** 10	**26%** 9	**9%** 3	**11%** 4		2	3.49	1.29	35
Snow and ice traveler information and motorist warnings (via CMS, HAR, web, phone, etc.)	**44%** 16	**17%** 6	**22%** 8	**8%** 3	**8%** 3		1	3.81	1.33	36
Icy Bridges/Black ice treatment	**20%** 7	**34%** 12	**20%** 7	**6%** 2	**20%** 7		5	3.29	1.41	35
Icy bridges/black ice traveler information and motorist warning	**23%** 8	**29%** 10	**20%** 7	**9%** 3	**20%** 7		6	3.26	1.44	35
Intense rain traveler information and motorist warning	**6%** 2	**14%** 5	**46%** 16	**23%** 8	**11%** 4		8	2.80	1.02	35
Flooding traveler information and motorist warning	**11%** 4	**22%** 8	**42%** 15	**19%** 7	**6%** 2		7	3.14	1.05	36
Low visibility traveler information and motorist warning	**19%** 7	**22%** 8	**36%** 13	**22%** 8	**0%** 0		4	3.39	1.05	36
High winds traveler information and motorist warning	**22%** 8	**28%** 10	**22%** 8	**25%** 9	**3%** 1		3	3.42	1.18	36
Other:	0	0	1	0	1					
Slide probability detection			1							

6. Rate the potential usefulness of RWIS and VAMS for the following functions



7. Please indicate to which level you agree with the following statements

	Strongl 5	4	3	2	Strongly 1	Not Applicable	Rank	Mean	Stan Dev	# Resp
I can access RWIS data in my workplace	**71%** 20	**7%** 2	**7%** 2	**7%** 2	**7%** 2	7	1	4.29	1.30	28
Accessing RWIS information is easy and requires minimum effort	**48%** 16	**21%** 7	**6%** 2	**15%** 5	**9%** 3	3	9	3.85	1.42	33
When I view RWIS data, I feel that the temperatures and other data is accurate for the time reported	**31%** 10	**25%** 8	**31%** 10	**3%** 1	**9%** 3	4	11	3.66	1.23	32
When I view RWIS data, I feel that the reported data is current	**26%** 8	**39%** 12	**26%** 8	**3%** 1	**6%** 2	5	10	3.74	1.09	31
Monitoring road conditions and weather forecasts is important in doing my job	**65%** 24	**11%** 4	**11%** 4	**3%** 1	**11%** 4	0	3	4.16	1.36	37
I am encouraged to use RWIS and weather information	**42%** 13	**16%** 5	**13%** 4	**19%** 6	**10%** 3	4	12	3.61	1.45	31
RWIS help monitor road weather conditions	**50%** 16	**31%** 10	**13%** 4	**6%** 2	**0%** 0	4	2	4.25	0.92	32
Cameras help monitor road weather conditions	**41%** 14	**32%** 11	**18%** 6	**6%** 2	**3%** 1	3	5	4.03	1.06	34
In my district, RWIS is used as a tool for traffic operations, such as fog or high wind warnings	**27%** 8	**13%** 4	**13%** 4	**23%** 7	**23%** 7	6	17	2.97	1.56	30
In my district, RWIS is used as a tool for winter road maintenance (snow and ice control)	**50%** 14	**14%** 4	**18%** 5	**7%** 2	**11%** 3	8	8	3.86	1.41	28
In my district, RWIS is used as a tool to schedule and monitor maintenance and construction jobs	**7%** 2	**19%** 5	**26%** 7	**15%** 4	**33%** 9	9	18	2.52	1.34	27
RWIS would work better if there were more of them	**42%** 14	**24%** 8	**21%** 7	**3%** 1	**9%** 3	3	7	3.88	1.27	33
RWIS would work better if they were better located	**22%** 7	**19%** 6	**28%** 9	**9%** 3	**22%** 7	4	16	3.09	1.44	32
RWIS would work better if they were maintained better	**23%** 7	**23%** 7	**23%** 7	**10%** 3	**20%** 6	6	15	3.20	1.45	30
RWIS would work better if people knew how to use the information better	**38%** 12	**13%** 4	**31%** 10	**6%** 2	**13%** 4	4	13	3.56	1.39	32
RWIS would work better if the information was easier to use and interpret	**23%** 7	**19%** 6	**32%** 10	**10%** 3	**16%** 5	4	14	3.23	1.36	31
RWIS data should be included in the ATMS	**52%** 16	**16%** 5	**16%** 5	**6%** 2	**10%** 3	2	6	3.94	1.36	31
RWIS data should be posted on the Internet for public access	**65%** 22	**9%** 3	**9%** 3	**3%** 1	**15%** 5	1	4	4.06	1.50	34

Comments:

Caltrans needs to post RWIS on the Web.

Info is extremely unreliable

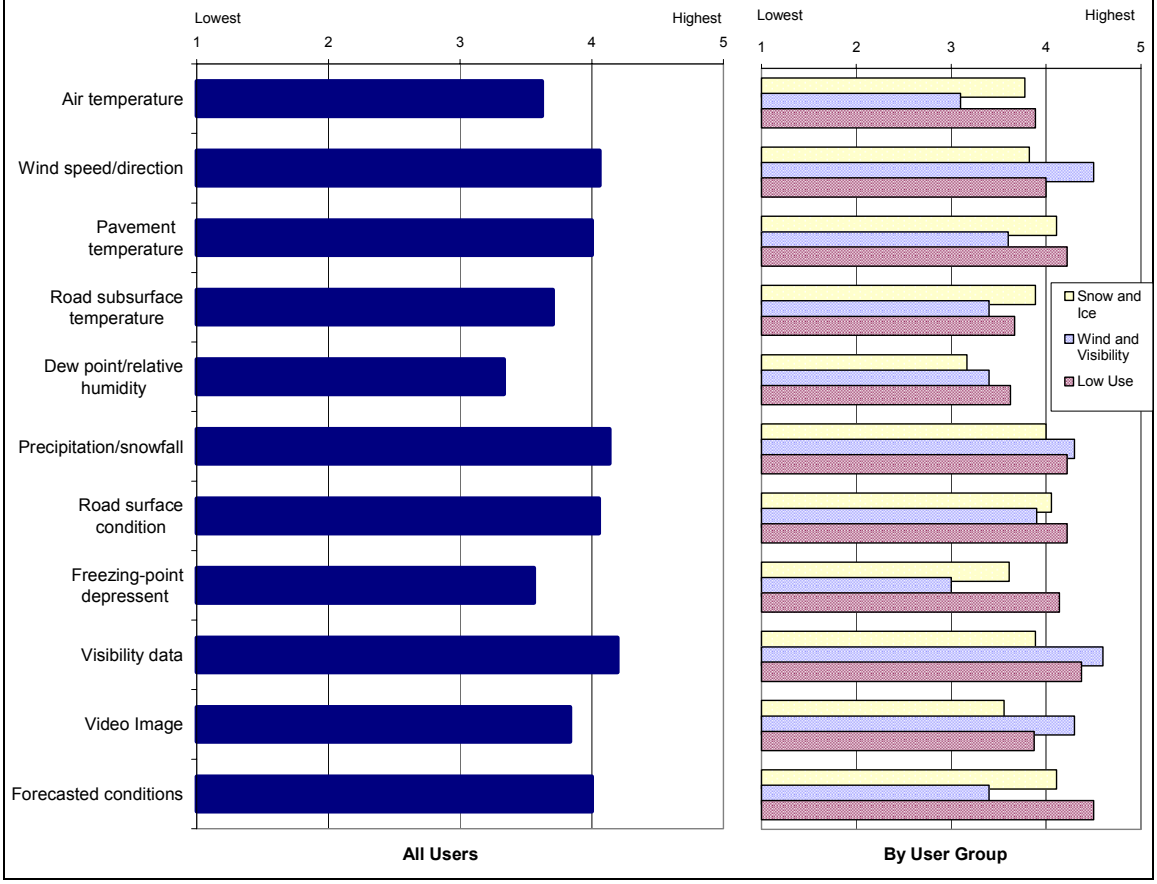
When Rwis available

Right now our Icecast system is new to our district this past year and only has a few locations in the valley area for fog and wind purposes. Our department has not been using Icecast to its full potential. I think the information icecast has to off

8. How useful is the following specific site information for the purpose of TRAFFIC OPERATIONS and TRAFFIC MANAGEMENT (e.g., providing

	Very 5	4	3	2	Not Useful 1		Rank	Mean	Stan Dev	# Resp
Air temperature	**30%** 11	**27%** 10	**24%** 9	**14%** 5	**5%** 2		9	3.62	1.21	37
Wind speed/direction	**49%** 17	**26%** 9	**14%** 5	**6%** 2	**6%** 2		3	4.06	1.19	35
Pavement temperature	**41%** 15	**32%** 12	**19%** 7	**3%** 1	**5%** 2		5	4.00	1.11	37
Road subsurface	**43%** 16	**19%** 7	**16%** 6	**8%** 3	**14%** 5		8	3.70	1.45	37
Dew point / relative	**22%** 8	**39%** 14	**3%** 1	**22%** 8	**14%** 5		11	3.33	1.41	36
Precipitation / snowfall	**46%** 17	**35%** 13	**11%** 4	**3%** 1	**5%** 2		2	4.14	1.08	37
Road surface condition (dry, wet, ice, etc.)	**41%** 15	**38%** 14	**11%** 4	**8%** 3	**3%** 1		4	4.05	1.05	37
Freezing-point depressant concentration	**32%** 11	**32%** 11	**9%** 3	**12%** 4	**15%** 5		10	3.56	1.44	34
Visibility data	**53%** 19	**28%** 10	**11%** 4	**3%** 1	**6%** 2		1	4.19	1.12	36
Video Image	**42%** 15	**28%** 10	**14%** 5	**6%** 2	**11%** 4		7	3.83	1.34	36
Forecasted conditions	**50%** 18	**25%** 9	**8%** 3	**8%** 3	**8%** 3		5	4.00	1.31	36
Any other useful RWIS	0	1	0	0	1					

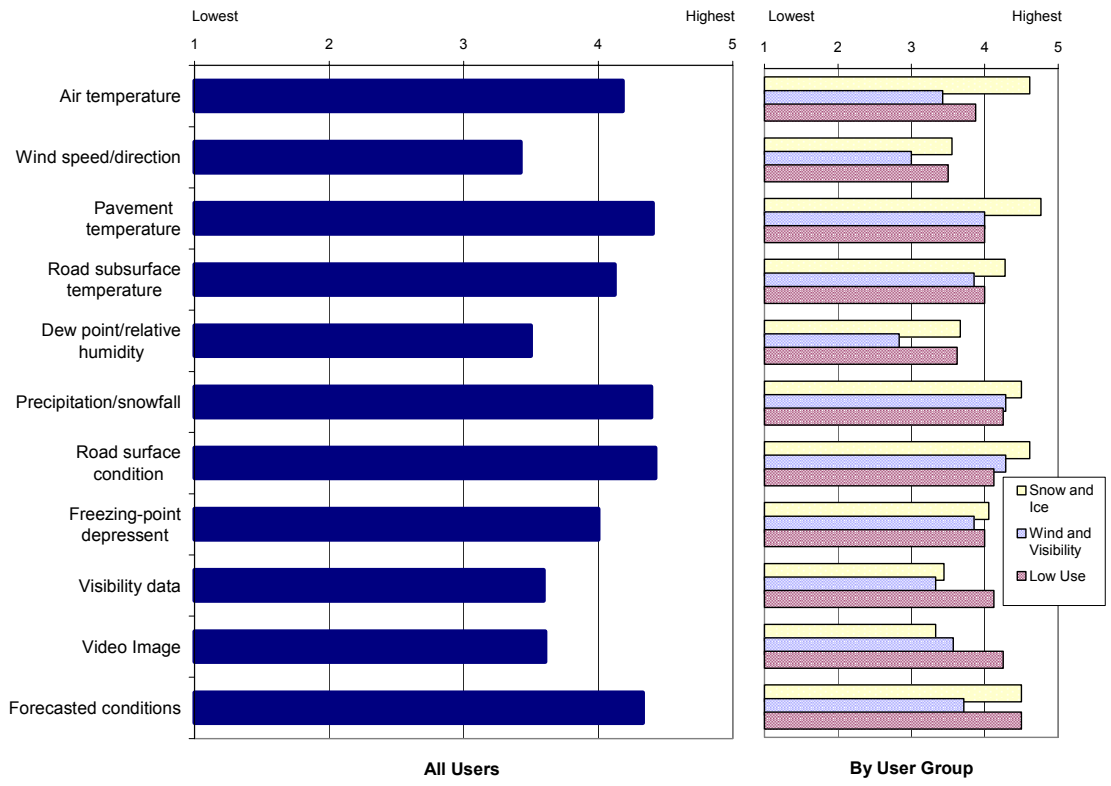
8. How useful is the following specific site information for the purpose of TRAFFIC OPERATIONS and TRAFFIC MANAGEMENT (e.g., providing fog, ice, or high wind warnings to drivers, incident reporting)?



9. How useful is the following specific site information for the purpose of WINTER ROAD MAINTENANCE (e.g., plowing, anti-icing, de-icing)?

	Very Useful 5	4	3	2	Not Useful 1		Rank	Mean	Stan Dev	# Resp
Air temperature	**58%** 19	**18%** 6	**15%** 5	**3%** 1	**6%** 2		5	4.18	1.18	33
Wind speed/direction	**30%** 10	**12%** 4	**36%** 12	**12%** 4	**9%** 3		11	3.42	1.30	33
Pavement temperature	**69%** 22	**16%** 5	**9%** 3	**0%** 0	**6%** 2		2	4.41	1.10	32
Road subsurface	**55%** 18	**21%** 7	**12%** 4	**6%** 2	**6%** 2		6	4.12	1.22	33
Dew point / relative	**31%** 10	**22%** 7	**22%** 7	**16%** 5	**9%** 3		10	3.50	1.34	32
Precipitation / snowfall	**58%** 19	**30%** 10	**9%** 3	**0%** 0	**3%** 1		3	4.39	0.90	33
Road surface condition (dry, wet, ice, etc.)	**67%** 22	**21%** 7	**6%** 2	**0%** 0	**6%** 2		1	4.42	1.06	33
Freezing-point depressant concentration	**52%** 17	**24%** 8	**9%** 3	**3%** 1	**12%** 4		7	4.00	1.37	33
Visibility data	**31%** 10	**25%** 8	**25%** 8	**9%** 3	**9%** 3		9	3.59	1.29	32
Video Image	**33%** 11	**30%** 10	**15%** 5	**6%** 2	**15%** 5		8	3.61	1.41	33
Forecasted conditions	**61%** 20	**24%** 8	**9%** 3	**0%** 0	**6%** 2		4	4.33	1.08	33
Any other useful RWIS features:	0	1	0	0	1					
Comment:Maintenance question, Operations is not in a position to evaluate.										
These all would be very useful if we had sensors in snow counties										

9. How useful is the following specific site information for the purpose of WINTER ROAD MAINTENANCE (e.g., plowing, anti-icing, de-icing)?



10. How useful is the following specific site information for the purpose of MAINTENANCE AND CONSTRUCTION (e.g., repaving, construction

	Very Useful 5	4	3	2	Not Useful 1		Rank	Mean	Stan Dev	# Resp
Air temperature	**40%** 14	**20%** 7	**26%** 9	**9%** 3	**6%** 2		4	3.80	1.23	35
Wind speed/direction	**20%** 7	**17%** 6	**20%** 7	**26%** 9	**17%** 6		9	2.97	1.40	35
Pavement temperature	**46%** 16	**20%** 7	**26%** 9	**3%** 1	**6%** 2		1	3.97	1.18	35
Road subsurface	**33%** 11	**12%** 4	**27%** 9	**6%** 2	**21%** 7		7	3.30	1.53	33
Dew point / relative	**15%** 5	**9%** 3	**33%** 11	**27%** 9	**15%** 5		11	2.82	1.26	33
Precipitation / snowfall	**36%** 12	**27%** 9	**21%** 7	**6%** 2	**9%** 3		5	3.76	1.28	33
Road surface condition (dry, wet, ice, etc.)	**48%** 16	**18%** 6	**15%** 5	**9%** 3	**9%** 3		3	3.88	1.36	33
Freezing-point depressant concentration	**22%** 7	**16%** 5	**25%** 8	**19%** 6	**19%** 6		8	3.03	1.43	32
Visibility data	**35%** 12	**18%** 6	**26%** 9	**12%** 4	**9%** 3		3	3.88	1.36	34
Video Image	**28%** 9	**6%** 2	**19%** 6	**19%** 6	**28%** 9		3	3.88	1.36	32
Forecasted conditions	**52%** 17	**21%** 7	**9%** 3	**6%** 2	**12%** 4		2	3.94	1.41	33
Any other useful RWIS	0	0	1	0	1					
Comment:Operations is not in a position to evaluate.										

Refer to the list of RWIS to answer the next three questions

11. What specific roadside locations are prone to having outdated data? (e.g., data from RWIS often appears to be 6 hours old.) Specify location, and

I do not have access to such information.
Unknown -- I can\'t access most stations.
Most

There is an installation in D10 on Highway 88 not listed above. May currently be inoperative. Should be upgraded and moved to a more useful location.
All of units on Rte 10 Unit ID 813, and 811
Any site that utilizes cell phone to communicate back to the TMC.
Can\'t access data from sites 309-330. Others appear to have good data.
201 & 206 - These are both RAWS. 201 is cell and solar not reliable.
207-208 Up dates OK
612 Due to cell service.
801, 802, 803, 804
iF ACCESSED PROPERLY THE INFO SHOULD BE WITHIN MINUTES OF SITE UPDATE.
None
There is an RWIS Installation project to relocate an existing UNit to HUM-101-133.2. The other units are proposed and will be installed ont he same contract
n/a
Unknown
all are
don\'t know
NA
forcasting all
Not actively using Rwis.

12. What specific roadside locations are prone to data being <u>inaccurate</u>? (e.g., pavement temperature is usually 10 degrees warmer than actual conditions

I do not have access to such information.
Unknown -- I can\'t
Most
N/A-no baseline data is in place to evaluate this condition.
All seem to be reasonable accurate when all functions are working.
207-208 Forecasts are terrible. Rarely are they ever close
813
I.D. 903 HAS BEEN INACCURATE AT TIMES DUE TO PHONE LINE PROBLEMS. ALL ELSE SEEMS TO BE ACCURATE.
None
See above
n/a
Unknown
none
don\'t know
Not actively using Rwis.
NA
Not actively using Rwis.

13. Provide any recommendations for new locations or relocation of existing stations .

Procedures and requirements for selecting locations and configurations of systems should be set in policy prior to installing any new sites. Once the policy is in force a study should be conducted to determine the best locations and develop a top down/bot

Siting of stations should include review and recommendation of NWS or VAMS meteorologist.

See #11 above.

SBD Rte 15 @ Rte 210, Rte 66, Rte 10 RIV Rte 15 @ Rte 60 SBD Rte 60 @ Haven RIV Rte 60 @ Mission

Upgrade all locations to CDPD or similar communication mode, to help offset monthly communications related cost.

Good locations

THERE HAS BEEN DISCUSSION OF OTHER LOCATIONS WITHIN THE DISTRICT IN REMOTE LOCATIONS. ADDED LOCATIONS FOR MY AREA WOULD INCLUDE ONE ON HIGHWAY 202 AND ANOTHER ON ROUTE 58 IN THE \"HARTFLAT\" AREA.

S/B 014 @ Escondido Canyon P.M 43.28

Locate your units on the recommendation=s of the field crews that actually patrol the area. They know best where and when it icecs up here in District 1. Frost is are main reason for having RWIS from a Maintenance view point.

SB 154 E&W of San Marcos Pass, Scr 17 Summit, SB 101/1 Jct, Mon 101, Mon 1, Scr9

SR 02, 138/018, 138 @ 210th, I-005 @ 138, Tejon summit

Tejon Summit

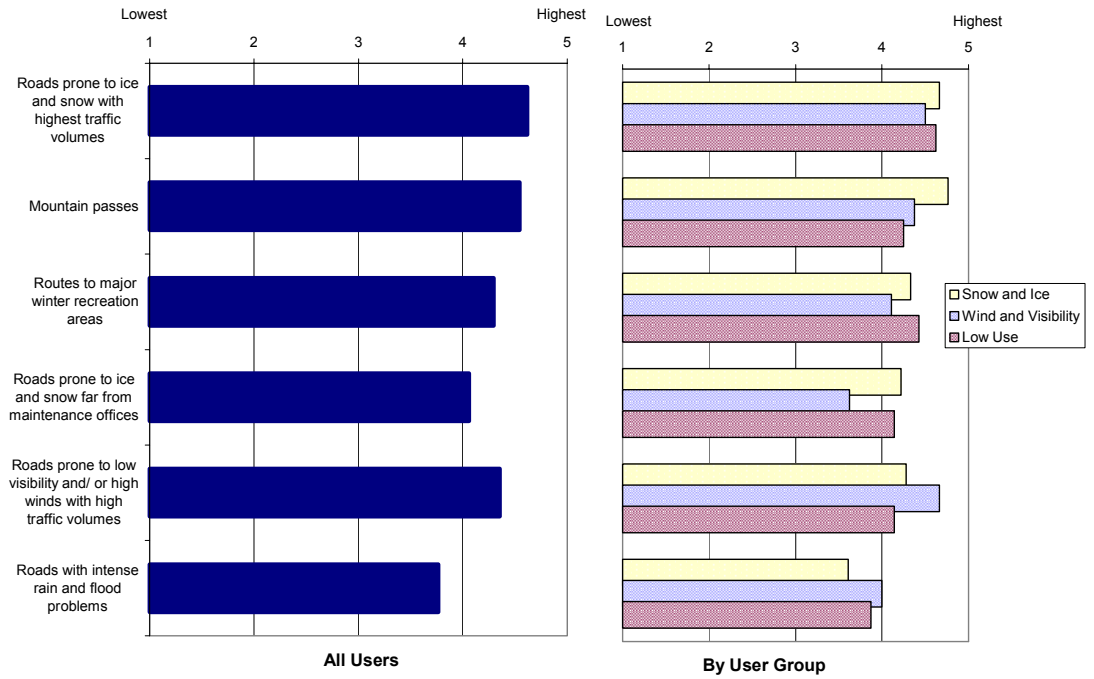
NA

Management has given info.

14. How important is it to place RWIS in the following locations

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Roads prone to ice and snow with the **highest traffic volumes**	**76%** 26	**12%** 4	**9%** 3	**3%** 1	**0%** 0		1	4.62	0.78	34
Mountain passes and other roads with the most severe snow and ice weather	**64%** 21	**30%** 10	**3%** 1	**3%** 1	**0%** 0		2	4.55	0.71	33
Routes to major winter recreation areas that are prone to ice and snow	**56%** 19	**29%** 10	**6%** 2	**6%** 2	**3%** 1		4	4.29	1.03	34
Roads prone to ice and snow that are **farthest from the maintenance office**	**45%** 15	**30%** 10	**12%** 4	**9%** 3	**3%** 1		5	4.06	1.12	33
Roads prone **to low visibility and/or high winds** with the highest traffic	**62%** 21	**18%** 6	**15%** 5	**6%** 2	**0%** 0		3	4.35	0.95	34
Roads with the most **intense rain and flood** problems	**38%** 13	**21%** 7	**26%** 9	**9%** 3	**6%** 2		6	3.76	1.23	34
Comments (provide other locations and importance):	0	0	0	0	1					
Some RWIS stations should be strategically placed that helps improve forecasting elsewhere.										

14. How important is it to place RWIS in the following locations



15. Rate the potential usefulness of the following functions in displaying road weather information in a computer application.

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Integrate RWIS data with radar or satellite images	**38%** 14	**27%** 10	**22%** 8	**11%** 4	**3%** 1		4	3.86	1.13	37
Make RWIS data easy to read and interpret	**64%** 23	**19%** 7	**11%** 4	**0%** 0	**6%** 2		1	4.36	1.07	36
Display color-coded RWIS data (e.g., pavement temperature, wind speed and direction) directly on map of RWIS sites	**41%** 15	**27%** 10	**27%** 10	**0%** 0	**5%** 2		3	3.97	1.09	37
For a length of road, provide estimated current precipitation rates and types	**28%** 10	**25%** 9	**36%** 13	**3%** 1	**8%** 3		6	3.61	1.18	36
Display graph of short-term history of RWIS data	**14%** 5	**22%** 8	**50%** 18	**8%** 3	**6%** 2		8	3.31	1.01	36
Provide historical traffic volumes by time of day	**14%** 5	**14%** 5	**36%** 13	**19%** 7	**17%** 6		10	2.89	1.26	36
Incorporate observations from field personnel (plow drivers, traffic management team, highway patrol, etc.)	**31%** 11	**31%** 11	**22%** 8	**8%** 3	**8%** 3		5	3.67	1.24	36
For a length of road, provide estimated current temperatures	**26%** 9	**31%** 11	**20%** 7	**11%** 4	**11%** 4		7	3.49	1.31	35
For a length of road, provide forecasted conditions	**50%** 18	**25%** 9	**17%** 6	**3%** 1	**6%** 2		2	4.11	1.14	36
Show locations of current accidents	**28%** 10	**11%** 4	**28%** 10	**17%** 6	**17%** 6		9	3.17	1.44	36
Other:	0	1	0	0	1					
Display of current NWS Watches and Warnings										
information from TMC roadway conditions (traffic speed)										

16. How accurate and useful are the localized weather forecasts provided by vendors (VAMS) (if available):

	Very 5	4	3	2	Very Poor 1	Not	Rank	Mean	Stan Dev	# Resp
Accuracy	**15%** 3	**35%** 7	**35%** 7	**10%** 2	**5%** 1	17	0	3.45	1.05	20
Usefulness	**25%** 5	**40%** 8	**25%** 5	**5%** 1	**5%** 1	16	0	3.75	1.07	20

Any comments:
I do not have access to such information.
Comparison of forecasting for 00/01 year showed VAMS forecasting to be somewhat more accurate than NWS, and more geographically precise
When they are accurate they are very useful. This year they\'ve been off the wall.
RWIS forecasts are also very poor

17. How often is chemical anti-icing treatment of the road prior to the snow accumulation used in your district?

Very often	8
Occasionally	4
Sometimes	4
Rarely	4
Never	4
Don't Know	13

18. Which of the following would improve anti-icing in your district (select any that apply).

More reliable forecasts.	15
More familiarity with anti-icing practices.	4
More resources (people and equipment.)	10
Not needed in this district	5

Other suggestions to improve anti-icing.
More confidence in RWIS systems as a tool. More RWIS systems.
This comment is in regards to #17. We do not use anti-icing prior to storms, we use salt and salt brine. We use anti-icer after and between
CHEMICAL SPRAYERS INSTALLED ON BRIDGE DECKS.
Don\'t know

19. Please provide suggestions to improve the USEFULNESS of the RWIS and VAMS:

Needs to be on the Web. Need more RWIS sites Need stardard specifications for NTCIP compliant RWIS facilities
1. Greater direction and support from management. 2. State wide system design with district support. 3. Better sharing of data/information from design to management of systems.
Full TCPIP visibility of all RWIS stations statewide. Development of \'open\' standards to encourage competition among vedors. Fully integrate RWIS data with satellite, radar, forecasting, alerting and NWS Warnings and Watches Local pavement temperature
Statewide networking of all RWIS so that some or all information could be made available to the public.
See previous comment. Cheaper forcast services and full NTCIP compliance from vendors.
Speed up the installation of the systems. Get them on line.
Provide accurate
THE NATIONAL WEATHER SERVICE HAS RADIO BROADCASTS THAT ARE EASY TO RECEIVE.....SAME WOULD BE GOOD FOR RWIS AND VAMS.
connect the system statewide and accessable to districts/regions/crews

20.

In the past two years, how many hours of training have

Over 40 hours	0	0%
20 - 40 hours	1	3%
8 - 20 hours	4	11%
Under 8 hours	15	41%
None	17	46%
Total	37	

How would you classify this amount of training?

Excessive	0	0%
More than adequate	4	14%
Correct amount	5	17%
Less than adequate	7	24%
Minimal	13	45%
Total	29	

21. Please list any suggestions on how to improve TRAINING on use of the RWIS:

1. Provide funding for training. 2. Select interested parties for design and maintenance and train. 3. Study installed systems and determine needed corrections before installing new systems. 4. Make needed changes for future projects, budgeting for addi
1.Maintenance training should be \'hands-on\' for calibration,corrective measures, and interpretation of data. 2.Operations training should be detailed in the area of interpreting the data and the application interface.
As a manager and given the seperation between RWIS stations little training is required if the interface is good.
In D2 those that have the sites are very familiar with how to read and apply the info. No additional training needed until we have more sites and users.
OVERVIEW OF SYSTEM WAS GIVEN BUT THE MORE DETAIL INFO WASN\'T GRASPED TO USE LATER ON THE JOB.
First get the new Rwis sites working, then train staff to use them.
N/A

22. Please provide any other suggestions or comments:

Good start.
RWIS systems need to be standardized, especially in the communications protocols so that systems from different vendors can work together. One office or branch in Caltrans shuold monitor the systems we currently have and be responsible for all placement,
for doing business in the state of California, vendors must agree on equivalent components, interfaces, data structures, for inter-changeability and intra-operability.
Unless accurate forecasts can be provided, it is a total waste of tax payers money.
Install RWIS stations in District 5
I HAVE COMPUTER ACCESS ONLY AND HAVE TO BE IN MY OFFICE TO DO THIS FUNCTION...NOT ALWAYS CONVIENIANT.

California Department of Transportation

Survey of Road Weather Information Systems

Group 1: Snow and Ice Users

(Comments and Write-in Answers Removed for Brevity)

District	
District 1	0
District 2	7
District 3	0
District 4	0
District 5	0
District 6	0
District 7	4
District 8	1
District 9	1
District 10	0
District 11	2
District 12	0
Headquarters	3
Total	**18**

Primary Job Function	
Traffic Operations	2
RWIS System Maint	0
Management	4
Winter Maintenance	12

1. How do you usually obtain information from RWIS?

Verbally, by notes, or by printout, from a computer operated by someone else	5
From a computer that I operate	11
I usually do not obtain this information	2
Other:	1

2. HOW OFTEN do you use these METHODS to obtain weather information for making weather-related decisions in your job?

	Very Often 5	**Often 4**	**Sometimes 3**	**Rarely 2**	**Never 1**	**Not Available**	**Rank**	**Mean**	**Stan Dev**	**# Resp**
Televised weather reports	**50%** 9	**0%** 0	**6%** 1	**33%** 6	**11%** 2	0	3	3.44	1.65	18
Weather radio broadcasts	**25%** 4	**13%** 2	**6%** 1	**25%** 4	**31%** 5	0	5	2.75	1.65	16
Commercial radio weather reports	**25%** 4	**13%** 2	**31%** 5	**19%** 3	**13%** 2	0	4	3.19	1.38	16
Telephone calls	**0%** 0	**19%** 3	**25%** 4	**38%** 6	**19%** 3	0	6	2.44	1.03	16
2-way radio calls	**6%** 1	**13%** 2	**31%** 5	**13%** 2	**38%** 6	0	7	2.38	1.31	16
Pager	**6%** 1	**6%** 1	**6%** 1	**6%** 1	**75%** 12	0	8	1.63	1.26	16
RWIS computer application:	**53%** 9	**0%** 0	**12%** 2	**12%** 2	**24%** 4	0	2	3.47	1.77	17
Non-Caltrans Internet website	**61%** 11	**6%** 1	**17%** 3	**17%** 3	**0%** 0	0	1	4.11	1.23	18
Other methods used:	4	1	2	0	2					

3. If other methods for delivery of weather information were provided, which would be desirable? (Select any that apply)

Internet (commercial sites or other states or agencies)	9
Caltrans web site including all RWIS statewide	12
TV	1
Radio	1
Pagers that deliver brief weather message under alert conditions	4
Dial-up RWIS voice recording of the current conditions	6
No other methods are needed	5
Other:	3

4. Rate the impact to TRAVELERS in your district of the following inclement weather events:

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Snow and ice	**72%** 13	**6%** 1	**11%** 2	**6%** 1	**6%** 1		1	4.33	1.24	18
Icy bridges/black ice	**47%** 8	**24%** 4	**18%** 3	**6%** 1	**6%** 1		2	4.00	1.22	17
Intense rain	**0%** 0	**29%** 5	**59%** 10	**6%** 1	**6%** 1		5	3.12	0.78	17
Flooding	**31%** 5	**13%** 2	**31%** 5	**19%** 3	**6%** 1		3	3.44	1.31	16
Low visibility (fog, dust, smoke)	**22%** 4	**6%** 1	**39%** 7	**28%** 5	**6%** 1		6	3.11	1.23	18
High winds	**17%** 3	**33%** 6	**17%** 3	**17%** 3	**17%** 3		4	3.17	1.38	18
Other:	0	1	0	0	1					

5. Rate the impact to TRAFFIC OPERATIONS AND MAINTENANCE in your district of the following inclement weather events:

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Snow and ice	**67%** 12	**22%** 4	**0%** 0	**6%** 1	**6%** 1		1	4.39	1.14	18
Icy bridges/black ice	**12%** 2	**47%** 8	**29%** 5	**6%** 1	**6%** 1		2	3.53	1.01	17
Intense rain	**0%** 0	**29%** 5	**47%** 8	**12%** 2	**12%** 2		5	2.94	0.97	17
Flooding	**13%** 2	**38%** 6	**25%** 4	**25%** 4	**0%** 0		3	3.38	1.02	16
Low visibility (fog, dust, smoke)	**6%** 1	**11%** 2	**33%** 6	**44%** 8	**6%** 1		6	2.67	0.97	18
High winds	**6%** 1	**39%** 7	**28%** 5	**17%** 3	**11%** 2		4	3.11	1.13	18
Other:	1	0	0	0	1					

6. Rate the potential usefulness of RWIS and VAMS for the following functions

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Snow and ice control including anti-icing	**35%** 6	**29%** 5	**24%** 4	**12%** 2	**0%** 0		2	3.88	1.05	17
Snow and ice traveler information and motorist warnings (via CMS, HAR, web, phone, etc.)	**50%** 9	**17%** 3	**22%** 4	**11%** 2	**0%** 0		1	4.06	1.11	18
Icy Bridges/Black ice treatment	**12%** 2	**41%** 7	**29%** 5	**6%** 1	**12%** 2		4	3.35	1.17	17
Icy bridges/black ice traveler information and motorist warning	**18%** 3	**29%** 5	**29%** 5	**12%** 2	**12%** 2		5	3.29	1.26	17
Intense rain traveler information and motorist warning	**6%** 1	**18%** 3	**41%** 7	**18%** 3	**18%** 3		8	2.76	1.15	17
Flooding traveler information and motorist warning	**17%** 3	**22%** 4	**39%** 7	**17%** 3	**6%** 1		6	3.28	1.13	18
Low visibility traveler information and motorist warning	**12%** 2	**18%** 3	**41%** 7	**29%** 5	**0%** 0		7	3.12	0.99	17
High winds traveler information and motorist warning	**18%** 3	**35%** 6	**29%** 5	**12%** 2	**6%** 1		3	3.47	1.12	17
Other:	0	0	0	0	1					

7. Please indicate to which level you agree with the following statements

	Strongly Agree 5	4	3	2	Strongly Disagree 1	Not Applicable	Rank	Mean	Stan Dev	# Resp
I can access RWIS data in my workplace	73% 11	7% 1	7% 1	0% 0	13% 2	2	3	4.27	1.44	15
Accessing RWIS information is easy and requires minimum effort	50% 9	22% 4	6% 1	6% 1	17% 3	0	7	3.83	1.54	18
When I view RWIS data, I feel that the temperatures and other data is accurate for the time reported	29% 5	29% 5	24% 4	0% 0	18% 3	1	10	3.53	1.42	17
When I view RWIS data, I feel that the reported data is current	35% 6	41% 7	12% 2	0% 0	12% 2	1	6	3.88	1.27	17
Monitoring road conditions and weather forecasts is important in doing my job	83% 15	6% 1	6% 1	0% 0	6% 1	0	1	4.61	1.04	18
I am encouraged to use RWIS and weather information	50% 8	13% 2	13% 2	13% 2	13% 2	2	9	3.75	1.53	16
RWIS help monitor road weather conditions	59% 10	24% 4	12% 2	6% 1	0% 0	1	2	4.35	0.93	17
Cameras help monitor road weather conditions	47% 7	27% 4	20% 3	7% 1	0% 0	3	4	4.13	0.99	15
In my district, RWIS is used as a tool for traffic operations, such as fog or high wind warnings	19% 3	13% 2	19% 3	13% 2	38% 6	2	18	2.63	1.59	16
In my district, RWIS is used as a tool for winter road maintenance (snow and ice control)	63% 10	13% 2	6% 1	6% 1	13% 2	2	5	4.06	1.48	16
In my district, RWIS is used as a tool to schedule and monitor maintenance and construction jobs	14% 2	21% 3	36% 5	7% 1	21% 3	4	16	3.00	1.36	14
RWIS would work better if there were more of them	50% 9	17% 3	17% 3	0% 0	17% 3	0	7	3.83	1.50	18
RWIS would work better if they were better located	28% 5	6% 1	28% 5	11% 2	28% 5	0	17	2.94	1.59	18
RWIS would work better if they were maintained better	28% 5	28% 5	17% 3	0% 0	28% 5	0	13	3.28	1.60	18
RWIS would work better if people knew how to use the information better	33% 6	6% 1	39% 7	0% 0	22% 4	0	13	3.28	1.53	18
RWIS would work better if the information was easier to use and interpret	22% 4	11% 2	44% 8	0% 0	22% 4	0	15	3.11	1.41	18
RWIS data should be included in the ATMS	29% 4	21% 3	21% 3	7% 1	21% 3	2	12	3.29	1.54	14
RWIS data should be posted on the Internet for public access	47% 8	12% 2	6% 1	6% 1	29% 5	1	11	3.41	1.80	17

8. How useful is the following specific site information for the purpose of TRAFFIC OPERATIONS and TRAFFIC MANAGEMENT (e.g., providing fog, ice, or high wind warnings to drivers, incident reporting)?

	Very Useful 5	4	3	2	Not Useful 1		Rank	Mean	Stan Dev	# Resp
Air temperature	**39%** 7	**28%** 5	**11%** 2	**17%** 3	**6%** 1		8	3.78	1.31	18
Wind speed/direction	**47%** 8	**24%** 4	**6%** 1	**12%** 2	**12%** 2		7	3.82	1.47	17
Pavement temperature	**56%** 10	**17%** 3	**17%** 3	**6%** 1	**6%** 1		1	4.11	1.23	18
Road subsurface temperature	**56%** 10	**11%** 2	**11%** 2	**11%** 2	**11%** 2		5	3.89	1.49	18
Dew point / relative humidity	**17%** 3	**44%** 8	**0%** 0	**17%** 3	**22%** 4		11	3.17	1.50	18
Precipitation / snowfall	**39%** 7	**39%** 7	**11%** 2	**6%** 1	**6%** 1		4	4.00	1.14	18
Road surface condition (dry, wet, ice, etc.)	**39%** 7	**44%** 8	**6%** 1	**6%** 1	**6%** 1		3	4.06	1.11	18
Freezing-point depressant concentration	**33%** 6	**33%** 6	**11%** 2	**6%** 1	**17%** 3		9	3.61	1.46	18
Visibility data	**44%** 8	**28%** 5	**11%** 2	**6%** 1	**11%** 2		5	3.89	1.37	18
Video Image	**33%** 6	**28%** 5	**17%** 3	**6%** 1	**17%** 3		10	3.56	1.46	18
Forecasted conditions	**61%** 11	**17%** 3	**6%** 1	**6%** 1	**11%** 2		1	4.11	1.41	18
Any other useful RWIS features:	0	0	0	0	1					

9. How useful is the following specific site information for the purpose of WINTER ROAD MAINTENANCE (e.g., plowing, anti-icing, de-icing)?

	Very Useful 5	4	3	2	Not Useful 1		Rank	Mean	Stan Dev	# Resp
Air temperature	**72%** 13	**17%** 3	**11%** 2	**0%** 0	**0%** 0		2	4.61	0.70	18
Wind speed/direction	**33%** 6	**11%** 2	**39%** 7	**11%** 2	**6%** 1		9	3.56	1.25	18
Pavement temperature	**82%** 14	**12%** 2	**6%** 1	**0%** 0	**0%** 0		1	4.76	0.56	17
Road subsurface temperature	**61%** 11	**17%** 3	**11%** 2	**11%** 2	**0%** 0		6	4.28	1.07	18
Dew point / relative humidity	**33%** 6	**28%** 5	**17%** 3	**17%** 3	**6%** 1		8	3.67	1.28	18
Precipitation / snowfall	**61%** 11	**28%** 5	**11%** 2	**0%** 0	**0%** 0		4	4.50	0.71	18
Road surface condition (dry, wet, ice, etc.)	**67%** 12	**28%** 5	**6%** 1	**0%** 0	**0%** 0		2	4.61	0.61	18
Freezing-point depressant concentration	**50%** 9	**28%** 5	**11%** 2	**0%** 0	**11%** 2		7	4.06	1.30	18
Visibility data	**33%** 6	**17%** 3	**22%** 4	**17%** 3	**11%** 2		10	3.44	1.42	18
Video Image	**33%** 6	**17%** 3	**22%** 4	**6%** 1	**22%** 4		11	3.33	1.57	18
Forecasted conditions	**72%** 13	**17%** 3	**6%** 1	**0%** 0	**6%** 1		4	4.50	1.04	18
Any other useful RWIS features:	0	0	0	0	1					

10. How useful is the following specific site information for the purpose of MAINTENANCE AND CONSTRUCTION (e.g., repaving, construction scheduling, pothole monitoring)?

	Very Useful 5	4	3	2	Not Useful 1		Rank	Mean	Stan Dev	# Resp
Air temperature	**44%** 8	**11%** 2	**39%** 7	**0%** 0	**6%** 1		3	3.89	1.18	18
Wind speed/direction	**28%** 5	**11%** 2	**17%** 3	**17%** 3	**28%** 5		9	2.94	1.63	18
Pavement temperature	**56%** 10	**11%** 2	**28%** 5	**0%** 0	**6%** 1		1	4.11	1.18	18
Road subsurface temperature	**29%** 5	**12%** 2	**29%** 5	**0%** 0	**29%** 5		7	3.12	1.62	17
Dew point / relative humidity	**12%** 2	**6%** 1	**35%** 6	**24%** 4	**24%** 4		11	2.59	1.28	17
Precipitation / snowfall	**41%** 7	**18%** 3	**24%** 4	**6%** 1	**12%** 2		5	3.71	1.40	17
Road surface condition (dry, wet, ice, etc.)	**50%** 9	**22%** 4	**6%** 1	**11%** 2	**11%** 2		3	3.89	1.45	18
Freezing-point depressant concentration	**22%** 4	**17%** 3	**28%** 5	**11%** 2	**22%** 4		8	3.06	1.47	18
Visibility data	**39%** 7	**11%** 2	**28%** 5	**11%** 2	**11%** 2		3	3.89	1.45	18
Video Image	**29%** 5	**0%** 0	**18%** 3	**18%** 3	**35%** 6		3	3.89	1.45	17
Forecasted conditions	**61%** 11	**11%** 2	**6%** 1	**6%** 1	**17%** 3		2	3.94	1.59	18
Any other useful RWIS features:	0	0	0	0	1					

14. How important is it to place RWIS in the following locations

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Roads prone to ice and snow with the **highest traffic volumes**	**83%** 15	**0%** 0	**17%** 3	**0%** 0	**0%** 0		2	4.67	0.77	18
Mountain passes and other roads with the most severe snow and ice weather	**76%** 13	**24%** 4	**0%** 0	**0%** 0	**0%** 0		1	4.76	0.44	17
Routes to major winter recreation areas that are prone to ice and snow	**61%** 11	**28%** 5	**0%** 0	**6%** 1	**6%** 1		3	4.33	1.14	18
Roads prone to ice and snow that are **farthest from the maintenance office**	**56%** 10	**28%** 5	**6%** 1	**6%** 1	**6%** 1		5	4.22	1.17	18
Roads prone **to low visibility and/or high winds** with the highest traffic volumes	**61%** 11	**17%** 3	**11%** 2	**11%** 2	**0%** 0		4	4.28	1.07	18
Roads with the most **intense rain and flood** problems	**39%** 7	**11%** 2	**28%** 5	**17%** 3	**6%** 1		6	3.61	1.33	18
Comments (provide other locations and importance):	0	0	0	0	1					

15. Rate the potential usefulness of the following functions in displaying road weather information in a computer application.

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Integrate RWIS data with radar or satellite images	**50%** 9	**28%** 5	**11%** 2	**6%** 1	**6%** 1		3	4.11	1.18	18
Make RWIS data easy to read and interpret	**67%** 12	**11%** 2	**11%** 2	**0%** 0	**11%** 2		2	4.22	1.35	18
Display color-coded RWIS data (e.g., pavement temperature, wind speed and direction) directly on map of RWIS sites	**50%** 9	**11%** 2	**28%** 5	**0%** 0	**11%** 2		4	3.89	1.37	18
For a length of road, provide estimated current precipitation rates and types	**33%** 6	**22%** 4	**28%** 5	**6%** 1	**11%** 2		5	3.61	1.33	18
Display graph of short-term history of RWIS data	**11%** 2	**17%** 3	**50%** 9	**11%** 2	**11%** 2		8	3.06	1.11	18
Provide historical traffic volumes by time of day	**17%** 3	**22%** 4	**28%** 5	**11%** 2	**22%** 4		9	3.00	1.41	18
Incorporate observations from field personnel (plow drivers, traffic management team,	**28%** 5	**28%** 5	**28%** 5	**0%** 0	**17%** 3		6	3.50	1.38	18
For a length of road, provide estimated current temperatures	**33%** 6	**22%** 4	**17%** 3	**11%** 2	**17%** 3		7	3.44	1.50	18
For a length of road, provide forecasted conditions	**72%** 13	**17%** 3	**0%** 0	**0%** 0	**11%** 2		1	4.39	1.29	18
Show locations of current accidents	**28%** 5	**6%** 1	**22%** 4	**22%** 4	**22%** 4		10	2.94	1.55	18
Other:	0	0	0	0	1					

16. How accurate and useful are the localized weather forecasts provided by vendors (VAMS) (if available):

	Very Good 5	4	3	2	Very Poor 1	Not Available	Rank	Mean	Stan Dev	# Resp
Accuracy	**18%** 2	**27%** 3	**36%** 4	**9%** 1	**9%** 1	7	0	3.36	1.21	11
Usefulness	**27%** 3	**27%** 3	**36%** 4	**0%** 0	**9%** 1	7	0	3.64	1.21	11

17. How often is chemical anti-icing treatment of the road prior to the snow accumulation used in your district?

Very often	7
Occasionally	2
Sometimes	3
Rarely	2
Never	2
Don't Know	2

18. Which of the following would improve anti-icing in your district (select any that apply).

More reliable forecasts.	9
More familiarity with anti-icing practices.	2
More resources (people and equipment.)	8
Not needed in this district	2

20.

In the past two years, how many hours of training have you received in obtaining, interpreting, and using RWIS information?

Over 40 hours	0
20 - 40 hours	0
8 - 20 hours	2
Under 8 hours	8
None	8

How would you classify this amount of training?

Excessive	0
More than adequate	4
Correct amount	2
Less than adequate	4
Minimal	6

California Department of Transportation
Survey of Road Weather Information Systems
Group 2: Wind and Visibility Users
(Comments and Write-in Answers Removed for Brevity)

District	
District 1	0
District 2	0
District 3	3
District 4	0
District 5	0
District 6	4
District 7	0
District 8	3
District 9	0
District 10	0
District 11	0
District 12	0
Headquarters	0
Total	**10**

Primary Job Function	
Traffic Operations	7
RWIS System Maint	1
Management	2
Winter Maintenance	0

1. How do you usually obtain information from RWIS?

Verbally, by notes, or by printout, from a computer operated by someone else	1
From a computer that I operate	9
I usually do not obtain this information	0
Other:	0

2. HOW OFTEN do you use these METHODS to obtain weather information for making weather-related decisions in your job?

	Very Often 5	Often 4	Sometimes 3	Rarely 2	Never 1	Not Available	Rank	Mean	Stan Dev	# Resp
Televised weather reports	**20%** 2	**40%** 4	**40%** 4	**0%** 0	**0%** 0	0	2	3.80	0.79	10
Weather radio broadcasts	**10%** 1	**10%** 1	**20%** 2	**10%** 1	**50%** 5	0	7	2.20	1.48	10
Commercial radio weather reports	**20%** 2	**30%** 3	**20%** 2	**0%** 0	**30%** 3	0	4	3.10	1.60	10
Telephone calls	**0%** 0	**22%** 2	**44%** 4	**33%** 3	**0%** 0	0	6	2.89	0.78	9
2-way radio calls	**11%** 1	**33%** 3	**11%** 1	**33%** 3	**11%** 1	0	5	3.00	1.32	9
Pager	**0%** 0	**0%** 0	**0%** 0	**29%** 2	**71%** 5	1	8	1.29	0.49	7
RWIS computer application:	**44%** 4	**22%** 2	**22%** 2	**0%** 0	**11%** 1	1	1	3.89	1.36	9
Non-Caltrans Internet website	**30%** 3	**30%** 3	**30%** 3	**0%** 0	**10%** 1	0	3	3.70	1.25	10
Other methods used:	0	2	1	0	0					

3. If other methods for delivery of weather information were provided, which would be desirable? (Select any that apply)

Internet (commercial sites or other states or agencies)	9
Caltrans web site including all RWIS statewide	6
TV	1
Radio	0
Pagers that deliver brief weather message under alert conditions	3
Dial-up RWIS voice recording of the current conditions	4
No other methods are needed	1
Other:	0

4. Rate the impact to TRAVELERS in your district of the following inclement weather events:

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Snow and ice	**80%** 8	**20%** 2	**0%** 0	**0%** 0	**0%** 0		1	4.80	0.42	10
Icy bridges/black ice	**40%** 4	**30%** 3	**20%** 2	**0%** 0	**10%** 1		4	3.90	1.29	10
Intense rain	**11%** 1	**44%** 4	**22%** 2	**11%** 1	**11%** 1		6	3.33	1.22	9
Flooding	**20%** 2	**30%** 3	**30%** 3	**20%** 2	**0%** 0		5	3.50	1.08	10
Low visibility (fog, dust, smoke)	**78%** 7	**22%** 2	**0%** 0	**0%** 0	**0%** 0		2	4.78	0.44	9
High winds	**60%** 6	**20%** 2	**20%** 2	**0%** 0	**0%** 0		3	4.40	0.84	10
Other:	0	1	0	0	0					

5. Rate the impact to TRAFFIC OPERATIONS AND MAINTENANCE in your district of the following inclement weather events:

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Snow and ice	**78%** 7	**22%** 2	**0%** 0	**0%** 0	**0%** 0		1	4.78	0.44	9
Icy bridges/black ice	**44%** 4	**56%** 5	**0%** 0	**0%** 0	**0%** 0		2	4.44	0.53	9
Intense rain	**25%** 2	**13%** 1	**63%** 5	**0%** 0	**0%** 0		6	3.63	0.92	8
Flooding	**11%** 1	**78%** 7	**11%** 1	**0%** 0	**0%** 0		4	4.00	0.50	9
Low visibility (fog, dust, smoke)	**44%** 4	**33%** 3	**22%** 2	**0%** 0	**0%** 0		3	4.22	0.83	9
High winds	**22%** 2	**22%** 2	**56%** 5	**0%** 0	**0%** 0		5	3.67	0.87	9
Other:	0	0	0	0	0					

6. Rate the potential usefulness of RWIS and VAMS for the following functions

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Snow and ice control including anti-icing	22% 2	44% 4	22% 2	0% 0	11% 1		5	3.67	1.22	9
Snow and ice traveler information and motorist warnings (via CMS, HAR, web, phone, etc.)	44% 4	22% 2	33% 3	0% 0	0% 0		3	4.11	0.93	9
Icy Bridges/Black ice treatment	22% 2	44% 4	22% 2	0% 0	11% 1		5	3.67	1.22	9
Icy bridges/black ice traveler information and motorist warning	33% 3	33% 3	22% 2	0% 0	11% 1		4	3.78	1.30	9
Intense rain traveler information and motorist warning	11% 1	0% 0	44% 4	33% 3	11% 1		8	2.67	1.12	9
Flooding traveler information and motorist warning	11% 1	33% 3	33% 3	11% 1	11% 1		7	3.22	1.20	9
Low visibility traveler information and motorist warning	50% 5	30% 3	20% 2	0% 0	0% 0		1	4.30	0.82	10
High winds traveler information and motorist warning	50% 5	30% 3	20% 2	0% 0	0% 0		1	4.30	0.82	10
Other:	0	0	0	0	0					

7. Please indicate to which level you agree with the following statements

	Strongly Agree 5	4	3	2	Strongly Disagree 1	Not Applicable	Rank	Mean	Stan Dev	# Resp
I can access RWIS data in my workplace	89% 8	0% 0	11% 1	0% 0	0% 0	1	1	4.78	0.67	9
Accessing RWIS information is easy and requires minimum effort	60% 6	20% 2	10% 1	10% 1	0% 0	0	6	4.30	1.06	10
When I view RWIS data, I feel that the temperatures and other data is accurate for the time reported	30% 3	30% 3	40% 4	0% 0	0% 0	0	11	3.90	0.88	10
When I view RWIS data, I feel that the reported data is current	11% 1	44% 4	44% 4	0% 0	0% 0	1	13	3.67	0.71	9
Monitoring road conditions and weather forecasts is important in doing my job	60% 6	20% 2	0% 0	10% 1	10% 1	0	9	4.10	1.45	10
I am encouraged to use RWIS and weather information	50% 4	13% 1	25% 2	13% 1	0% 0	1	10	4.00	1.20	8
RWIS help monitor road weather conditions	44% 4	44% 4	11% 1	0% 0	0% 0	1	5	4.33	0.71	9
Cameras help monitor road weather conditions	60% 6	30% 3	0% 0	10% 1	0% 0	0	4	4.40	0.97	10
In my district, RWIS is used as a tool for traffic operations, such as fog or high wind warnings	56% 5	22% 2	11% 1	11% 1	0% 0	1	7	4.22	1.09	9
In my district, RWIS is used as a tool for winter road maintenance (snow and ice control)	29% 2	14% 1	43% 3	0% 0	14% 1	3	16	3.43	1.40	7
In my district, RWIS is used as a tool to schedule and monitor maintenance and construction jobs	0% 0	13% 1	25% 2	13% 1	50% 4	2	18	2.00	1.20	8
RWIS would work better if there were more of them	44% 4	22% 2	33% 3	0% 0	0% 0	1	8	4.11	0.93	9
RWIS would work better if they were better located	11% 1	56% 5	22% 2	0% 0	11% 1	1	15	3.56	1.13	9
RWIS would work better if they were maintained better	29% 2	14% 1	43% 3	14% 1	0% 0	3	14	3.57	1.13	7
RWIS would work better if people knew how to use the information better	38% 3	13% 1	38% 3	13% 1	0% 0	1	12	3.75	1.16	8
RWIS would work better if the information was easier to use and interpret	25% 2	25% 2	13% 1	25% 2	13% 1	1	17	3.25	1.49	8
RWIS data should be included in the ATMS	80% 8	10% 1	10% 1	0% 0	0% 0	0	2	4.70	0.67	10
RWIS data should be posted on the Internet for public access	78% 7	0% 0	22% 2	0% 0	0% 0	0	3	4.56	0.88	9
Comments:										

8. How useful is the following specific site information for the purpose of TRAFFIC OPERATIONS and TRAFFIC MANAGEMENT (e.g., providing fog, ice, or high wind warnings to drivers, incident reporting)?

	Very Useful 5	4	3	2	Not Useful 1		Rank	Mean	Stan Dev	# Resp
Air temperature	10% 1	30% 3	30% 3	20% 2	10% 1		10	3.10	1.20	10
Wind speed/direction	60% 6	30% 3	10% 1	0% 0	0% 0		2	4.50	0.71	10
Pavement temperature	20% 2	40% 4	30% 3	0% 0	10% 1		6	3.60	1.17	10
Road subsurface temperature	30% 3	10% 1	40% 4	10% 1	10% 1		7	3.40	1.35	10
Dew point / relative humidity	30% 3	30% 3	0% 0	30% 3	10% 1		7	3.40	1.51	10
Precipitation / snowfall	60% 6	30% 3	0% 0	0% 0	10% 1		3	4.30	1.25	10
Road surface condition (dry, wet, ice, etc.)	40% 4	30% 3	10% 1	20% 2	0% 0		5	3.90	1.20	10
Freezing-point depressant concentration	11% 1	33% 3	11% 1	33% 3	11% 1		11	3.00	1.32	9
Visibility data	80% 8	0% 0	20% 2	0% 0	0% 0		1	4.60	0.84	10
Video Image	70% 7	10% 1	10% 1	0% 0	10% 1		3	4.30	1.34	10
Forecasted conditions	20% 2	40% 4	10% 1	20% 2	10% 1		7	3.40	1.35	10
Any other useful RWIS features:	0	0	0	0	0					

9. How useful is the following specific site information for the purpose of WINTER ROAD MAINTENANCE (e.g., plowing, anti-icing, de-icing)?

	Very Useful 5	4	3	2	Not Useful 1		Rank	Mean	Stan Dev	# Resp
Air temperature	29% 2	29% 2	14% 1	14% 1	14% 1		8	3.43	1.51	7
Wind speed/direction	29% 2	0% 0	29% 2	29% 2	14% 1		10	3.00	1.53	7
Pavement temperature	57% 4	14% 1	14% 1	0% 0	14% 1		3	4.00	1.53	7
Road subsurface temperature	43% 3	29% 2	14% 1	0% 0	14% 1		4	3.86	1.46	7
Dew point / relative humidity	17% 1	17% 1	17% 1	33% 2	17% 1		11	2.83	1.47	6
Precipitation / snowfall	71% 5	14% 1	0% 0	0% 0	14% 1		1	4.29	1.50	7
Road surface condition (dry, wet, ice, etc.)	71% 5	14% 1	0% 0	0% 0	14% 1		1	4.29	1.50	7
Freezing-point depressant concentration	57% 4	14% 1	0% 0	14% 1	14% 1		4	3.86	1.68	7
Visibility data	17% 1	33% 2	33% 2	0% 0	17% 1		9	3.33	1.37	6
Video Image	14% 1	57% 4	14% 1	0% 0	14% 1		7	3.57	1.27	7
Forecasted conditions	29% 2	43% 3	14% 1	0% 0	14% 1		6	3.71	1.38	7
Any other useful RWIS features:	0	0	0	0	0					

10. How useful is the following specific site information for the purpose of MAINTENANCE AND CONSTRUCTION (e.g., repaving, construction scheduling, pothole monitoring)?

	Very Useful 5	4	3	2	Not Useful 1		Rank	Mean	Stan Dev	# Resp
Air temperature	**13%** 1	**38%** 3	**25%** 2	**13%** 1	**13%** 1		8	3.25	1.28	8
Wind speed/direction	**0%** 0	**50%** 4	**13%** 1	**25%** 2	**13%** 1		9	3.00	1.20	8
Pavement temperature	**25%** 2	**25%** 2	**38%** 3	**0%** 0	**13%** 1		5	3.50	1.31	8
Road subsurface temperature	**29%** 2	**14%** 1	**43%** 3	**0%** 0	**14%** 1		7	3.43	1.40	7
Dew point / relative humidity	**14%** 1	**0%** 0	**43%** 3	**29%** 2	**14%** 1		10	2.71	1.25	7
Precipitation / snowfall	**14%** 1	**71%** 5	**0%** 0	**0%** 0	**14%** 1		3	3.71	1.25	7
Road surface condition (dry, wet, ice, etc.)	**43%** 3	**29%** 2	**14%** 1	**0%** 0	**14%** 1		1	3.86	1.46	7
Freezing-point depressant concentration	**14%** 1	**14%** 1	**14%** 1	**43%** 3	**14%** 1		10	2.71	1.38	7
Visibility data	**29%** 2	**43%** 3	**14%** 1	**0%** 0	**14%** 1		1	3.86	1.46	7
Video Image	**33%** 2	**33%** 2	**0%** 0	**17%** 1	**17%** 1		1	3.86	1.46	6
Forecasted conditions	**33%** 2	**50%** 3	**0%** 0	**0%** 0	**17%** 1		2	3.83	1.47	6
Any other useful RWIS features:	0	0	0	0	0					

Refer to the list of RWIS to answer the next three questions

11. What specific roadside locations are prone to having outdated data? (e.g., data from RWIS often appears to be 6 hours old.) Specify location, and what type of data is typically not current.

Any site that utilizes cell phone to communicate back to the TMC.

Can\'t access data from sites 309-330. Others appear to have good data.

612 Due to cell service.

801, 802, 803, 804

Not actively using Rwis.

I have not had problems with old data yet.

12. What specific roadside locations are prone to data being inaccurate? (e.g., pavement temperature is usually 10 degrees warmer than actual conditions in area.) Specify location, and what type of data is typically inaccurate.

N/A-no baseline data is in place to evaluate this condition.

Not actively using Rwis.

Right now we only use RWIS for fog, wind warnings & icy roads

13. Provide any recommendations for new locations or relocation of existing stations .

Upgrade all locations to CDPD or similar communication mode, to help offset monthly communications related cost.

In snow country where needed, Placer, El Dorado, Nevada, Sierra and Butte counties. On I-80, 50, 32, 89, 267,20,49,28

14. How important is it to place RWIS in the following locations

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Roads prone to ice and snow with the **highest traffic volumes**	**75%** 6	**13%** 1	**0%** 0	**13%** 1	**0%** 0		2	4.50	1.07	8
Mountain passes and other roads with the most severe snow and ice weather	**63%** 5	**25%** 2	**0%** 0	**13%** 1	**0%** 0		3	4.38	1.06	8
Routes to major winter recreation areas that are prone to ice and snow	**44%** 4	**33%** 3	**11%** 1	**11%** 1	**0%** 0		4	4.11	1.05	9
Roads prone to ice and snow that are **farthest from the maintenance office**	**38%** 3	**13%** 1	**25%** 2	**25%** 2	**0%** 0		6	3.63	1.30	8
Roads prone **to low visibility and/or high winds** with the highest traffic volumes	**78%** 7	**11%** 1	**11%** 1	**0%** 0	**0%** 0		1	4.67	0.71	9
Roads with the most **intense rain and flood** problems	**38%** 3	**25%** 2	**38%** 3	**0%** 0	**0%** 0		5	4.00	0.93	8
Comments (provide other locations and importance):	0	0	0	0	0					

15. Rate the potential usefulness of the following functions in displaying road weather information in a computer application.

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Integrate RWIS data with radar or satellite images	**20%** 2	**30%** 3	**30%** 3	**20%** 2	**0%** 0		5	3.50	1.08	10
Make RWIS data easy to read and interpret	**67%** 6	**22%** 2	**11%** 1	**0%** 0	**0%** 0		1	4.56	0.73	9
Display color-coded RWIS data (e.g., pavement temperature, wind speed and direction) directly on map of RWIS sites	**40%** 4	**50%** 5	**10%** 1	**0%** 0	**0%** 0		2	4.30	0.67	10
For a length of road, provide estimated current precipitation rates and types	**10%** 1	**20%** 2	**60%** 6	**0%** 0	**10%** 1		7	3.20	1.03	10
Display graph of short-term history of RWIS data	**10%** 1	**50%** 5	**30%** 3	**10%** 1	**0%** 0		4	3.60	0.84	10
Provide historical traffic volumes by time of day	**0%** 0	**0%** 0	**44%** 4	**44%** 4	**11%** 1		10	2.33	0.71	9
Incorporate observations from field personnel (plow drivers, traffic management team,	**30%** 3	**40%** 4	**10%** 1	**20%** 2	**0%** 0		3	3.80	1.14	10
For a length of road, provide estimated current temperatures	**20%** 2	**20%** 2	**30%** 3	**20%** 2	**10%** 1		7	3.20	1.32	10
For a length of road, provide forecasted conditions	**20%** 2	**20%** 2	**50%** 5	**10%** 1	**0%** 0		5	3.50	0.97	10
Show locations of current accidents	**20%** 2	**20%** 2	**20%** 2	**20%** 2	**20%** 2		9	3.00	1.49	10
Other:	0	0	0	0	0					

16. How accurate and useful are the localized weather forecasts provided by vendors (VAMS) (if available):

	Very Good 5	4	3	2	Very Poor 1	Not Available	Rank	Mean	Stan Dev	# Resp
Accuracy	**20%** 1	**60%** 3	**0%** 0	**20%** 1	**0%** 0	5	0	3.80	1.10	5
Usefulness	**40%** 2	**40%** 2	**0%** 0	**20%** 1	**0%** 0	5	0	4.00	1.22	5
Any comments:										

17. How often is chemical anti-icing treatment of the road prior to the snow accumulation used in your district?

Very often	1
Occasionally	1
Sometimes	1
Rarely	0
Never	2
Don't Know	5

18. Which of the following would improve anti-icing in your district (select any that apply).

More reliable forecasts.	3
More familiarity with anti-icing practices.	1
More resources (people and equipment.)	2
Not needed in this district	1
Other suggestions to improve anti-icing.	

19. Please provide suggestions to improve the USEFULNESS of the RWIS and VAMS:

See previous comment. Cheaper forcast services and full NTCIP compliance from vendors.

It has the potential, put it in the locations that can benefit most

20.

In the past two years, how many hours of training have you received in obtaining, interpreting, and using RWIS information?		**How would you classify this amount of training?**	
Over 40 hours	0	Excessive	0
20 - 40 hours	1	More than adequate	0
8 - 20 hours	2	Correct amount	3
Under 8 hours	6	Less than adequate	2
None	1	Minimal	4

21. Please list any suggestions on how to improve TRAINING on use of the RWIS:

1.Maintenance training should be \'hands-on\' for calibration,corrective measures, and interpretation of data. 2.Operations training should be detailed in the area of interpreting the data and the application interface.

N/A

22. Please provide any other suggestions or comments:

for doing business in the state of California, vendors must agree on equivalent components, interfaces, data structures, for inter-changeability and intra-operability.

California Department of Transportation
Survey of Road Weather Information Systems
Group 3: Minimum Use Districts
(Comments and Write-in Answers Removed for Brevity)

District	
District 1	4
District 2	0
District 3	0
District 4	1
District 5	2
District 6	0
District 7	0
District 8	0
District 9	0
District 10	0
District 11	0
District 12	2
Headquarters	0
Total	**9**

Primary Job Function	
Traffic Operations	2
RWIS System Maint	1
Management	0
Winter Maintenance	3

1. How do you usually obtain information from RWIS?

Verbally, by notes, or by printout, from a computer operated by someone else	7
From a computer that I operate	1
I usually do not obtain this information	0
Other:	1

2. HOW OFTEN do you use these METHODS to obtain weather information for making weather-related decisions in your job?

	Very Often 5	Often 4	Sometimes 3	Rarely 2	Never 1	Not Available	Rank	Mean	Stan Dev	# Resp
Televised weather reports	**33%** 3	**22%** 2	**22%** 2	**22%** 2	**0%** 0	0	2	3.67	1.22	9
Weather radio broadcasts	**0%** 0	**11%** 1	**22%** 2	**67%** 6	**0%** 0	0	5	2.44	0.73	9
Commercial radio weather reports	**0%** 0	**22%** 2	**56%** 5	**22%** 2	**0%** 0	0	3	3.00	0.71	9
Telephone calls	**22%** 2	**0%** 0	**22%** 2	**44%** 4	**11%** 1	0	4	2.78	1.39	9
2-way radio calls	**11%** 1	**0%** 0	**33%** 3	**22%** 2	**33%** 3	0	6	2.33	1.32	9
Pager	**0%** 0	**0%** 0	**22%** 2	**22%** 2	**56%** 5	0	8	1.67	0.87	9
RWIS computer application:	**0%** 0	**13%** 1	**25%** 2	**25%** 2	**38%** 3	1	7	2.13	1.13	8
Non-Caltrans Internet website	**14%** 1	**57%** 4	**29%** 2	**0%** 0	**0%** 0	1	1	3.86	0.69	7
Other methods used:	1	0	2	0	0					

3. If other methods for delivery of weather information were provided, which would be desirable?
(Select any that apply)

Internet (commercial sites or other states or agencies)	7
Caltrans web site including all RWIS statewide	9
TV	3
Radio	1
Pagers that deliver brief weather message under alert conditions	1
Dial-up RWIS voice recording of the current conditions	4
No other methods are needed	0
Other:	1

4. Rate the impact to TRAVELERS in your district of the following inclement weather events:

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Snow and ice	11% 1	11% 1	11% 1	22% 2	44% 4		6	2.22	1.48	9
Icy bridges/black ice	22% 2	11% 1	11% 1	11% 1	44% 4		4	2.56	1.74	9
Intense rain	33% 3	22% 2	11% 1	33% 3	0% 0		1	3.56	1.33	9
Flooding	11% 1	22% 2	33% 3	33% 3	0% 0		2	3.11	1.05	9
Low visibility (fog, dust, smoke)	0% 0	22% 2	44% 4	33% 3	0% 0		3	2.89	0.78	9
High winds	11% 1	0% 0	33% 3	44% 4	11% 1		4	2.56	1.13	9
Other:	1	0	0	0	0					

5. Rate the impact to TRAFFIC OPERATIONS AND MAINTENANCE in your district of the following inclement weather events:

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Snow and ice	11% 1	33% 3	11% 1	0% 0	44% 4		3	2.67	1.66	9
Icy bridges/black ice	11% 1	22% 2	0% 0	11% 1	56% 5		5	2.22	1.64	9
Intense rain	22% 2	11% 1	33% 3	33% 3	0% 0		1	3.22	1.20	9
Flooding	11% 1	0% 0	56% 5	33% 3	0% 0		2	2.89	0.93	9
Low visibility (fog, dust, smoke)	0% 0	11% 1	22% 2	67% 6	0% 0		4	2.44	0.73	9
High winds	0% 0	11% 1	11% 1	67% 6	11% 1		5	2.22	0.83	9
Other:	1	0	0	0	0					

6. Rate the potential usefulness of RWIS and VAMS for the following functions

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Snow and ice control including anti-icing	11% 1	11% 1	33% 3	11% 1	33% 3		7	2.56	1.42	9
Snow and ice traveler information and motorist warnings (via CMS, HAR, web, phone, etc.)	33% 3	11% 1	11% 1	11% 1	33% 3		1	3.00	1.80	9
Icy Bridges/Black ice treatment	33% 3	11% 1	0% 0	11% 1	44% 4		4	2.78	1.92	9
Icy bridges/black ice traveler information and motorist warning	22% 2	22% 2	0% 0	11% 1	44% 4		6	2.67	1.80	9
Intense rain traveler information and motorist warning	0% 0	22% 2	56% 5	22% 2	0% 0		1	3.00	0.71	9
Flooding traveler information and motorist warning	0% 0	11% 1	56% 5	33% 3	0% 0		4	2.78	0.67	9
Low visibility traveler information and motorist warning	0% 0	22% 2	44% 4	33% 3	0% 0		3	2.89	0.78	9
High winds traveler information and motorist warning	0% 0	11% 1	11% 1	78% 7	0% 0		8	2.33	0.71	9
Other:	0	0	1	0	0					

7. Please indicate to which level you agree with the following statements

	Strongly Agree 5	4	3	2	Strongly Disagree 1	Not Applicable	Rank	Mean	Stan Dev	# Resp
I can access RWIS data in my workplace	25% 1	25% 1	0% 0	50% 2	0% 0	4	12	3.25	1.50	4
Accessing RWIS information is easy and requires minimum effort	20% 1	20% 1	0% 0	60% 3	0% 0	3	13	3.00	1.41	5
When I view RWIS data, I feel that the temperatures and other data is accurate for the time reported	40% 2	0% 0	40% 2	20% 1	0% 0	3	7	3.60	1.34	5
When I view RWIS data, I feel that the reported data is current	20% 1	20% 1	40% 2	20% 1	0% 0	3	10	3.40	1.14	5
Monitoring road conditions and weather forecasts is important in doing my job	33% 3	11% 1	33% 3	0% 0	22% 2	0	11	3.33	1.58	9
I am encouraged to use RWIS and weather information	14% 1	29% 2	0% 0	43% 3	14% 1	1	14	2.86	1.46	7
RWIS help monitor road weather conditions	33% 2	33% 2	17% 1	17% 1	0% 0	2	4	3.83	1.17	6
Cameras help monitor road weather conditions	11% 1	44% 4	33% 3	0% 0	11% 1	0	9	3.44	1.13	9
In my district, RWIS is used as a tool for traffic operations, such as fog or high wind warnings	0% 0	0% 0	0% 0	80% 4	20% 1	3	18	1.80	0.45	5
In my district, RWIS is used as a tool for winter road maintenance (snow and ice control)	40% 2	20% 1	20% 1	20% 1	0% 0	3	5	3.80	1.30	5
In my district, RWIS is used as a tool to schedule and monitor maintenance and construction jobs	0% 0	20% 1	0% 0	40% 2	40% 2	3	17	2.00	1.22	5
RWIS would work better if there were more of them	17% 1	50% 3	17% 1	17% 1	0% 0	2	6	3.67	1.03	6
RWIS would work better if they were better located	20% 1	0% 0	40% 2	20% 1	20% 1	3	15	2.80	1.48	5
RWIS would work better if they were maintained better	0% 0	20% 1	20% 1	40% 2	20% 1	3	16	2.40	1.14	5
RWIS would work better if people knew how to use the information better	50% 3	33% 2	0% 0	17% 1	0% 0	3	2	4.17	1.17	6
RWIS would work better if the information was easier to use and interpret	20% 1	40% 2	20% 1	20% 1	0% 0	3	7	3.60	1.14	5
RWIS data should be included in the ATMS	57% 4	14% 1	14% 1	14% 1	0% 0	0	3	4.14	1.21	7
RWIS data should be posted on the Internet for public access	88% 7	13% 1	0% 0	0% 0	0% 0	0	1	4.88	0.35	8

8. How useful is the following specific site information for the purpose of TRAFFIC OPERATIONS and TRAFFIC MANAGEMENT (e.g., providing fog, ice, or high wind warnings to drivers, incident reporting)?

	Very Useful 5	4	3	2	Not Useful 1		Rank	Mean	Stan Dev	# Resp
Air temperature	33% 3	22% 2	44% 4	0% 0	0% 0		8	3.89	0.93	9
Wind speed/direction	38% 3	25% 2	38% 3	0% 0	0% 0		7	4.00	0.93	8
Pavement temperature	33% 3	56% 5	11% 1	0% 0	0% 0		3	4.22	0.67	9
Road subsurface temperature	33% 3	44% 4	0% 0	0% 0	22% 2		10	3.67	1.58	9
Dew point / relative humidity	25% 2	38% 3	13% 1	25% 2	0% 0		11	3.63	1.19	8
Precipitation / snowfall	44% 4	33% 3	22% 2	0% 0	0% 0		3	4.22	0.83	9
Road surface condition (dry, wet, ice, etc.)	44% 4	33% 3	22% 2	0% 0	0% 0		3	4.22	0.83	9
Freezing-point depressant concentration	57% 4	29% 2	0% 0	0% 0	14% 1		6	4.14	1.46	7
Visibility data	38% 3	63% 5	0% 0	0% 0	0% 0		2	4.38	0.52	8
Video Image	25% 2	50% 4	13% 1	13% 1	0% 0		9	3.88	0.99	8
Forecasted conditions	63% 5	25% 2	13% 1	0% 0	0% 0		1	4.50	0.76	8
Any other useful RWIS features:	0	1	0	0	0					

9. How useful is the following specific site information for the purpose of WINTER ROAD MAINTENANCE (e.g., plowing, anti-icing, de-icing)?

	Very Useful 5	4	3	2	Not Useful 1		Rank	Mean	Stan Dev	# Resp
Air temperature	50% 4	13% 1	25% 2	0% 0	13% 1		9	3.88	1.46	8
Wind speed/direction	25% 2	25% 2	38% 3	0% 0	13% 1		11	3.50	1.31	8
Pavement temperature	50% 4	25% 2	13% 1	0% 0	13% 1		6	4.00	1.41	8
Road subsurface temperature	50% 4	25% 2	13% 1	0% 0	13% 1		6	4.00	1.41	8
Dew point / relative humidity	38% 3	13% 1	38% 3	0% 0	13% 1		10	3.63	1.41	8
Precipitation / snowfall	38% 3	50% 4	13% 1	0% 0	0% 0		2	4.25	0.71	8
Road surface condition (dry, wet, ice, etc.)	63% 5	13% 1	13% 1	0% 0	13% 1		4	4.13	1.46	8
Freezing-point depressant concentration	50% 4	25% 2	13% 1	0% 0	13% 1		6	4.00	1.41	8
Visibility data	38% 3	38% 3	25% 2	0% 0	0% 0		4	4.13	0.83	8
Video Image	50% 4	38% 3	0% 0	13% 1	0% 0		2	4.25	1.04	8
Forecasted conditions	63% 5	25% 2	13% 1	0% 0	0% 0		1	4.50	0.76	8
Any other useful RWIS features:	0	1	0	0	0					

10. How useful is the following specific site information for the purpose of MAINTENANCE AND CONSTRUCTION (e.g., repaving, construction scheduling, pothole monitoring)?

	Very Useful 5	4	3	2	Not Useful 1		Rank	Mean	Stan Dev	# Resp
Air temperature	**56%** 5	**22%** 2	**0%** 0	**22%** 2	**0%** 0		1	4.11	1.27	9
Wind speed/direction	**22%** 2	**0%** 0	**33%** 3	**44%** 4	**0%** 0		10	3.00	1.22	9
Pavement temperature	**44%** 4	**33%** 3	**11%** 1	**11%** 1	**0%** 0		1	4.11	1.05	9
Road subsurface temperature	**44%** 4	**11%** 1	**11%** 1	**22%** 2	**11%** 1		6	3.56	1.59	9
Dew point / relative humidity	**22%** 2	**22%** 2	**22%** 2	**33%** 3	**0%** 0		8	3.33	1.22	9
Precipitation / snowfall	**44%** 4	**11%** 1	**33%** 3	**11%** 1	**0%** 0		4	3.89	1.17	9
Road surface condition (dry, wet, ice, etc.)	**50%** 4	**0%** 0	**38%** 3	**13%** 1	**0%** 0		5	3.88	1.25	8
Freezing-point depressant concentration	**29%** 2	**14%** 1	**29%** 2	**14%** 1	**14%** 1		9	3.29	1.50	7
Visibility data	**33%** 3	**11%** 1	**33%** 3	**22%** 2	**0%** 0		5	3.88	1.25	9
Video Image	**22%** 2	**0%** 0	**33%** 3	**22%** 2	**22%** 2		5	3.88	1.25	9
Forecasted conditions	**44%** 4	**22%** 2	**22%** 2	**11%** 1	**0%** 0		3	4.00	1.12	9
Any other useful RWIS features:	0	0	1	0	0					

14. How important is it to place RWIS in the following locations

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Roads prone to ice and snow with the **highest traffic volumes**	**63%** 5	**38%** 3	**0%** 0	**0%** 0	**0%** 0		1	4.63	0.52	8
Mountain passes and other roads with the most severe snow and ice weather	**38%** 3	**50%** 4	**13%** 1	**0%** 0	**0%** 0		3	4.25	0.71	8
Routes to major winter recreation areas that are prone to ice and snow	**57%** 4	**29%** 2	**14%** 1	**0%** 0	**0%** 0		2	4.43	0.79	7
Roads prone to ice and snow that are **farthest from the maintenance office**	**29%** 2	**57%** 4	**14%** 1	**0%** 0	**0%** 0		4	4.14	0.69	7
Roads prone **to low visibility and/or high winds** with the highest traffic volumes	**43%** 3	**29%** 2	**29%** 2	**0%** 0	**0%** 0		4	4.14	0.90	7
Roads with the most **intense rain and flood** problems	**38%** 3	**38%** 3	**13%** 1	**0%** 0	**13%** 1		6	3.88	1.36	8
Comments (provide other locations and importance):	0	0	0	0	0					

15. Rate the potential usefulness of the following functions in displaying road weather information in a computer application.

	Highest 5	4	3	2	Lowest 1		Rank	Mean	Stan Dev	# Resp
Integrate RWIS data with radar or satellite images	33% 3	22% 2	33% 3	11% 1	0% 0		7	3.78	1.09	9
Make RWIS data easy to read and interpret	56% 5	33% 3	11% 1	0% 0	0% 0		1	4.44	0.73	9
Display color-coded RWIS data (e.g., pavement temperature, wind speed and direction) directly on map of RWIS sites	22% 2	33% 3	44% 4	0% 0	0% 0		7	3.78	0.83	9
For a length of road, provide estimated current precipitation rates and types	38% 3	38% 3	25% 2	0% 0	0% 0		3	4.13	0.83	8
Display graph of short-term history of RWIS data	25% 2	0% 0	75% 6	0% 0	0% 0		9	3.50	0.93	8
Provide historical traffic volumes by time of day	22% 2	11% 1	44% 4	11% 1	11% 1		10	3.22	1.30	9
Incorporate observations from field personnel (plow drivers, traffic management team,	38% 3	25% 2	25% 2	13% 1	0% 0		5	3.88	1.13	8
For a length of road, provide estimated current temperatures	14% 1	71% 5	14% 1	0% 0	0% 0		4	4.00	0.58	7
For a length of road, provide forecasted conditions	38% 3	50% 4	13% 1	0% 0	0% 0		2	4.25	0.71	8
Show locations of current accidents	38% 3	13% 1	50% 4	0% 0	0% 0		5	3.88	0.99	8
Other:	0	0	0	0	0					

16. How accurate and useful are the localized weather forecasts provided by vendors (VAMS) (if available):

	Very Good 5	4	3	2	Very Poor 1	Not Available	Rank	Mean	Stan Dev	# Resp
Accuracy	0% 0	25% 1	75% 3	0% 0	0% 0	5	0	3.25	0.50	4
Usefulness	0% 0	75% 3	25% 1	0% 0	0% 0	4	0	3.75	0.50	4
Any comments:										

17. How often is chemical anti-icing treatment of the road prior to the snow accumulation used in your district?

Very often	0
Occasionally	1
Sometimes	0
Rarely	2
Never	0
Don't Know	6

18. Which of the following would improve anti-icing in your district (select any that apply).

More reliable forecasts.	3
More familiarity with anti-icing practices.	1
More resources (people and equipment.)	0
Not needed in this district	2
Other suggestions to improve anti-icing.	

20.

In the past two years, how many hours of training have you received in obtaining, interpreting, and using RWIS information?

Over 40 hours	0
20 - 40 hours	0
8 - 20 hours	0
Under 8 hours	1
None	8

How would you classify this amount of training?

Excessive	0
More than adequate	0
Correct amount	0
Less than adequate	1
Minimal	3

D. Data Collected from Caltrans Districts and Headquarters

District 1

Initial Phone Interview

Name: Stephen Bradley
Title: Traffic Transportation Engineer
Address: 1656 Union St
Eureka, CA 95501
E-mail address: Stephen_Bradley@dot.ca.gov
Phone number: (707) 445-6229

QUESTION: How many RWIS stations do you have in your District? The data we have from the Caltrans Transportation Management Systems Baseline Inventory indicates that you have __1_ sites in operations, __0___ under construction, __6__ in the design and requirements phase, and __0__ in the planning phase. [but the GIS data we received from headquarters indicates that you have __0__ in operations.]

ANSWER:

__1__ operational ___8___ under construction __0___ design__0__ planned

District 1 has one station; it is older. Currently, they are looking at expanding with the addition of 6 new stations which are now under construction. Also, two additional stations are being installed as part of another project. They are looking at retrofitting the one existing station as the new 8 are being built.

QUESTION: Is there an Internet site or a computer application for your District that displays the RWIS readings or locations?

Answer: There is a computer in Caltrans dispatch, which is not Internet accessible that brings in the data they have right now. There will be an upgrade with the new project and they will have Internet accessible computers.

QUESTION: To obtain a better understanding of the RWIS in your District, we also request that you send us any documentation about the equipment or use of RWIS. To make this easier for you, we will include a checklist of documents that you may have with the inventory survey. The list includes, but is not limited to, database specifications, RWIS design documents, training and user manuals, and winter level of service maps and system descriptions.

QUESTION: Could you give a general description of the RWIS activities in your District?

ANSWER: Relatively Limited, RWIS is basically used as a maintenance tool for anti-icing and road maintenance. The new project will expand into the summit areas in District 1.

QUESTION: How receptive has staff generally been to RWIS innovations? What is their attitude towards RWIS?

ANSWER: Very excited about the 1 they have. We will get a better sense of this as the new stations go in. So far, response has been positive.

QUESTION: Is there any additional information that would help us to attain a better understanding of the current condition of the RWIS in your District?

ANSWER: No

QUESTION: Can you tell us of some agencies outside of Caltrans that may serve as potential partners in road weather information? These may include private interests, agencies with weather stations, local transportation centers or county DOT's, and/or neighboring state DOT's.

ANSWER: Oregon DOT

Inventory Survey

Not completed

District Visit Notes

Attendance

Name	Email	Position
Steven Bradley	sbradley@dot.ca.gov	TMC
Bill Richards	william_richards@dot.ca.gov	TMC
Nick Motto	Nick_motto@dot.ca.gov	Maint Sup
John Carson	Jcarson01@dot.ca.gov	Traffic Ops
Marty Van Zandt	Martin_van_zandt@dot.ca.gov	Maint Ops

RWIS Usage

- SSI
- Primarily used for winter road maintenance associated with frost and ice.

History

- First RWIS site set up in 1992. Currently being moved to new location.

Current

- ScanWeb 3—web based
- Had a 3 year contract with SSI to do once a year maintenance to perform preventive work
- Maintenance now maintains own equipment
- District has had good service from SSI, especially since SSI went to a web based service
- District owns the RWIS data, they can access it without dealing with SSI
- Davis weather stations installed at two sites are collocated with CCTV and CMS for ATIS
- Separate visibility sensors and sensors for icy curve warning system
- Personnel usually have anti-icing equipment ready and monitor conditions overnight
- Have visibility sensors that tell the percent of suspended moisture, but these are not part of RWIS
- Dispatch will tell the public who calls them with requests about weather and forecasts
- Used solar power for RWIS; panels stolen and cabinets broken into; required large effort to seal cabinet and weld solar mounting unit
- Used radio communications for RWIS

Planned

- Use radio communications or cell phone for RWIS
- Install 5, for 6 total; all frost/ice
- New stations are located on summits
- 18 Davis weather stations are planned
- Installing infrared vehicle-mounted pavement temperature sensors on some maintenance vehicles

Forecast Services

- SSI ScanCast—used for frost prediction. ScanCast is considered to be accurate by D1 crews
- SSI issues two forecasts per day
- DTN (Meteorlogix) StormSentry for weather tracking mesoscale weather events—now has storm cell tracking ability and is very configurable to needs. This allows real time 5 minute storm forecasting.

RWIS Goals

- Increase service and decrease costs
- Minimize use of maintenance personnel for frost detection
- Get pavement temperature sensor for maintenance control vehicles
- Allow maintenance to have access to RWIS sites that are going to be installed
- Add Vaisala and Meridian to list of vendors
- Determine how to get emergency power to sites
- Make user friendly systems for maintenance crews

- Have Caltrans headquarters do in-house training to lead to standardization
- Would like to see training every other year developed through Caltrans headquarters either in the region (D1, D2), in the District, or in Sacramento
- Would like to get a state meteorologist

The District reviewed a list of potential high level requirements and supported the following items:

- Caltrans shall incorporate road weather information into a statewide traveler information web page (M)
- Weather information shall be incorporated into the ATMS (H)
- Caltrans shall develop consistent statewide recommendations for RWIS needs and siting (M) – (written down body of knowledge would be helpful but does not support statewide policies and requirements for siting.)
- Caltrans shall develop consistent statewide recommendations for RWIS field equipment (H) (not requirements)
- Caltrans shall develop consistent statewide recommendations for forecasting services (M) (make sure District gives feedback to vendor if forecasts are not accurate. Calibration may be needed)
- Caltrans shall identify policies and procedures to build confidence in RWIS (how do you interpret the data so you feel comfortable using it) (H)
- Caltrans shall implement a standard communications protocol for RWIS (H)
- Caltrans shall build relationships with other agencies to share information (M)
- Caltrans shall incorporate road weather information into 511 (M)

Best Practices

- Very active in contacting SSI when forecasts incorrect—10 calls a month when first installed
- Maintains RWIS (SSI does preventative)
- Interested in tracking forecasts and work efforts for cost/benefit analysis
- Field maintenance placed RWIS at location where frost/ice forms first and problem areas, north slopes—early warning system
- Not limiting placement of RWIS when comm. Or power not present; use radio and solar

Partners

- Oregon DOT
- NWS—Contact has been made to Jon Lovegrove in Eureka

District 2

Initial Phone Interview

Name: Russ Wenham
Title: District Division Chief Maintenance/Operations
Address: P.O. Box 496073
Redding, CA 96049-6073
E-mail address: Russ_Whenam@dot.ca.gov
Phone number: (530) 225-3545

QUESTION: How many RWIS stations do you have in your District? The data we have from the Caltrans Transportation Management Systems Baseline Inventory indicates that you have _8__ sites in operations, ___4__ under construction, _5___ in the design and requirements phase, and __47__ in the planning phase. [but the GIS data we received from headquarters indicates that you have __8__ in operations.]

ANSWER:

__8__ operational__4____ under construction ____5___ design __47__ planned

QUESTION: Is there an internet site or a computer application for your District that displays the RWIS readings or locations?

ANSWER: There is an INTRAnet site that uses SSI Scan Web to display information from 6 of the sites.

QUESTION: To obtain a better understanding of the RWIS in your District, we also request that you send us any documentation about the equipment or use of RWIS. To make this easier for you, we will include a checklist of documents that you may have with the inventory survey. The list includes, but is not limited to, database specifications, RWIS design documents, training and user manuals, and winter level of service maps and system descriptions.

ANSWER: They will have project reports that justify and explain what they have done and why they're doing some of the projects they are doing. Other than that, they will have very little.

QUESTION: Could you give a general description of the RWIS activities in your District?

ANSWER: They've been in the RWIS business for about 10 years. The system is primarily and historically been used as a maintenance planning and scheduling tool.

In the past couple years, they've been trying to get 2 initiatives off the ground:

1. **Using information in their traffic management center for helping to make management decisions during storm events. Also, for changing and activating variable message signs.**

2. **Trying to get information posted to the Internet for public traveler information. All current RWIS sites are "stand alone" sites. They are not integrated with other ITS features.**

Current Project; they are trying to take the same RWIS, but integrate it with an automated message sign for use in wind and ice warning.

QUESTION: How receptive has staff generally been to RWIS innovations? What is their attitude towards RWIS?

ANSWER: Generally receptive. One problem with selling RWIS is that they don't have very good interfaces and wide area network capability in order to make information as useable as possible.

Example: Staff says RWIS is a "really cool" thing if they knew they could export it to the public.

Currently, they don't export information to the public; this would help as a traveler information tool. Also, they don't have their cameras online yet, so they are not getting the full benefit of RWIS.

The maintenance people have been very receptive.

QUESTION: Is there any additional information that would help us to attain a better understanding of the current condition of the RWIS in your District?

ANSWER: We know RWIS is a good thing, and we know we ought to be putting the information out to the public. Until the Department captures a statewide "traveler information vision", we are going to continue to limp along.

They are working on it, though, they've formed a traveler information taskforce.

QUESTION: Can you tell us of some agencies outside of Caltrans that may serve as potential partners in road weather information? These may include private interests, agencies with weather stations, local transportation centers or county DOT's, and/or neighboring state DOT's.

ANSWER: **California Department of Forestry and Fire Protection**

U.S. Forest Service
Federal Bureau of Land Management

California Department of Water Resources

These organizations currently use RAWS(Remote Activated Weather Stations). It would be nice if we were all sharing that same information. *These organizations are heavily invested in RAWS, and would love to have a direct link to our RWIS sites.

Inventory Survey

General Information

What criteria does your district use in selecting RWIS equipment, software, communications systems, and locations?

Equipment & software: reliability, ease of use, and of course $$.

Communications: reliability, availability of utilities, ease of use, $$.

Location: Known "problem areas", most useful to maintenance crews and traveling public such as summits.

How many people in your district are trained to use the RWIS information? **12 +/-**

How many people are trained to maintain the roadside RWIS site? **6 +/-**

Communication Systems

Please describe the communication system for your RWIS. If you have more than one type, please describe each. Include:

- Technology (Fiber, Spread Spectrum, dial-up telephone, twisted pair, etc.)
- Possible update frequency (once every n minutes)
- Plans for upgrade

- **Dial-up telephone**
- **Once every 2 minutes**
- **Add cameras**

User Interfaces

Please describe the RWIS user interface. If you have more than one type, please describe each. Include:

- Name (ScanCast, etc.)
- Platform (Windows, Web, DOS, etc.)
- Who can access the user interface (e.g. dispatch in Maintenance Office x, y and z; maintenance at the district office, traffic operators, etc.)
- Developer (e.g. SSI, Caltrans, etc.)
- Description of Integration with Traffic Management Center
- Description of how it works

- **SSI/ScanCast**
- **Windows**
- **Maintenance station, superintendent office, dispatch**
- **SSI**
- **?**

Shows a map with sensor locations and temperature information for each location. Clicking on a location will provide more information. A scancast is available for each location as are current trends of the information. You can create a graph with any of the current or historical information. The sensors on the maps are also color coded so a brief glance will tell you the sensor "status". Dry, ice alert, etc.

Central Processor

Please describe the RWIS central processor. If you have more than one type, please describe each. Include:

- Location (e.g., district office TMC, maintenance office, etc.)
- Developer/provider (e.g. SSI, Caltrans, etc.)

- Description of computer specifications
- Data Storage Information
  - Frequency of storage: (e.g. every 10 min)
  - Months of storage
  - Description of data stored
- Issues accessing stored data

- **Location of CPU for Dunsmuir, Black Butte, Weed, and Snowman is in the Mount Shasta maintenance station. Location for Buckhorn and Oregon Mountain is the Weaverville maintenance station.**
- **SSI/Caltrans**
-
- **?**
- **Frequency of storage is variable, every 10 minutes is usual.**
- **12 months is stored on CPU, sometimes more, can be archived on PC.**
- **All collected data from RPU is stored. Temps, winds, precip, etc.**
- **Accessing stored data is somewhat of a hassle, it must first be downloaded onto PC. When system was upgraded from a DOS system to a Windows system, the new system could not access the old DOS data. A second computer, with the old DOS system, had to be maintained to access the DOS data.**

Contacts

Please use the list provided by Russ Wenham.

District Visit Notes

February 5, 2002

Attendance:

Name	Email	Position
Wally Snell		TMS
Brian Adams	Brian_adams@dot.ca.gov	Superintendent
Clyde Aker	Clyde_aker@dot.ca.gov	Area Superintendent
Milt Apple	Milt.apple@dot.ca.gov	Superintendent
Russ Wenham	Russ.wenham@dot.ca.gov	Deputy Dist. Director
Jim Scott	James.scott@dot.ca.gov	Maintenance Supervisor

RWIS Usage

- SSI ScanWeb 3
- Use RWIS as a tool for winter road maintenance including anti-icing and for high wind warnings

History

- Began using RWIS in 1993 on I-5 near Dunsmuir& Weed to improve maintenance, scheduling, staff, and operations
- In 1993-94, Scan system was seen as very useful because Internet and weather web sites were not easily available
- Use RWIS for anti-icing, determine wind direction, and maintenance, but not for visibility

Current

- Snow and ice control options include solid salt, magnesium chloride, cinders, and salt brine.
- All measured and forecasted data used to different extents by all or some maintenance users
- One participant commented on use and importance of subsurface temperature
- Pavement temperature is important but pucks (sensors) are becoming unreliable
- SSI sends replacement pucks; District staff installs
- Chemical factor useful in reducing reapplication of chemicals
- Besides RWIS, TMC and maintenance also obtain weather information from NWS Medford office (urgent forecasts), Accuweather, weather.com, weather Underground. Staff utilizes information from Reno radar and west coast satellite.
- RWIS data is key for chain control operations
- Testing truck-mounted infrared pavement temperature sensors
- Central Processing Units are in maintenance offices with a wide area network (WAN) link to TMC

Planned

- 56 sites under construction, in design , or planned
- Distribution of RWIS data on Internet under development
- Automated icy curve warning with RWIS to be installed at Fredonyer Summit including automated paging
- Similar system at Spring Garden on Plumas SR 70 east of Quency
- Automated high-wind warning system at Mt Shasta

Forecast Services

- Uses ScanCast forecasts with forecasted pavement temperature
- Forecasts recognized as a valuable function for anti-icing
- ScanWeb used to predict pavement freezing

RWIS Goals

- District-maintained sites; considered more economical than contracted services
- Training for system maintenance and system use; some in Sacramento, some with vendor in District
- Statewide forums for maintenance, electrical staff, traffic operations staff
- Provide information to public except chemical factors. District users currently access Oregon data via Internet
- Integrate RWIS into ATMS
- Provide access to all data that is in the TMC to maintenance offices
- Improve forecasting capabilities for pavement temperatures

The District reviewed a list of potential high level requirements and supported the following items:

- Caltrans shall incorporate road weather information into a statewide traveler information web page (H)
- Weather information shall be incorporated into the ATMS (H)

- Caltrans shall develop consistent statewide recommendations for RWIS field equipment (M)
- Caltrans shall implement a standard communications protocol for RWIS (H)
- Caltrans shall develop capabilities to access RWIS data and other road weather information from the field (H)
- Caltrans shall build relationships with other agencies to share information (M)
- Caltrans shall incorporate road weather information into 511 (H)

Best Practices

- Putting RWIS data on their website
- Use CCTV to get images off the website

Partners

- District and state should partner with agencies that already have weather stations: United States Forest Service, Bureau of Land Management, California Department of Forestry, United States Department of Forestry, Department of Water Resources, etc.

ITS Technician

District 2 would like to see a classification for ITS Technician with the following desired skills:

Broadcast/industrial video and audio
- NTSC video
- RGBHV video
- Video switching systems
- Display systems
- Sync systems
- Video encoders and decoders
- CATV systems
- Frequency division multiplexing
- Time division multiplexing

Cabling and facility infrastructure
- Structured cabling
- Cable termination techniques (cat5, coax, etc.)
- Fiber installation, termination and test (MM and SM)
- Equipment room hardware (racks, cable ladder, etc.)

LAN/WAN and general telecom
- Digital transmission
- Ethernet
- Router (function and configuration)
- Switches (function and configuration)
- Various Telco transmission services (T1, frame relay, ISDN, POTS, ATM, etc.)
- IP protocol suite
- 7 layer OSI model

Microwave (wireless)
- Basic transmission (path calculations and propagation)
- Radio system functionality (system level)
- Radio spectrum and characteristics
- Licensed microwave and unlicensed ISM band
- Interface types – Ethernet, T1, serial, analog video, etc.
- Basic antennas and transmission lines

Basic electrical (power)
- NEC issues
- Industry conventions
- Proper wiring practice

Programming
- Ability to program in a common language (C, etc.)
- General program structure
- HTML and web presentation
- Understanding of Java, JavaScript, applets, etc.

Server admin and security
- Basic understanding of functionality associated with fundamental network services (web, DNS, FTP, TFTP, etc.)
- Basic understanding of server and dial-up security issues

Control systems
- Basic device control issues
- Techniques for simplifying operator user interaction with a complicated system
- SOCCS, Crestron, etc.

District 3

February 4, 2002

Initial Phone Interview

Name: Brian Simi
Title: Chief, Electrical Systems for D3
Address: 3165 Gold Valley Dr.
Rancho Cordova, CA 95742
E-mail address: Brian_Simi@dot.ca.gov
Phone number: (916) 859-7960

QUESTION: How many RWIS stations do you have in your District? The data we have from the Caltrans Transportation Management Systems Baseline Inventory indicates that you have _16__ sites in operations, ___1__ under construction, __0__ in the design and requirements phase, and __0__ in the planning phase. [but the GIS data we received from headquarters indicates that you have _14___ in operations.]

ANSWER:

_17___ operational__1___ under construction___0____ design__0__ planned

There are 9 RWIS stations in Sacramento County, and 8 up in the Sierra Nevada's.

QUESTION: Is there an internet site or a computer application for your District that displays the RWIS readings or locations?

ANSWER: There is 1 Intranet site for the SSI System. There is a VISO system on the Internet available in the Sacramento area, but people must acquire a license to view the information. The information will be available soon on the Internet in a text format.

QUESTION: Could you give a general description of the RWIS activities in your District?

ANSWER: There are 9 sites in the Sacramento area, and they are used for wind warning on the taller bridges, and to determine visibility conditions. Also, they are used for dispatching maintenance for sand on bridge decks for ice removal.

The 8 sites up on the mountain passes are used for dispatching maintenance for anti-icing. Brian doesn't know the intimate details of how they use the data in the mountains.

QUESTION: How receptive has staff generally been to RWIS innovations? What is their attitude towards RWIS?

ANSWER: Since the system has been put in for them, they are usually positive about it. The issue is, there may not be a consistent front, as far as some maintenance staffs do not see as much benefit as others.

I would say it's mixed, but overall positive. Some may or may not see the need for it. Brian hasn't received a lot of direct feedback about the system.

QUESTION: Can you tell us of some agencies outside of Caltrans that may serve as potential partners in road weather information? These may include private interests, agencies with weather stations, local transportation centers or county DOT's, and/or neighboring state DOT's.

ANSWER: NDOT Region 2; the counties to a much lesser extent; The National Weather Service has been interested; local fire departments that are interested in the humidity level. Also, they have got other requests from other entities in the past.

Inventory Survey

General Information

What criteria does your district use in selecting RWIS equipment, software, communications systems, and locations?

Criteria for RWIS equipment are based on past RWIS contracts. The specifications for the contracts are based upon earlier work with vendors, maintenance and operations personnel in trying to determine the field requirements. This was mostly based on what the potential vendors could provide at the time. The extent of what sensors are installed is determined by the local need – i.e. ice, fog, wind etc.

The Software criteria are very general as well and also centers around what the vendors are able to provide since unique software packages would drive up cost. Typical criteria are ease of use, accessibility of data, maintainability, etc.

Communication system criteria are cost versus performance. Dial-up and CDPD are primarily used because of low cost. CDPD is, however, limited in availability. But both are easy to deploy and configure and the vendors can accommodate both. CDPD does not incur toll charges were as dial-up and cellular do. They also require experience of the local maintenance supervisor.

The district does not have any formal criteria for the placement of RWIS locations. It is mainly done through requests from maintenance. It is typically in an area where they have icing problems and is based on the experience of the local maintenance supervisor.

How many people in your district are trained to use the RWIS information? **Approx 5**

How many people are trained to maintain the roadside RWIS site? **2 maybe**

Electrical Maintenance has just recently begun to maintain the sites but very limited training has been given. The older sites are more difficult to maintain because the lack of formal training. With the newer sites training has been done.

Communication Systems

Please describe the communication system for your RWIS. If you have more than one type, please describe each. Include:

- Technology (Fiber, Spread Spectrum, dial-up telephone, twisted pair, etc.)
  - **Dial-Up from server to RPU (remote Site) (SSI)**
  - **CDPD from Server to RPU (Vaisala)**

- Possible update frequency (once every n minutes)
  - **Once every 15 minutes (Vaisala) – SSI unknown**

- Plans for upgrade
  - **Upgrade to NTCIP when availability by vendor(s)**

User Interfaces

Please describe the RWIS user interface. If you have more than one type, please describe each. Include:

- Name (ScanCast, etc.)
- Platform (Windows, Web, DOS, etc.)
  - **ScanCast (SSI) – Web based GUI – Web based**
  - **Icecast (Vaisala) – Client/server based application – Windows based**
- Who can access the user interface (e.g. dispatch in Maintenance Office x, y and z; maintenance at the district office, traffic operators, etc.)
  - **ScanCast can be viewed by any user on the Caltrans Intra-Net.**
  - **Icecast is viewable by Maintenance Dispatch, Maintenance Supervisors and the RTMC**
- Developer (e.g. SSI, Caltrans, etc.)
- Description of Integration with Traffic Management Center
- Description of how it works

- **SSI – Web based display has list of sites with weather data in text/table format. Each site has link to page with more complete data and further links to historical data and camera images (if equipped). No map used.**
- **Vaisaila – Windows based display. Can view list of sites with weather data in text/table format (configurable) Historical information by site. Map with zoom and pan capabilities and configurable icons. Graphing capabilities**

Central Processor

Please describe the RWIS central processor. If you have more than one type, please describe each. Include:

- Location (e.g., district office TMC, maintenance office, etc.)
- Developer/provider (e.g. SSI, Caltrans, etc.)

- Description of computer specifications
- Data Storage Information
  - Frequency of storage: (e.g. every 10 min)
  - Months of storage
  - Description of data stored
- Issues accessing stored data

- **SSI System – Server/Central Processor is located in Kingvale Maintenance Station**
- **Data storage is unknown**
- **No training has been provided to current administrators and then cannot currently access the server directly.**
- **Vaisala System - Server/Central Processor is located in the RTMC in Rancho Cordova**
- **Server is a SCO-Unix based system onto a Dell PowerEdge 1400.**
- **Data storage is done every 15 minutes and can store over a year's worth of data. All weather data for each site is stored.**
- **Stored data is accessed through the GUI and is limited to those users.**

Contacts

Jim Edson
Maintenance – Kingvale
530-426-76008

Rusty Grout
Maintenance – Nevada City
530-265-4290

Georgia Parsons
Maintenance – Kingvale
530-582-5053
530-426-79709 Winter

Dale Buchanan
Maintenance – Headquarters
916-653-8782

Markus Heiman
Operations – Regional TMC
(916) 859-7979

District Visit Notes

Attendance:

Name	Email	Position
Brain Simi		TMC
Joan		TMC
Ron Bronc		
Pete Acevedo		

RWIS Usage

- Vaisala
- SSI

History

- Began using SSI in 1995 in mountainous areas
- Started using Vaisala in 2000 in the valley areas

Current

- Only District that uses both Vaisala and SSI
- Uses RWIS mostly for maintenance uses: visibility, freezing temperatures, and wind conditions in the Central Valley
- ScanWeb 3
- Maintenance calls airport for weather reports to determine wind data
- CDPD communications are used to obtain cellular data in Valley locations
- Jcorr, a callbox based system, is used in 14 locations as a visibility system to determine fog
- TMC operators manually check surface temperatures, wind every hour
- There is one licensed IceCast for one of the workstations
- ScanCast is used for forecasting services
- The Vaisala system has the warning system IceAlarm on it's systems
- Cameras are used on SSI RWIS sites
- Currently working with an ESS working group

Forecast Services

- ScanCast
- IceCast licensed for one workstation
- IceAlarm: warning window on Vaisala system

RWIS Goals

- Staff needs training
- Operational policies need to be determined
- Trying to get Vaisala NTCIP compliant so SSI can integrate the system
- Headquarters should test the RWIS data
- Documents advising how often data needs to be pulled
- Maintenance pop up alarms for temperature

District 4

February 7, 2002

Inventory Survey

General Information

What criteria does your district use in selecting RWIS equipment, software, communications systems, and locations?

The criteria for using RWIS equipment is when dangerous ice conditions on the roadway can occur due to bad weather.

How many people in your district are trained to use the RWIS information? **5-10 people**

How many people are trained to maintain the roadside RWIS site? **3-4 people**

Communication Systems

Please describe the communication system for your RWIS. If you have more than one type, please describe each. Include:

- Technology (Fiber, Spread Spectrum, dial-up telephone, twisted pair, etc.)
- Possible update frequency (once every n minutes)
- Plans for upgrade

The RWIS station located on route 580 in the city of Livermore communicates by a dial-up telephone line to the Server located at the District Office inside the Traffic Management Center.

The data from the RWIS is updated every 10 minutes. There is no immediate plan to upgrade the current system.

User Interfaces

Please describe the RWIS user interface. If you have more than one type, please describe each. Include:

- Name (ScanCast, etc.)
- Platform (Windows, Web, DOS, etc.)
- Who can access the user interface (e.g. dispatch in Maintenance Office x, y and z; maintenance at the district office, traffic operators, etc.)
- Developer (e.g. SSI, Caltrans, etc.)
- Description of Integration with Traffic Management Center
- Description of how it works

The RWIS station is monitored by the server computer located in the Traffic Management Center. The Server is accessed by Caltrans Maintenance Dispatch Staff as well as by Traffic Operations Staff. The Server computer runs on Windows NT and uses the ScanCast Software Application to view the data. A client pc located at the field maintenance station connects up to the server via dial up modem

and allows the field maintenance supervisor to monitor the RWIS data. The system also will page the field supervisor if an alarm condition is detected.

The system was developed and set up by SSI.

Central Processor

Please describe the RWIS central processor. If you have more than one type, please describe each. Include:

- Location (e.g., district office TMC, maintenance office, etc.)
- Developer/provider (e.g. SSI, Caltrans, etc.)
- Description of computer specifications
- Data Storage Information
  - Frequency of storage: (e.g. every 10 min)
  - Months of storage
  - Description of data stored
- Issues accessing stored data

The Server computer uses a pentium 233MHZ processor. It has a 4GB harddrive and a 4GB mirror drive. The data stored from the RWIS is roadway surface temperature, air temperature, dew point and wind velocity.

Contacts

Name	Contact Info
Ricardo Alejandre	**510-286-3781**
Paul Parecadan	**510-286-4507**
Danny Robbles	**925-606-4473**
Yvette Bidegain	**510-286-4554**

District Visit Notes

Attendance:

Name	Email	Position
Hector Garcia		TMC Systems
Paul Paradian		Maintenance Supervisor

RWIS Usage

- One station installed for ice detection
- SSI ScanWeb
- ScanSentry Paging

History

- Began using RWIS in 1992 requested by maintenance
- The system was upgraded in 1999

Current

- Single installation used for ice detection. No ice has been detected for the last 3 years, partially due to increased traffic and its thermal and mechanical affect on potential ice

- A separate flood warning system located in Pittsburgh on Highway 4. This system has a trigger that a static warning that relays the message
- Caltrans maintains the sites; no calibration has ever been performed
- January and February are the only months RWIS is needed
- TMC have a limited need for RWIS
- TMC would use the information if a maintenance field worker confirmed the icy condition
- D4 owns the RWIS data
- Maintenance uses Storm Sentry, which is more helpful than Internet weather sites
- District feels there is no need for visibility warnings in the District
- Livermore maintenance station and TMC get RWIS data
- Dial-up connection every 10 minutes

Planned

- No plans for future RWIS

Forecast Services

- Internet weather sites used to monitor conditions and review forecasts

RWIS Goals

- Less vendor dependence

The District reviewed a list of potential high level requirements and supported the following items:

- Caltrans Districts shall work together to develop an improved maintenance computer application for decision support for Caltrans maintenance (M)
- Caltrans shall incorporate road weather information into a statewide traveler information web page (H)
- Weather information shall be incorporated into the ATMS (L)
- Caltrans shall develop consistent statewide recommendations for RWIS field equipment (M)
- Caltrans shall develop consistent statewide recommendations for forecasting services (L)
- Caltrans shall identify policies and procedures to build confidence in RWIS (how do you interpret the data so you feel comfortable using it) (L)
- Caltrans shall implement a standard communications protocol for RWIS (H)
- Caltrans shall develop capabilities to access RWIS data and other road weather information from the field (M)
- Caltrans shall build relationships with other agencies to share information (M)
- Caltrans shall incorporate road weather information into 511 (M)

Partners

- Related to weather, District 4 does not feel it would gain much benefit through working with any external partners

District 5

Initial Phone Interview

Name: Scott Eades
Title: Operations Coordinator
Address: 50 Higura St.
E-mail address: San Luis Obispo, CA 93405
Phone number: (805) 549-3612

QUESTION: How many RWIS stations do you have in your District? The data we have from the Caltrans Transportation Management Systems Baseline Inventory indicates that you have _0__ sites in operations, __0___ under construction, _0___ in the design and requirements phase, and __4__ in the planning phase. [but the GIS data we received from headquarters indicates that you have _0___ in operations.]

ANSWER:

__0__ operational __0____ under construction ___0____ design__0__ planned

QUESTION: Could you give a general description of the RWIS activities in your District?

ANSWER: We have little fog, snow, or ice in our District. There are a few places where we have icy conditions. We may use the system for snow, fog, and ice.

District Visit Notes

Attendance

Name	Email	Position
Scott Eades		Traffic Operations
Sherwin Gilliland		Electrical Operations
Ron Belben		Maintenance
Tom Martin		TMC Support

RWIS Usage

- District 5 currently has no RWIS.
- Central Coast Strategic Plan identified potential locations for RWIS deployment, although these deployments are of lower priority than other traffic management types of deployments (vehicle detectors, ramp metering, changeable message signs).
- Weather on the central coast is a relatively minor concern, although there are areas that have occasional icing problems, visibility problems, and wind problems. Weather typically comes from the North or West.
- Although typical RWIS applications don't usually address them, the district has rock/mud slide problems and intense rain as well.
- Weather issues that the district identified were, in order of significance:

- Rain
- Snow (1-2 times per year) on SR 154, SR 101 (on Cuesta Grade), and SR 17
- Wind (somewhat a factor; Gaviota Pass on 101 was identified as a location with these problems)
- Ice (occurs 1-2 times per year)
- Freezes

- When it does snow or ice, district maintenance will plow and distribute sand. Salt or other chemicals is not used.

History

None

Current

- Currently TMC and maintenance staff get weather data from the Meteologics system and from forecasts and current conditions available on television and the world wide web. For maintenance, when forecasts indicate potential icing conditions, maintenance staff will be called on duty at night or put on standby.
- Weather impacts are highest on highway 1, Highway 17 in the Santa Cruz Mountains, spot locations on 101, and 154.
- Although the district does not have RWIS, they have used solar panels for other ITS applications and are satisfied with their performance.

Planned

- District 5 traffic operations identified 10 locations, using the SDP recommendations and providing more specific locations.
- They are interested in teaming with other agencies to get more detailed weather data.
- Weather applications that would be useful include wind warnings, ice warnings, site-specific forecasts, mud slide or rock slide detectors, flood detection, ice detection (spot locations).
- A potential useful application would be a portable weather station that can be used to monitor travel routes when active wild fires.

Forecast Services

- District 5 forecast services are through the standard (recently upgraded) Meteorlogix system.

RWIS Goals

- District supports any documentation or support that headquarters could provide to help in siting RWIS, maintaining the systems, training, etc.
- District 5 supports Headquarters development of interoperability requirements and guidelines for site selection and use. Component selection, deployment, and use of the RWIS should be up to district discretion. .
- District 5 would be interested in receiving weather data from District 6 related to dust storms or low visibility.
- Receive weather-related SigAlerts from District 4 to help manage commuter traffic in the Santa Cruz area. This information would serve to better inform travelers in District

5 who may be heading into the neighboring districts at the point, in District 5, where they have the option to take an alternative route.

The District reviewed a list of potential high level requirements and supported the following items:

- Caltrans Districts shall work together to develop an improved maintenance computer application for decision support for Caltrans maintenance (H)
- Caltrans shall incorporate road weather information into a statewide traveler information web page (H)
- Weather information shall be incorporated into the ATMS (M)
- Caltrans shall develop consistent statewide recommendations for RWIS needs and siting (not regulatory - M)
- Caltrans shall develop consistent statewide recommendations for RWIS field equipment (not regulatory – M)
- Caltrans shall develop consistent statewide recommendations for forecasting services (M)
- Caltrans shall identify policies and procedures to build confidence in RWIS (how do you interpret the data so you feel comfortable using it) (M)
- Caltrans shall implement a standard communications protocol for RWIS (H)
- Caltrans shall develop capabilities to access RWIS data and other road weather information from the field (Access from supervisor's office)
- Caltrans shall build relationships with other agencies to share information (M)
- Caltrans shall incorporate road weather information into 511 (M)

Partners

Discussion Points

During discussion, Sherwyn mentioned that Caltrans had tried to develop a standard RWIS roadside device a few years ago, using the 2070 controller, but this effort did not succeed.

Use of weather information should be incorporated into the TMC operations guide that headquarters is developing.

Scott Eades requested that the report includes a discussion on smart call boxes and their potential application for RWIS. Santa Barbara Council of Area Governments is currently funding a call box project and may be expanding this to smart call boxes.

RWIS Candidate Locations
On State Highways in District 5

The following list was prepared by CalTrans District 5 Traffic Operations and Maintenance program staff to identify candidate locations for future installation of Road Weather Information Systems (RWIS) components. Desired features include temperature sensor, wind sensor, moisture/rain sensor, and/or visibility sensor. Specific weather information and communication/notification needs may vary by location.

Candidate Location	*Condition*	*District Priority*
Santa Barbara County		
Route 154		
At/near Summit (approximate PM 24.5)	Freezing, Rain, Wind, Fog	H
East of Summit (btwn summit and Rte 246)	Freezing, Rain, Wind, Fog	M
West of Summit (btwn summit and Rte 192)	Freezing, Rain, Wind, Fog	M
Route 101		
Near the 1/101 Junction	Rain, Wind, Fog	M
San Luis Obispo County		
Route 41		
Near Cottonwood Pass (approx. PM 50)	Freezing, Rain, Wind	M
Route 101		
At/near Cuesta Grade Summit (approx. PM 35)	Freezing, Rain, Wind, Fog	H
Monterey County		
Route 1		
Near Big Sur (approx. PM 40)	Rain, Wind, Fog	L
Route 101		
Btwn King City and Prunedale (PM 40/95)	Rain, Wind, Fog	L
Santa Cruz County		
Route 9		
At/near Summit (approximate PM 21)	Freezing, Rain, Wind, Fog	M
Route 17		
At/near Summit (approximate PM 12.5)	Freezing, Rain, Wind, Fog	H

Legend
L= Low
M= Medium
H= High

District 6

Initial Phone Interview

Name: Diana Gomez
Title: Chief, Office of Traffic Management
Address: 1352 W. Olive
Fresno, CA 93728
E-mail address: Diana_Gomez@dot.ca.gov
Phone number: (559) 488-4163

QUESTION: How many RWIS stations do you have in your District? The data we have from the Caltrans Transportation Management Systems Baseline Inventory indicates that you have _12__ sites in operations, __0___ under construction, __2__ in the design and requirements phase, and __40__ in the planning phase. [but the GIS data we received from headquarters indicates that you have _12___ in operations.]

ANSWER:

__12__ operational __0____ under construction __2_____ design__40__ planned

QUESTION: Is there an internet site or a computer application for your District that displays the RWIS readings or locations?

ANSWER: There is no internet site.

QUESTION: Could you give a general description of the RWIS activities in your District?

ANSWER: The primary use is the visibility sensors. We use the visibility sensors for two operations:

1. Operation Fog

2. Operation Snowflake

Operation Fog: Used to gather what the visibility is at any time during the day; based on the answer we get from RWIS, and that's the level of operation that we're under. We also collect humidity, precipitation, wind. Visibility is the most important thing to us.

QUESTION: How receptive has staff generally been to RWIS innovations? What is their attitude towards RWIS?

ANSWER: We've had it for a long time. This is not a new innovation here. The staff just sees it as another tool that they can use to do their jobs better. They have no problem with them.

QUESTION: Is there any additional information that would help us to attain a better understanding of the current condition of the RWIS in your District?

ANSWER: We would like some more RWIS systems. We would like it if our RWIS talked to our message signs and stuff like that.

QUESTION: Can you tell us of some agencies outside of Caltrans that may serve as potential partners in road weather information? These may include private interests, agencies with weather stations, local transportation centers or county DOT's, and/or neighboring state DOT's.

ANSWER: Nevada DOT

Inventory Survey

General Information

What criteria does your district use in selecting RWIS equipment, software, communications systems, and locations?

We have been using two criteria:

1. **Locations that exhibit severe fog and or wind conditions. We have placed them on the two major routes only, but are aware of the need to expand to other routes.**

2. **We are now considering routes that lead into high elevations and the national parks. We will use them to help us better identify adverse ice and snow conditions.**

Communications use dial up exclusively, due to the capabilities specified by the vendor. All our RWIS are from the same vendor we. There are no plans to change vendor due to the considerable investment.

How many people in your district are trained to use the RWIS information? **19**

How many people are trained to maintain the roadside RWIS site? **10**

Communication Systems

Please describe the communication system for your RWIS. If you have more than one type, please describe each. Include:

- Technology (Fiber, Spread Spectrum, dial-up telephone, twisted pair, etc.)
- Possible update frequency (once every n minutes)
- Plans for upgrade

1. **Currently we are using dial telephone. All local Weather stations are polled every 5 min. and long distance locations, every ½ hour or when needed. During the summer months they are all polled once every hour.**

2. **We have no plans for upgrade to anything else.**

User Interfaces

Please describe the RWIS user interface. If you have more than one type, please describe each. Include:

- Name (ScanCast, etc.)

SSI Scan Software

- Platform (Windows, Web, DOS, etc.)

Windows based, with web access

- Who can access the user interface (e.g. dispatch in Maintenance Office x, y and z; maintenance at the district office, traffic operators, etc.)

TMC and Maintenance and District employees, anyone can view the data that has Intranet access and the IP address to the SCAN Server.

- Developer (e.g. SSI, Caltrans, etc.)

SSI

- Description of Integration with Traffic Management Center

The display and control are housed in the TMC and completely controlled by the TMC

- Description of how it works

The CPU (server) in the TMC polls the RWIS and updates the web page.

Central Processor

Please describe the RWIS central processor. If you have more than one type, please describe each. Include:

- Location (e.g., district office TMC, maintenance office, etc.) **TMC**

- Developer/provider (e.g. SSI, Caltrans, etc.) SSI

- Description of computer specifications

The computer must have the following or better: Pentium Class 500 Mhz. Processor,128MB SDRAM, 256K pipeline burst SRAM, PCI local-bus graphics accelerator with 2MB DRAM, 2.5GB EIDE hard drive, 3.5" 1.44MB diskette drive, 4GB internal tape drive, 3 serial ports, 10base T Ethernet Network Card, 12X CD-ROM, 33.6K baud external modem, uninterrupted power supply, Mid Tower Case, 104+ keyboard. All are required to be NT Compatible.

- Data Storage Information
  - Frequency of storage: (e.g. every 10 min)

    Currently we are using dial telephone. All local Weather stations are polled every 5 min. and long distance locations, every ½ hour or when needed. During the summer months they are all polled once every hour.

  - Months of storage

    Theoretically all of the data is present from the inception of the system, but presently, the TMC does not perform any analysis on the data. The TMC interest is on current conditions.

- Description of data stored
  All of the displayed data.

- Issues accessing stored data
  None

Contacts

Name	Contact Info
Sergio Venegas	**559-445-5483**
David Martinez	**559-445-6166**
Ralph Caigiano	**559-445-6166**
John Reynolds	**559-488-4152**

District Visit Notes

January 30, 2002

Attendance

Name	Email	Position
Diana Gomez	Diana.Gomez@dot.ca.gov	TMC Support
Anthony Lopez	Anthony.r.lopez@dot.ca.gov	TMC support
Sergio Venegas	Sergio.venegas@dot.ca.gov	TMC support
David Martinez		TMC operator

RWIS Usage

- Uses SSI system
- Use DTN (Meteorlogix) as a forecasting system

History

- In 1991 maintenance requested RWIS to monitor ice on bridges
- Large accidents precipitated the Operations Fog, Snowflake, and Operation Wind
- D6 has been trained to calibrate their own RWIS stations

Current

- Currently 12 RWIS sites
- RWIS alarms TMC operator of poor visibility; TMC requests CHP officer to verify before TMC posts messages on CMS
- CHP is used to visually report hazardous conditions
- Used to determine fog, wind, sand/dust conditions
- Currently have a contract with SSI
- District staff perform calibration once a month; had problems with the contract performing the maintenance
- D6 uses sand, not salt, to remove ice
- Training is done for TMC once a year

- Since changes in operations related to fog problems have been in place, including implementation of RWIS, fog-related collisions have decreased

Forecast Services

- DTN (Meteorlogix)
- Tried fog forecasting from SSI, gave up because unable to predict

RWIS Goals

- An analysis of Cost/Benefit should be done

The District reviewed a list of potential high level requirements and supported the following items:

- Caltrans shall incorporate road weather information into a statewide traveler information web page (ranked 6th)
- Weather information shall be incorporated into the ATMS (ranked 2nd – H)
- Caltrans shall develop consistent statewide recommendations for RWIS field equipment (ranked 1st – H)
- Caltrans shall identify policies and procedures to build confidence in RWIS (how do you interpret the data so you feel comfortable using it) (ranked 3rd – H)
- Caltrans shall implement a standard communications protocol for RWIS (ranked 4th)
- Caltrans shall build relationships with other agencies to share information (ranked 5th)
- Caltrans shall incorporate road weather information into 511 (ranked 6th)

Partnerships

- MOU with NWS to provide RWIS data currently in place

Best Practices

- Calibrate their equipment
- Trains TMC operators every year on procedures/policy including RWIS

Discussion Points

- Contract with SSI: D6 owns data.
- D6 does not want their data on the Internet.
- Should be Caltrans' HQ policy as to how data goes to public.
- Noted that SSI told them that SSI was NTCIP compliant, but no test available to prove it.
- Reports are attempting to standardize management of weather events; CMS messages, etc.
- Research ideas: 1) practices for driving safely in fog; 2) seeding "fluffy fog" (Tulle fog) to dissipate.

District 7

District Visit Notes

January 27, 2002

Attendance:

Name	Email	Position
Jerry Holcombe		Caltrans Superintendent
Lee Benjamin		CMS
Chris Erskine	Chris_erskine@dot.ca.gov	CSM
Dennis Stubblefield		CHML
Chuck Webster	Chuck_Webster@dot.ca.gov	
Tom Pellerman		CMS
Jeff Aragaki		TMC Operator

RWIS Usage

- SSI equipment. SSI staff has been very helpful.
- ScanWeb that CHP and any partner with the IP address can access. Upgraded from a desktop DOS system in 2000
- D7 maintenance staff in North Maintenance region use RWIS
- Construction could use RWIS information but only does so infrequently
- TMC traffic operators have access to ScanWeb but rarely use it

History

- Began using RWIS in 1990 at three sites: Tejon, Lee Avery, and Fraizer
- Installed as another tool to schedule maintenance staff
- In 1993-94 five more sites were added: Youngs Hill, I5, Vincent, Ave D, Big Rock
- District staff identified the installed sites. They have found that they are slightly constrained with those sites.
- District not recognized as snow district, yet Interstate 5 has snow/ice problems every winter
- Snow line is 3 – 10 miles long in variable terrain on I-5 Grapevine. Also have snow and ice problems on SR 14 and SR 2. Policy is to never require chains and to always keep I-5 open. Fog and rain are also problems on these roads.

Current

- Uses RWIS for scheduling crews for winter road maintenance.
- Visibility can be checked at sites by users through CCTV (7 of 8 sites have cameras). In addition, three sites have visibility sensors.
- CHP in area uses RWIS (or at least has access)
- NWS and DTN (Meteorlogix) radar pictures are also used
- TMC can access CCTV that are at RWIS through the ScanWeb site. Maintenance cannot access the cameras used through ATMS that traffic operations has installed.

- Usually, TMC operators gets weather conditions in region by calling maintenance and accessing. They also can access the ScanWeb site.
- D9 information is accessible through D7 computers. D7 is working with SSI to share data with D8.
- Maintenance staff participating in meeting do not want information given to the public. They currently have an agreement with SSI to not share data with the public.
- It takes 10 to 20 minutes for maintenance foreman to analyze the RWIS data and make decisions. This is a detriment to full use of system.
- Participants in meeting felt that they received enough training on RWIS

Planned

- Add height to cameras for greater visibility
- Through discussion at this meeting, participants identified 6 sites in problem areas

Forecast Services

- Scan Cast forecasts on three stations (Tejon, Whitaker, and Frazier Park)
- Maintenance have mixed feelings on the quality of forecasts. Some felt that the forecasts were very accurate but others felt some forecasts were not accurate
- District maintenance staff communicates with SSI forecasters about the quality of forecasts.
- Maintenance and traffic operators also use public forecasts from NWS and other sources
- DTN (Meteorlogix) is available in the TMC and for maintenance

RWIS Goals

- Use information from other districts to determine where the weather is coming from
- Universal integration of RWIS for all agencies
- Place RWIS at better sites
- Allow maintenance to access the cameras from TMC
- Linked system by whatever means to TMC and other Districts
- Statewide system for maintenance
- Allow district to place RWIS devices
- Build relationships with other agencies

In the context of the potential high level requirements, the District staff we met with supported the following items:

- Caltrans Districts shall work together to develop an improved maintenance computer application for decision support for Caltrans maintenance
- Caltrans shall develop consistent statewide recommendations for RWIS needs and siting (Allow the Districts to choose the sites)
- Caltrans shall implement a standard communications protocol for RWIS
- Caltrans shall build relationships with other agencies to share information

Partners

Interested in pursuing better partnerships related to RWIS with:

- LA County (which has used Caltrans RWIS data previously)
- California Department of Forestry
- D7 TMC/traffic operations, which has cameras for ATMS that can be helpful to maintenance.
- CHP (always talks with Caltrans about weather data)

District 8

Initial Phone Interview

Name: Bob Jeannotte
Title: Associate Transportation Electrical Engineer
Address: 464 W. 4th Street, 6th floor; Mailstop #1060; San Bernardino, CA 92401-1400
E-mail address: Bob_Jeannotte@dot.ca.gov
Phone number: (909) 383-4157
Some questions answered by Tom Ainsworth at (909) 383-4535

QUESTION: How many RWIS stations do you have in your District? The data we have from the Caltrans Transportation Management Systems Baseline Inventory indicates that you have _16__ sites in operations, __2___ under construction, __0__ in the design and requirements phase, and __54__ in the planning phase. [but the GIS data we received from headquarters indicates that you have __16__ in operations.]

ANSWER:

__16__ operational ___4___ under construction ___0____ design__??__ planned

QUESTION: Is there an internet site or a computer application for your District that displays the RWIS readings or locations?

ANSWER(Tom Anesworth): Yes there is

QUESTION: To obtain a better understanding of the RWIS in your District, we also request that you send us any documentation about the equipment or use of RWIS. To make this easier for you, we will include a checklist of documents that you may have with the inventory survey. The list includes, but is not limited to, database specifications, RWIS design documents, training and user manuals, and winter level of service maps and system descriptions.

ANSWER: The same training manuals are used in all the Districts, because Caltrans gets their equipment from the same company---don't want doubles!

QUESTION: Could you give a general description of the RWIS activities in your District?

ANSWER: It is used for snow and anti-icing, as well as blowing sand.

Each District defines a need for RWIS, and system does that:

Dust Storms

Snow/Ice

Sand Storms

Wouldn't have RWIS in an area without any peculiar weather

QUESTION: How receptive has staff generally been to RWIS innovations? What is their attitude towards RWIS?

ANSWER: They like them because it helps the public know the weather. This is a tool that they didn't have before. RWIS prevents having snow removal crews up on the mountain all night long. This saves overtime pay.

QUESTION: Is there any additional information that would help us to attain a better understanding of the current condition of the RWIS in your District?

ANSWER: It is difficult to get the information on the Internet or to interface it with something else because RWIS manufacturers have propriety software that goes with the system. Too much "secret stuff"

QUESTION: Can you tell us of some agencies outside of Caltrans that may serve as potential partners in road weather information? These may include private interests, agencies with weather stations, local transportation centers or county DOT's, and/or neighboring state DOT's.

ANSWER(Tom Ainsworth): AQMD(Air Quality and Management District)

In particular to measure the amount of particulates in the air around construction projects.

Inventory Survey

General Information

What criteria does your district use in selecting RWIS equipment, software, communications systems, and locations?

Equipment: Tried to use equipment that was compatibile with and could communicate with RWIS equipment in neighboring Districts whose weather information is helpful to us.

Communications Systems: Try to use the cheapest/month system

Locations: Try to select locations that are most helpful to District TMC, local maintenance forces that are in the most severe weather locations

How many people in your district are trained to use the RWIS information? **Approx 15**

How many people are trained to maintain the roadside RWIS site? **Approx 10**

Communication Systems

Please describe the communication system for your RWIS. If you have more than one type, please describe each. Include:

- Technology (Fiber, Spread Spectrum, dial-up telephone, twisted pair, etc.)
- Possible update frequency (once every n minutes)

- Plans for upgrade

- **Twisted pair to server (1 site - #812)**
- **Conventional telephone lines (4 sites - #809, #810, #815, #816)**
- **Cellular telephone (1 site - #811)**
- **Low band wireless radio (8 sites - #801 through & including #814)**

Ethernet links via T-1 telephone lines from one central processor to the TMC – using same Ethernet link as used by the maintenance offices for non-RWIS purposes. Currently a dial-up telephone line from the other central processor (low dessert) to the TMC in District office (San Bernardino)

User Interfaces

Please describe the RWIS user interface. If you have more than one type, please describe each. Include:

- Name (ScanCast, etc.) **ScanCast**
- Platform (Windows, Web, DOS, etc.) **Windows**
- Who can access the user interface (e.g. dispatch in Maintenance Office x, y and z; maintenance at the district office, traffic operators, etc.)

  Dispatch in Cajon Maintenance Office, dispatch in Indio Comm Center, laptop computers of select Maintenance Supervisors. TMC operators and select supervisors in TMC environment

- Developer (e.g. SSI, Caltrans, etc.) **SSI**
- Description of Integration with Traffic Management Center
- Description of how it works

PC in TMC running SSI software accesses the RWIS Central Processors (via Ethernet Network to the Cajon Processor and via dial-up to the Indio CHP Comm Center Processor) and accesses data on the processor. Indio processor will be put on an Ethernet network to the TMC in the near future. There is also an automatic call out system that the RWIS has preset thresholds of wind speed, visibility and icing conditions that automatically pates/telephones pre selected maintenance personnel.

Central Processor

Please describe the RWIS central processor. If you have more than one type, please describe each. Include:

- Location (e.g., district office TMC, maintenance office, etc.)
  - **In Cajon Pass for High Desert (#809-#816)**
  - **CHP Comm Center in Indio for low desert (#801-#808)**
- Developer/provider (e.g. SSI, Caltrans, etc.) **SSI**
- Description of computer specifications **Pentium PC**
- Data Storage Information

- Frequency of storage: (e.g. every 10 min) **Storage every 10 minutes at Cajon Central Processor; ever 30 minutes at Indio CHP Communications Center Central Processor**
- Months of storage **12 months**
- Description of data stored **everything available**

- Issues accessing stored data **It comes out in a proprietary format that makes it more difficult to disperse – for example over the Internet. It would be better if it was in a standard format such as Excel that is more universal**

Contacts

Bob Sutton	**760-249-3251**
Tom Ainsworth	**909-383-4565**
Alan Kirst	**909-383-6446**
Steve Pucket	**909-383-4286**

District Visit Notes

January 31, 2002

Attendance:

Name	Email	Position
Alan Kirst	Allen.kirst@dot.ca.gov	TMC Ops Manager
Tom Ainsworth	Thomas.ainsworth@dot.ca.gov	Freeway Systems
Martin Squires		Electrician II
Paul Glass	Paul_glass@dot.ca.gov	North Region Contracts
Bob Jeannotte	Bob_jeannotte@dot.ca.gov	Electrical Design
Bob Sutton	Bob.sutton@dot.ca.gov	Maint Superintendent
Steve Puckett		Electrical MTCE

RWIS Usage

- SSI, using old SSI DOS program

History

- Began using RWIS in 1999 in Cajon Pass for wind, visibility, and winter operations. Installation pursued due to 150-car fog accident
- TMC asked maintenance to assist in sighting and using RWIS

Current

- 17 RWIS sites
- 8 wireless RWIS sites in the desert
- Workstation located in one maintenance station and TMC
- Most RWIS elements are not near other field elements
- Maintenance does not see RWIS as reliable; TMC has more confidence.
- Caltrans maintains and calibrates RWIS

- District owns their own equipment
- District wants access to RWIS data so TMC can configure data for their own custom uses. SSI has not yet provided this.
- 3 CCTV on Cajon pass
- Don't have access to other District data, and don't want it
- Do not want CMS automatically triggered by RWIS
- District uses salt and cinders before a storm. They clean up after every storm, screen out foreign objects, and reuse the cinders. Salt is used in an anti-icing capacity, placed before the storm hits instead of afterwards.

Planned

- 30 to 40 more sites are planned on I-15, I-215, and SR-60

Forecast Services

- ScanCast - Cajon pass only

RWIS Goals

- Need alarms for wind and visibility issues
- A user-configurable display
- Caltrans needs consistent specifications and a non-proprietary system throughout the state
- Want web based information to give to CHP
- One agreement is needed between Caltrans and SSI
- More than eight hours of training is needed
- More reliable forecasts

The District reviewed a list of potential high level requirements and supported the following items:

- Caltrans Districts shall work together to develop an improved maintenance computer application for decision support for Caltrans maintenance (M)
- Caltrans shall incorporate road weather information into a statewide traveler information web page (M)
- Weather information shall be incorporated into the ATMS (M)
- Caltrans shall develop consistent statewide recommendations for RWIS needs and siting (M)
- Caltrans shall develop consistent statewide recommendations for RWIS field equipment (H)
- Caltrans shall develop consistent statewide recommendations for forecasting services (M)
- Caltrans shall implement a standard communications protocol for RWIS (H)
- Caltrans shall build relationships with other agencies to share information (L)
- Caltrans shall incorporate road weather information into 511 (M)

Partners

- District would like to give CHP RWIS data via web. Roadweather from SSI may accomplish that.
- Work with Ontario Airport to exchange information about wind.

Potential partners include

- Air Quality Management District (AQMD)
- Southern California Association of Governments (SCAG)

District 9

Initial Phone Interview

Name: Jon Patzer
Title: Electrical Engineer
Address: Bishop, CA
E-mail address: Jon_Patzer@dot.ca.gov
Phone number: (760) 872-5246

QUESTION: How many RWIS stations do you have in your District? The data we have from the Caltrans Transportation Management Systems Baseline Inventory indicates that you have _3_sites in operations, __0__ under construction, _0__ in the design and requirements phase, and _3__ in the planning phase. [but the GIS data we received from headquarters indicates that you have _3__ in operations.]

ANSWER:

_3__ operational ___0__ under construction ___0___ design _3__ planned

QUESTION: Is there an internet site or a computer application for your District that displays the RWIS readings or locations?

ANSWER: The information goes to the Scan system, not to Caltrans. Part of their license is that we can access all their information anywhere in the world over the Internet. They have information available to anyone that subscribes to the system. Caltrans can not tap into the raw data.

Phil Graham: There is a web-site, RoadWeather.com, that public can access for the SSI information. Can't access raw data. Data presented in an understandable manner.

QUESTION: To obtain a better understanding of the RWIS in your District, we also request that you send us any documentation about the equipment or use of RWIS. To make this easier for you, we will include a checklist of documents that you may have with the inventory survey. The list includes, but is not limited to, database specifications, RWIS design documents, training and user manuals, and winter level of service maps and system descriptions.

ANSWER: The Scan system put everything together; all D9 did was pick locations. The equipment list was provided, contract was written, design was done, construction contractor was provided. D9 did nothing but fund it.

QUESTION: Could you give a general description of the RWIS activities in your District?

ANSWER: The dispatch uses it. They put it up as a dial-up connection at a site that wasn't in their District, and the long distance calls were becoming very expensive. Maintenance division only has a monochrome monitor that they use to view the information.

QUESTION: How receptive has staff generally been to RWIS innovations? What is their attitude towards RWIS?

ANSWER: RWIS is basically a "labor-saving device" They implemented the system because it saves on labor costs. The old way was to have a guy sit up on the pass and watch the road. If it looked bad, he would radio dispatch and they would get the trucks up there. The RWIS system "does the watching"

For the cost of the system, you could pay somebody to sit up there for a long time.

QUESTION: Is there any additional information that would help us to attain a better understanding of the current condition of the RWIS in your District?

ANSWER: The Mohave Maintenance Division is a couple of hundred miles away from the traffic engineering office; it is difficult for us in Bishop to know what they're doing on a daily basis.

Phil Graham: Need to reach a saturation point with the RWIS sites; weather can change within several miles in the mountains. Not enough sites to give accurate forecasting. Some of the problem is communication; they don't have fiber optic cable running along the rural roads. They must rely on cellular phones and radios; this is a big problem in the mountains where signals are not good, and radio is only good for a couple of miles. Don't see D9 becoming a high-tech RWIS District because they don't have the volumes to justify the costs. They would like more, but through cost-benefit analysis, the general consensus was that at 41,000 + per site,(especially maintenance) didn't see RWIS as a big part of their 10-year ITS plan.

They have a black and white monitor and a DOS operating system to interpret the RWIS information. This system requires subscription; it is not much more informative than free information off the Web. This system is totally obsolete; everything is on the Web now.

QUESTION: Can you tell us of some agencies outside of Caltrans that may serve as potential partners in road weather information? These may include private interests, agencies with weather stations, local transportation centers or county DOT's, and/or neighboring state DOT's.

Phil Graham: Local airports, county offices, forest service. Weatherchannel.com information is taken at the local airports, so possibility there.

Inventory Survey

General Information

What criteria does your district use in selecting RWIS equipment, software, communications systems, and locations?

How many people in your district are trained to use the RWIS information?

How many people are trained to maintain the roadside RWIS site?

Communication Systems

Please describe the communication system for your RWIS. If you have more than one type, please describe each. Include:

- Technology (Fiber, Spread Spectrum, dial-up telephone, twisted pair, etc.)
- Possible update frequency (once every n minutes)
- Plans for upgrade

User Interfaces

Please describe the RWIS user interface. If you have more than one type, please describe each. Include:

- Name (ScanCast, etc.)
- Platform (Windows, Web, DOS, etc.)
- Who can access the user interface (e.g. dispatch in Maintenance Office x, y and z; maintenance at the district office, traffic operators, etc.)
- Developer (e.g. SSI, Caltrans, etc.)
- Description of Integration with Traffic Management Center
- Description of how it works

Central Processor

Please describe the RWIS central processor. If you have more than one type, please describe each. Include:

- Location (e.g., district office TMC, maintenance office, etc.)
- Developer/provider (e.g. SSI, Caltrans, etc.)
- Description of computer specifications
- Data Storage Information
  - Frequency of storage: (e.g. every 10 min)
  - Months of storage
  - Description of data stored
- Issues accessing stored data

Contacts

District Visit Notes

February 1, 2002

Attendance

Name	Email	Position
Phil Graham	Phil_graham@dot.ca.gov	TE Electrical
Bob Rubinstein	Robert_rubinstein@dot.ca.gov	Transportation Engineering Tech
Jon Patzer	Jon_patzer@dot.ca.gov	Transportation Elictrical Engineer

RWIS Usage

- SSI - old DOS program
- ScanWeb

History

- Began using in 1992
- In 1994 developed a 10-year plan and proposed 20 new sites

Current

- 3 current RWIS sites
- Mojave Maintenance uses old DOS site
- District office has ScanWeb
- Maintenance uncomfortable with RWIS
- Using personnel to patrol and report conditions when plowing is needed

Planned

- None

Forecast Services

- ScanCast recently contracted. Working with SSI and expecting one year of calibration on forecasts
- DTN (Meteorlogix) services used

RWIS Goals

- Incorporating RWIS information into ATMS
- Notification of conditions via a pager or in-vehicle display
- Implement a standard communication protocol

The District reviewed a list of potential high level requirements and supported the following items:

- Caltrans Districts shall work together to develop an improved maintenance computer application for decision support for Caltrans maintenance (No more computers, though) (M)
- Caltrans shall incorporate road weather information into a statewide traveler information web page (ML)

- Weather information shall be incorporated into the ATMS (H)
- Caltrans shall develop consistent statewide recommendations for RWIS field equipment (M)
- Caltrans shall develop consistent statewide recommendations for forecasting services (M)
- Caltrans shall implement a standard communications protocol for RWIS (H)
- Caltrans shall develop capabilities to access RWIS data and other road weather information from the field (H)
- Caltrans shall build relationships with other agencies to share information (M)
- Caltrans shall incorporate road weather information into 511 (M)

Partners

Potential partners for RWIS:

- IntraWest – owners of Mammoth Ski Resort
- Edison
- DWP
- BLM
- All have WIS stations in the area

District 10

No information collected

District 11

Initial Phone Interview

Name: Anupkumar Khant
Title: Transportation Engineer Electrical
Address: 7183 Opportunity Rd
San Diego, CA 92111
E-mail address: anupkumar_khant@dot.ca.gov or akhant@dot.ca.gov
Phone number: (858)467-3031

Anupkumar is from the Traffic Management Center. The weather stations in District 11 are used by the East County Maintenance Station:

Descanso Station
24171 Japatula Road
Descanso, CA 91901

Anupkumar met with maintenance users and wrote up answers to these questions.

QUESTION: How many RWIS stations do you have in your District? The data we have from the Caltrans Transportation Management Systems Baseline Inventory indicates that you have __0_ sites in operations, ___0__ under construction, __0__ in the design and requirements phase, and ___0_ in the planning phase. [but the GIS data we received from headquarters indicates that you have __0__ in operations.]

ANSWER:

6 operational, unknown under construction , unknown design, unknown planned

QUESTION: Is there an internet site or a computer application for your District that displays the RWIS readings or locations?

ANSWER:

Information is not available through a computer site directly to the TMC. The maintenance station has access to the RWIS data through a computer application (type unknown). Communications between the maintenance station and the RWIS are through wireless. Information is sent to the TMC from the maintenance station via email.

QUESTION: Could you give a general description of the RWIS activities in your District?

ANSWER:

The weather stations are used in the mountainous eastern portion of the [San Diego] county. This is the region of the District that can receive snow from November to March. The weather information is

emailed from the maintenance station to the TMC, although I am not sure about the content of the email. I will get more information on that. The TMC then can put messages on the CMS related to traveling conditions near the stations. The maintenance station also has control of CMS and can place messages from Descanso.

The other source of information is the DTN (Meteorlogix) weather information available via satellite. An agency in Seattle provides this information.

QUESTION: How receptive has staff generally been to RWIS innovations? What is their attitude towards RWIS?

ANSWER:

Not aware

QUESTION: Can you tell us of some agencies outside of Caltrans that may serve as potential partners in road weather information? These may include private interests, agencies with weather stations, local transportation centers or county DOT's, and/or neighboring state DOT's.

ANSWER:

Although not sure of the details, District 11 has a partnership with the DTN satellite weather information. There is also a private company that provides data. Will get more detail.

Inventory Survey

General Information

What criteria does your district use in selecting RWIS equipment, software, communications systems, and locations?

Strategic location in certain regions where freeway weather is of prime concern in providing up to date road weather information to the travelling public.

How many people in your district are trained to use the RWIS information? **4 people**

How many people are trained to maintain the roadside RWIS site? **2 Caltrans people (The Department also has an annual maintenance contract with the vendor Vaisala.)**

Communication Systems

Please describe the communication system for your RWIS. If you have more than one type, please describe each. Include:

- Technology (Fiber, Spread Spectrum, dial-up telephone, twisted pair, etc.)
- Possible update frequency (once every n minutes)
- Plans for upgrade

- **Dial-up Cellular Wireless Communication with adjustable polling rate.**
- **The polling rate is variable from seconds to hours.**
- **Since the technology is getting older the district is looking in to upgrading the existing systems.**

User Interfaces

Please describe the RWIS user interface. If you have more than one type, please describe each. Include:

- Name (ScanCast, etc.) **IceCast Viewer Rev 4.5**
- Platform (Windows, Web, DOS, etc.) **DOS Based**
- Who can access the user interface (e.g. dispatch in Maintenance Office x, y and z; maintenance at the district office, traffic operators, etc.) **Descanso Maintenance Office only**
- Developer (e.g. SSI, Caltrans, etc.) **Vaisala TMI Ltd., UK**
- Description of Integration with Traffic Management Center **Only Verbal**
- Description of how it works **Enclosed find a copy of User Manual**

Central Processor

Please describe the RWIS central processor. If you have more than one type, please describe each. Include:

- Location (e.g., district office TMC, maintenance office, etc.) **Descanso Maintenance Station**
- Developer/provider (e.g. SSI, Caltrans, etc.) **Vaisala TMI Ltd., UK**
- Description of computer specifications **Standalone Gateway Pentium PC**
- Data Storage Information
  - Frequency of storage: (e.g. every 10 min) **Varies from every 10 min to every Hour in Summer.**
  - Months of storage **Currently Data is available from Sept. 98 until current.**
  - Description of data stored **Locally on the PC no backup is available.**
  - Issues accessing stored data **Prefer but not available Secondary storage external to the PC**

Contacts

Name	Contact Info
Mark Ross - Station Supervisor	**619-445-2673**
Coy Hudson - Lead	**619-445-2673**
John Philips	**619-445-2673**
Jim Larson	**619-445-2673**

Karen Wallace D-11 TMC	**858-467-3203**
Anupkumar Khant, TEE Traffic Ops	**858-467-3031**

District Visit Notes

Attendance

Name	Email	Position
Anupkumar Khant	Anupkumar_khant@dot.ca.gov	Transportation Engineer Electrical
David Dutcher		TMC Supervisor
Barbara		TMC Operator
Mark Ross		Maintenance Station Supervisor

RWIS Usage

- 8 stations in eastern San Diego County
- Vaisala systems installed in 1994
- Locations on I-8 receives snow, ice, wind
- Used primarily for maintenance

Current

- Data from stations is available only from dedicated workstation at Region 1 Maintenance headquarters (no web access)
- TMC staff cannot access station data
- RWIS polling frequency is changeable. It runs at every 15 minutes during stormy season, twice daily during summer
- Communications to RWIS via cellular
- Initial system trouble shooting is conducted by primary maintenance user. Vaisala staff will visit at least annually. Help desk is available.
- Three maintenance staff know how to use RWIS

Planned

- No known expansion plans

Forecast Services

- Service provided November-March from Northwest Weather Net from Seattle at $240-$270 per month
- Forecasts sent via email to maintenance staff at least once a day. Afternoon update sent if needed. Access from home possible.
- Maintenance is satisfied with service. Forecasting is more accurate than commercial data, but not all storms are caught. In late April region received a storm that was
- Forecasts have saved money in dispatch
- Forecasts were accurate immediately.

RWIS Goals

- Traffic operators present would support incorporation of RWIS into ATMS only if there is easy access and it is user friendly.
- Support training once a system is installed and operating properly – too many experiences receiving training on a system before it is operational.

- TMC staff supports sharing data if resources are available for problems. They did not want the burden put on the operators to receive complaint calls when data is not functioning properly.

The staff present reviewed a list of potential high level requirements and supported the following items:

- Caltrans Districts shall work together to develop an improved maintenance computer application for decision support for Caltrans maintenance (H)
- Caltrans shall incorporate road weather information into a statewide traveler information web page (H)
- Weather information shall be incorporated into the ATMS (M)
- Caltrans shall implement a standard communications protocol for RWIS (L)
- Caltrans shall build relationships with other agencies to share information (M)
- Caltrans shall incorporate road weather information into 511 (L)

Other Issues

- Maintenance feels that a wind alarm is not needed. CHP will call responsible Caltrans staff at home when needed. Traffic will not stop due to wind until a truck blows over.
- Solar panels on RWIS were initially stolen. Then the panels were raised and there hasn't been any issues.
- District has a no chain control policy and a clear pavement policy. Maintenance will use salt on roads.
- CMS on I-8 in eastern San Diego County are controlled by maintenance staff 8am – 5pm. TMC operators control signs 5pm – 8am except Sundays. Maintenance can also control signs from home.
- CMS in metropolitan area are not used for weather-related messages.
- Snow in area with RWIS attracts people to region and causes more traffic
- DTN (Meteorlogix) is running at maintenance yards in Santee, El Centro, Descanso, and Lake Henshaw. The system will be upgraded to the new Meteorlogix system this year.

District 12

District Visit Notes

January 29, 2002. Visited new TMC building, then the District Office.

Attendance

Name	Email	Position
Sheridad Deravi		
Faed Nowshiran		

RWIS Usage

- D12 has no RWIS stations

History

- 10 to 15 days a year with rain
- Fog can be an issue on SR 73, San Joaquin Hills Corridor because it goes through coastal mountains and road goes over the summit
- SR 74 Ortega Highway goes through inland mountains to D8 and gets rain, snow, and landslides occasionally
- SR 1 Pacific Coast Highway floods during high tide occasionally
- SR 241 goes through inland mountains
- Being a technology leader, D12 has expressed interest in using RWIS

Current

- D12 currently has no RWIS sites
- Used to have Doppler radar information. Now use local weather information.
- Meeting participants are concerned with legal issues related to traveler information
- Construction work is contracted out. RWIS could be useful to schedule crews.
- Maintenance work is done by Caltrans

RWIS Goals

- Integrate into ATMS
- Access to RWIS data from the field
- Standard communications protocol

The District reviewed a list of potential high level requirements and supported the following items:

- Caltrans Districts shall work together to develop an improved maintenance computer application for decision support for Caltrans maintenance (M)
- Caltrans shall incorporate road weather information into a statewide traveler information web page (M)
- Weather information shall be incorporated into the ATMS (M)

- Caltrans shall develop consistent statewide recommendations for RWIS needs and siting (H)
- Caltrans shall develop consistent statewide recommendations for RWIS field equipment (M)
- Caltrans shall develop consistent statewide recommendations for forecasting services (M)
- Caltrans shall implement a standard communications protocol for RWIS (H)
- Caltrans shall develop capabilities to access RWIS data and other road weather information from the field (H)
- Caltrans shall build relationships with other agencies to share information (M)

Partners

- None identified

Caltrans Headquarters

Initial Phone Interview

Name: James Gilliam

Title: Transportation Engineer (Electrical), Caltrans Engineering Division

Address: 1727 30th Street; Sacramento, CA 95816

E-mail address: James_Gilliam@dot.ca.gov

Phone number: (916) 227-6258

Current RWIS Use

- RWIS has not been standardized; we're trying to make these systems compatible
- SSI's proprietary system locks you into buying more SSI systems
- Most current systems require a third party contractor to interpret raw field data
- RWIS is a controversial expenditure with some maintenance staff: "We can look outside and see that it is snowing."

RWIS Goals

- DOT Engineering wants to move toward an open architecture
- Either build own system with open architecture or let SSI take over
- Taking raw data and converting it into a form that is useable to a non-technical person has value. Data should be presented in a generic format that anybody can interpret.

Contacts

- Rick Nelson, Nevada DOT
- Arturo Robles, District 2 (has installed approximately 12 RWIS systems), 530-232-4283 (pager)

Initial Phone Interview

Name: Jim Varney

Title: Program Advisor, Caltrans Maintenance Division

Address: P.O. Box 942873 (MS 31); Sacramento, CA 94273-0001

E-mail address: Jim_Varney@dot.ca.gov

Phone number: (916) 654-3523

Current RWIS Use

- RWIS is highly fragmented, not networked statewide, to allow statewide data to be viewed
- Data can't be shared with Caltrans and external agencies
- Primary benefit of current system is for local maintenance (i.e. anti-icing)

RWIS Goals

- Develop Internet site with data from all RWIS sites
- Develop statewide standards, including set of minimum RWIS requirements
- Link sites statewide, provide a higher level of service by incorporating meteorological component that provides real-time forecasting information
- Encourage private leadership to promote value of RWIS to the public
- Develop organized and coordinated maintenance plan to minimize station malfunctions
- Investigate availability of off the shelf software for use in system development, in order to decrease dependency on proprietary software

Partners (potential)

- Oregon DOT
- Metropolitan areas within California

E. References

1. Pisano, Paul. *Road Weather Management: Better Information and Tools Improve Operations, Save Lives*.

2. Han, Chunhua, and Erland O. Lukanen. *Evaluation of Road Weather Information Systems In Minnesota.* August 1994.

3. Briseno, Coco. Assess Caltrans Road Weather Information Systems (RWIS) Devices and Related Sensors. 2001.

4. Manual of Practice for an Effective Anti-Icing Program. U.S. Army Cold Regions and Engineering Laboratory, Corps of Engineers, February 1996.

5. Maintenance Decision Support System (MDSS) Project MDSS Prototype Development Plan. NCAR, NSSL, and MIT, June 2001.

6. The NTCIP Guide National Transportation Communications for ITS Protocol. Report NTCIP 9001 v02.06 (Draft). AASHTO, ITE, and NEMA, December 1999.

7. NTCIP Object Definitions for Environmental Sensor Systems (ESS) with Changes from Proposed Recommended Amendment #1 Shown. Joint AASHTO/ITE/NEMA Standards Publication TS3.7-1998. AASHTO, ITE, and NEMA, September 28, 1998.

8. Office of the Federal Coordinator of Meteorological Services and Supporting Research (OFCM). Federal Standards for Siting Meteorological Sensors at Airports. FCM-S4-1994. http://www.ofcm.gov/siting/text/a-cover.htm. August 1994.

9. Boselly, E. S., E.J. Thornes, and C. Ulburg. *Road Weather Information Systems Volume 1: Research Report*. Strategic Highway Research Program Publication – SHRP-H-35-, National Research Council, Washington, D.C., 1993.

10. Ishikawa, N., H. Narita, Kajiya. *Contributions of hear from traffic vehicles to snow melting on roads.* Transportation Research Record-Journal of The Transportation Research Board 1672. 1999.

11. Boselly, E. S., and D.D. Ernst. *Road Weather Information Systems Volume 2: Implementation Guide*. Strategic Highway Research Program Publication – SHRP-H-351, National Research Council, Washington, D.C., 1993.

12. Boselly, E.S. *Benefit/Cost Study of RWIS and Anti-Icing Technologies.* March 2001.

13. Strong, Chris, Robb Larson and Alan McAllistar. *Oregon Department of Transportation Intelligent Transportation Systems Maintenance Plan*. Western Transportation Institute, Montana State University – Bozeman, 1999.