A Review of Intelligent Transportation Systems
at the Wyoming Department of Transportation
(September 30, 1996)

Purpose:

The purpose of this review was to:

1. Determine the status of Intelligent Transportation System (ITS) user services in Wyoming.

2. A secondary purpose was to improve existing user services and report on the outlook for new and developing user services of value to Wyoming.

Scope:

This review consisted of a central office/headquarters review with personnel from the Highway Patrol, Motor Vehicle Services, Planning, Ports of Entry, Programming, Public Affairs, Telecommunications, and Traffic Operations. Discussions were conducted with these sections to determine and evaluate the status of ITS user services in Wyoming.

Review Personnel:

Jim Gaulke	WYDOT - Programming
Mark Eisenhart	WYDOT - Construction
William Harris	WYDOT - Ports of Entry
John Berg	FHWA

Findings and Recommendations:

The status of ITS user service in Wyoming is summarized on the table on the next page. Following this summary is a more detailed discussion of the status of each user service, including commentary on the potential of future deployment.

STATUS OF ITS USER SERVICES

BUNDLE	*USER SERVICE*	*Application*	*Active*	*WYDOT Division*	*OPERATIONAL STATUS*
1. Travel and Transportation Management	*1. En-Route Driver Info.*	*YES*	*X*	*District Main./Traffic*	*Changeable Message Signs (24)*
	2. Route Guidance				
	3. Travel Services Information	*YES*			
	4. Traffic Control				
	5. Incident Management				
	6. Emissions Testing and Militation				
2. Travel Demand Management	*1. Demand Management and Operations*				
	2. Pre-Trip Travel Information	*YES*	*X*	*Public Affairs Telecommunications*	*Road and Travel Report, RWIS (26) Video Monitor (3)*
	3. Ride Matching and Reservation				
3. Public Transportation Operations	*1. Public Transportation Management*	*YES*			*Proposal by STAR for MDT's, AVL, and computerized dispatch*
	2. En-Route Transit Information	*YES*			
	3. Personalized Public Transit	*YES*			
4. Electronic Payment	*1. Electronic Payment Services*				
5. Commercial Vehicle Operations	*1. Commercial Vehicle Electronic Clearance*	*YES*	*X*	*Ports of Entry Highway Patrol*	*Weigh-in-motion(3), PrePass*
	2. Automated Roadside Safety Inspection	*YES*	*X*	*Ports of Entry Highway Patrol*	*Pen-based Computers*
	3. On-board Safety Monitoring	*YES*			
	4. Commercial Vehicle Administrative Process	*YES*	*X*	*Ports of Entry Highway Patrol*	*Wyoming Quality Carrier, Statewide Client-Server Computer Network*
	5. Hazardous Material Incident Response	*YES*			
	6. Freight Mobility				
6. Emergency Management	*1. Emergency Notification and Personal Security*	*YES*			
	2. Emergency Vehicle Manag.				
7. Advanced Vehicle Control and Safety Systems	*1. Longitudinal Collision Avoidance*	*YES*			
	2. Lateral Collision Avoidance	*YES*			
	3. Intersection Collision Avoidance	*YES*			
	4. Vision Enhancement for Crash Avoidance	*YES*			
	5. Safety Readiness	*YES*			
	6. Pre-Cash Restraint Deployment	*YES*			
	7. Automated Highway System	*YES*			

En-Route Driver Information:

The WYDOT operates 24 changeable message signs (CMS) statewide, including entire coverage of the I-SO corridor. The CMS have 4 rotating drums, each drum has 6 positions. Drums 1 and 2 can display 24 characters, drum 3 can display 18 characters, and drum 4 can display 6 characters (see attachment 1). Each district pre-selects different road and weather messages on the CMS. Each drum is back lighted with florescent lights. A message is requested to be displayed by a foreman when conditions warrant and the district radio dispatcher displays the message from the district office automatically via telephone connection. The WYDOT is not planning on installing additional CMS.

The ITS Steering Committee has proposed to attach the Road and Travel telephone number to the existing Road and Travel information signs. This will provide the motorist with a cellular number to access this information while traveling.

WYDOT does not currently operate portable variable message signs (VMS) or Highway Advisory Radio (HAR) However, Traffic Operations is considering having one VMS available in each District. The State of Wyoming operates several HAR for tourist information purposes.

Pre-Trip Travel Information:

WYDOT operates a road and travel information network which provides regular updated road condition reports. 65 Wyoming radio stations broadcast the road and travel reports. Road and travel information can also be accessed by telephone. WYDOT receives 1.5 million telephone calls to the road and travel network each year. WYDOT reports road and travel information on form RS-10 (See attachment 2). This form is faxed by the Wyoming Highway Patrol in Cheyenne to the Ports-of-Entry, Radio Stations and other public and private entities.

WYDOT has 26 Roadway Weather Information Systems (RWIS) statewide, which collect road and weather information. The maintenance foreman use RWIS information for scheduling operations. RWIS information is also indirectly used in the reporting of information for the road and travel report, and for selecting messages on the CMS. The WYDOT has plans to install 28 more RWIS units at various locations throughout the state. The RWIS information is centrally collected by the telecommunication section in Cheyenne.

The WYDOT Programming Section has just initiated a research project to study the type of information currently available from the WYDOT weather stations and the effectiveness of this information for the end users, be they Department personnel or the traveling public. Once the amount and type of information required by all end users is established, research can then be conducted to find the optimum equipment to provide that information.

Weather data gathered from RWlS has also been used to develop software for highway design.

Design features such as ditch widths are optimized using RWIS wind speed and precipitation data. The ditch cross-section is designed to store and trap snow, leaving the roadway clear. RWlS information has also been use for snowfence design and placement.

The future Road and Travel Report may be available on the World Wide Web and Kiosks, available to travelers at home, ports-of-entry, and hotels. Promising research is also underway which will transmit en-route traveler information via a subcarrier on AM and FM radio.

Commercial Vehicle Electronic Clearance:

The WYDOT has weigh-in-motion (WIM) sensors at three of their ports-of-entries. By joining 'PrePass' WYDOT will have WIM sensors, automatic vehicle identification (AVI) technologies, Automatic Vehicle Classification (AVC), and vehicle-to-roadside communication transponders to electronically weigh and verify the identity of trucks as they approach weigh stations. After a truck is weighed and the driver's credentials verified, and in-cab device alerts the driver to continue on or pull in to the weigh station. Ultimately, four Wyoming Weigh Stations will be equipped with the PrePass system. The Wyoming Quality Carrier is a new program that allows pre-validated carriers to bypass the weigh station after passing the WIM Approximately a dozen carriers are certified in the Wyoming Quality Carrier Program.

Automated Roadside Safety:

The WYDOT uses pen-based computers for roadside safety inspections for motor carriers. WYDOT was a pilot state for pen-based computers and has been using them for 3 years. The next step to fully automate roadside inspections is to acquire scanners to scan documents such as log-books. WYDOT is working on a grant to obtain scanners.

Commercial Vehicle Administrative Process:

The WYDOT is installing a client-server statewide (All 14 Ports-of Entry) computer network to share motor carrier information statewide. This network is an integral part of ITS Commercial Vehicle Operations. PrePass, as described above, is also a part of streamlining the administrative process.

Other Applicable User Services:

Other user services that are applicable in Wyoming include; Traveler Services Information, On-board Safety Monitoring (CVO), Hazardous Material Incident Response, Freight Mobility, Emergency Notification and Personal Security, user services associated with Advanced Vehicle

Control and Safety Systems, and Mayday. The WYDOT has taken a wait-and-see position on these user services, as many of these technologies are under development and their cost/benefit, in many cases, is largely unknown.

In particular, in-vehicle 'Mayday' systems hold great potential benefits for the rural Wyoming travelers. A Mayday system can automatically notify emergency dispatch centers with the location, identity, and cellular telephone number of a stricken individual by global positioning systems and cellular technologies. Once activated - either by dialing 911 or through optional activation methods, such as when an airbag is released, the system conveys information over a normal audio channel to the dispatch center through voice simulation. Implementation of a Mayday system appears to be driven by automobile and cellular manufactures, with cooperation from emergency management officials.

Greater Yellowstone Rural ITS Corridor:

The Western Transportation Institute (WTI) at Montana State University is undertaking early deployment planning on a rural corridor including Yellowstone and Teton National Parks and surrounding corridors (see attachment # 3). The corridor will serve as an excellent prototype for the development of rural ITS early deployment planning efforts. This corridor includes the portion of US 26 through the Snake River Canyon, which will go under reconstruction over the next several years, Rural ITS technologies could be demonstrated on this section of roadway as part of the WTI's plan for this corridor.

Automatic Traffic Recorders

Automatic traffic recorder locations are contained in attachment #4 Many recording stations are automatically accessed remotely from Cheyenne, by cellular and solar power technologies,

Telecommunications

WYDOT operates and maintains its own telecommunications system. The nucleus of this telecommunication system is dozen analog microwave towers located across the state. The existing system transmits construction engineering and WYDOT maintenance personnel radio traffic, RWIS information and other state and federal traffic The existing telecommunications network is near its useful capacity, and with the addition of 26 more RWIS systems, the network will be loaded with more data demand. WYDOT is considering upgrading this system to a digital trunk radio system at an estimated cost of 20-70 million dollars. Attachment #5 is a map of the WYDOT Telecommunications Program communications sites. Attachment #6 is a map of the cellular communication system in Wyoming.

Public Transportation Operations

The Sweetwater Transit Authority Resources (STAR) has developed a 'consolidated transit service' in Sweetwater County, This service is being replicated nationwide, Cindy Johnson, Director of STAR, has developed a proposal to expand this service into all of south-west Wyoming. This can be made possible by using ITS including Mobile Data Terminals (MDT), Automatic Vehicle Location (AVL), and computerized dispatching. This proposal also includes a trunk radio communications system which may be integrated into WYDOT's proposed communications upgrade.

Wyoming' s ITS Steering; Committee;

In January of 1996 the Wyoming Department of Transportation formed an ITS Steering Committee to establish ITS goals for Wyoming and coordinate ITS activities. This committee has had several productive meetings this year and its members are the authors of this report. A map summarizing existing ITS technologies in Wyoming can be found in attachment #7.

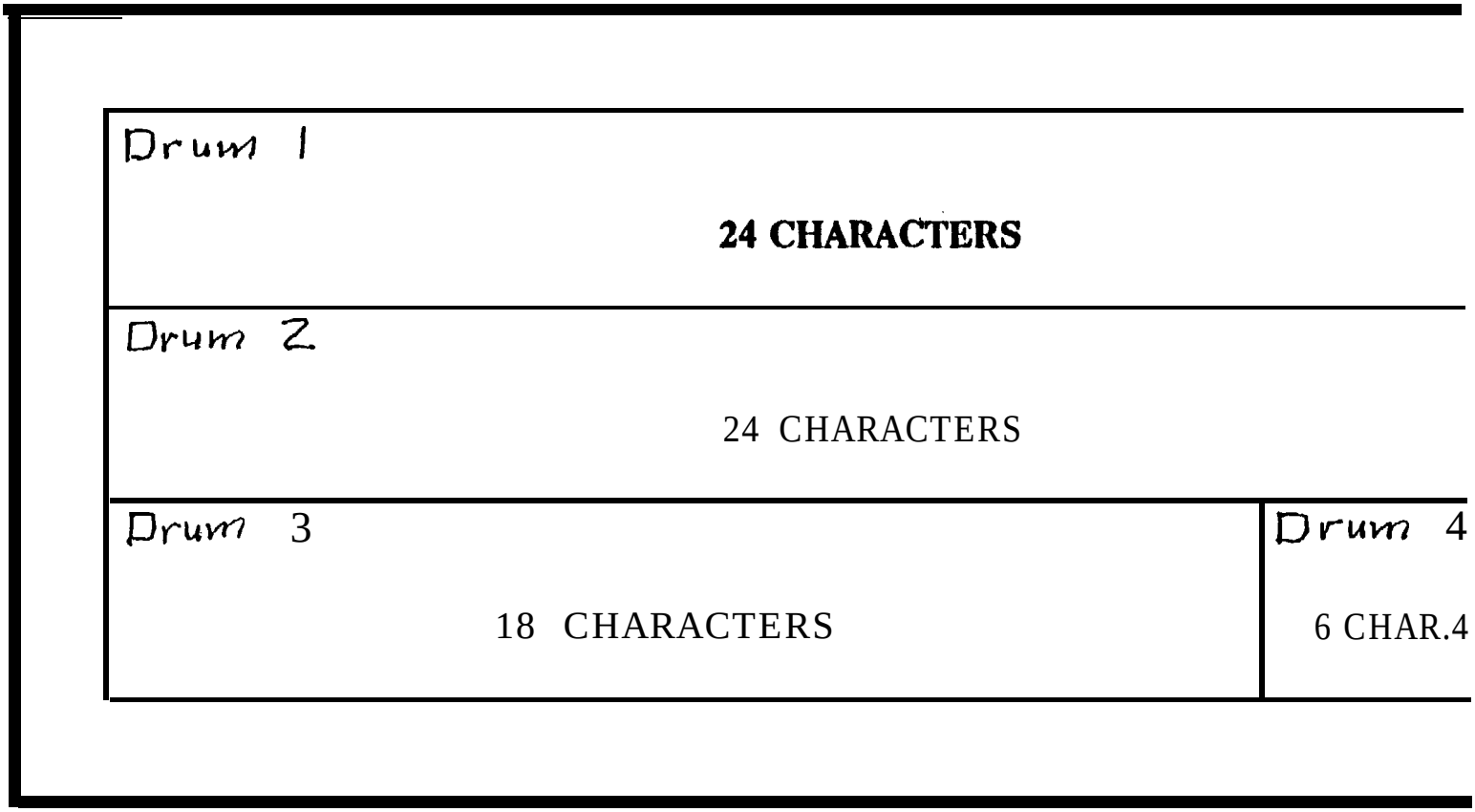

Figure 3.4. Drum and Display Configuration of the Study Area CMSs.

Each drum is 6 sided with back lighting.

Form RS-10
Rev. 10-91

WYOMING DEPARTMENT OF TRANSPORTATION
ROAD & TRAVEL REPORT

Attachment 2

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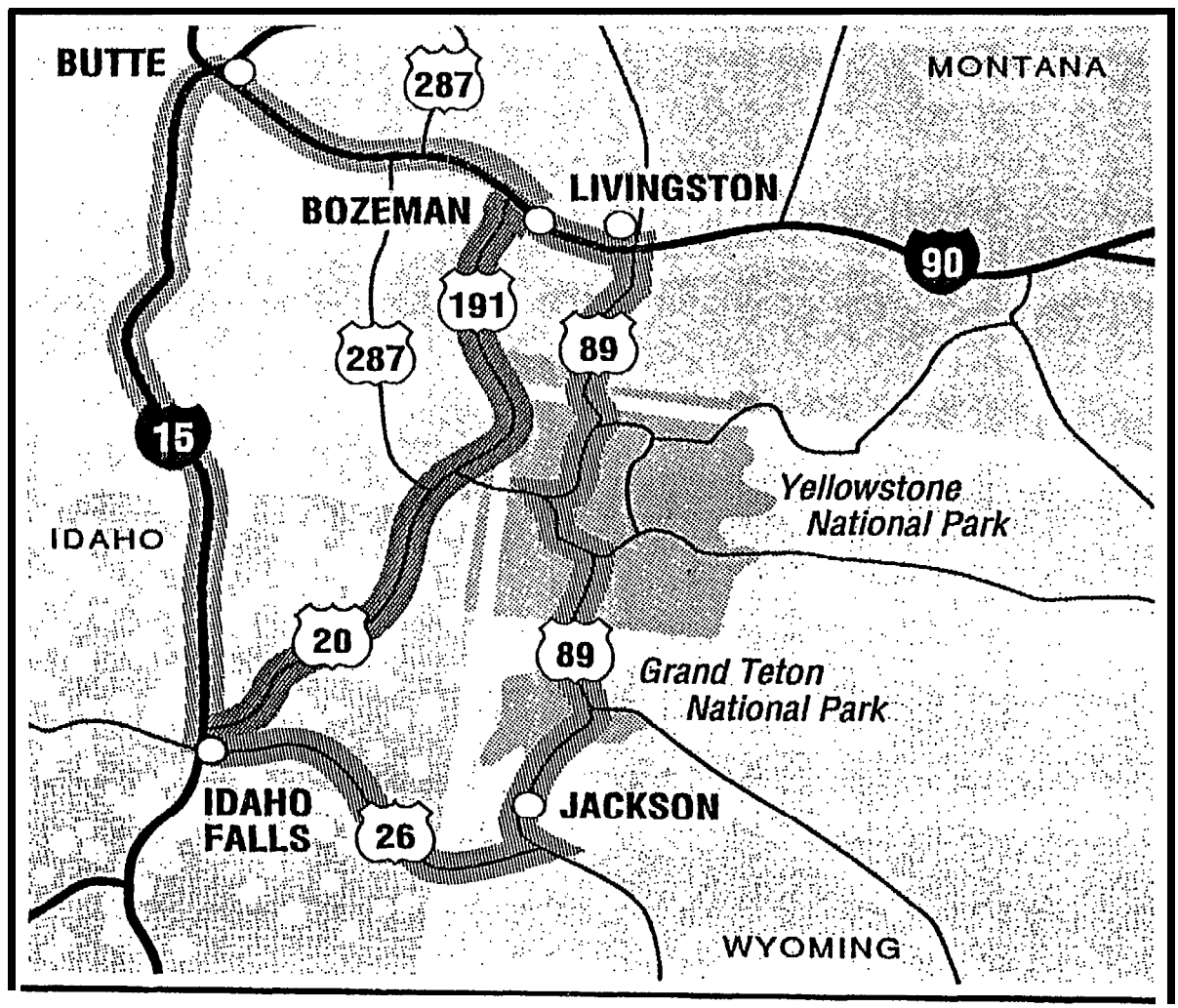
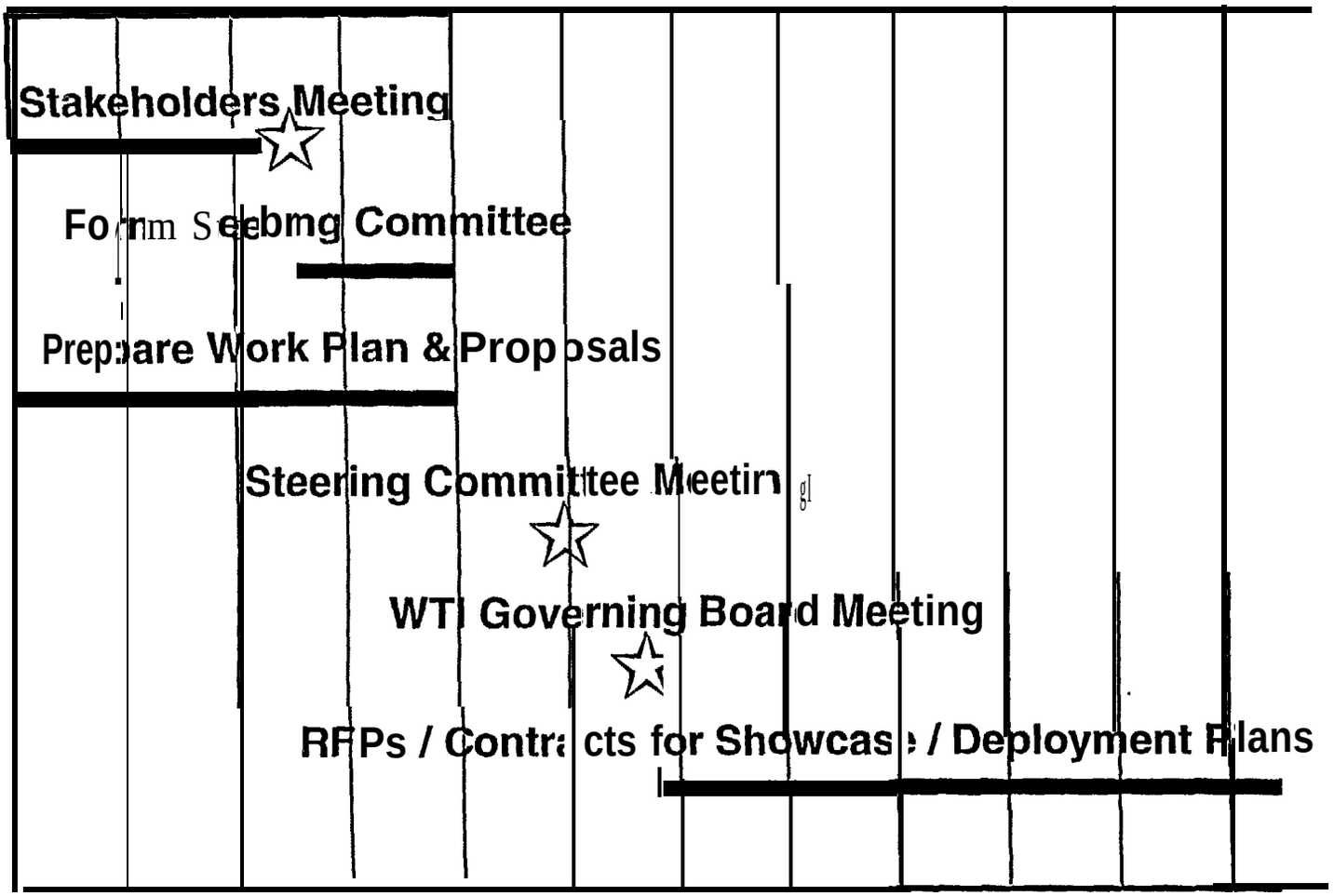
1430 P.M.
(Time)

	ROAD PASSABLE						WEATHER						
	Dry	Wet	Slick	Slick in Spots	Drifted Snow	Closed	Favorable	Snowing	Rain	Strong Winds	Fog	Blowing Snow	Limited Visibility
District 1 - Southeast	8-1	8-2	8-3	8-4	8-5	8-6	9-1	9-2	9-3	9-4	9-5	9-6	9-7
Pine Bluffs													
I-80 US 30 — Cheyenne													
I-80 US 30 — LARAMIE													
I-80 US 30 — WYO 230													
I-80 US 30 — US 287 Laramie South													
I-80 US 30 — Arlington													
I-80 US 30 — Elk Mountain													
I-80 US 30 — Medicine Bow													
I-80 US 30 — WYO 34													
I-80 US 30 — Rawlins													
Saratoga													
Baggs													
District 3 - Southwest	8-1	8-2	8-3	8-4	8-5	8-6	9-1	9-2	9-3	9.4	9.5	9.6	9.7
Wamsutter													
I-80 — Patrick Draw													
I-80 — ROCK SPRINGS													
I-80 — Granger													
I-80 — Lyman													
I-80 — Evanston													
Farson													
Pineds'													
LaBarge													
West Central — Kemmerer													
West Central — Cokeville													
West Central — Afton													
Jackson													
Teton Pass													
District 2 - Central	8-1	8-2	8-3	8-4	8-5	8-6	9-1	9-2	9-3	9-4	9-5	9-6	9-7
Chugwater													
Wheatland													
Douglas													
CASPER													
WYO 220													
Midwest													
Kaycee													
S.E. Cent. — Torrington													
S.E. Cent. — Lusk													
S. Cent. — Shirley Basin													
S. Cent. — Muddy Gap													
District 4 - Northeast	8-1	8-2	8-3	8-4	8-5	8-6	9-1	9-2	9-3	9-4	9-5	9-6	9-7
I-80 — SHERIDAN													
I-80 — I-90 to Montana													
I-80 — Buffalo													
I-80 — Gillette													
I-80 — Moorcroft													
I-80 — Sundance													
Hulett													
Newcastle													
So. Dakota Black Hills													
Mtn. Passes — Reno Jct.													
Mtn. Passes — Powder River Pass													
Mtn. Passes — Burgess Jct.													
District 5. Northwest	8-1	8-2	8-3	8-4	8-5	8-6	9-1	9-2	9-3	9-4	9-5	9-6	9-7
Mtn. Pass — South Pass													
Lander													
Sweetwater Station													
Riverton													
Shoshoni													
Wind River Canyon													
Big Horn Basin — Thermopolis													
Big Horn Basin — Worland													
Big Horn Basin — Ten Sleep													
Big Horn Basin — Ten Sleep Canyon													
Big Horn Basin — BASIN													
Big Horn Basin — Lovell													
Big Horn Basin — MONT 310 to Billings													
Cody													
Meeteetse													
Mtn. Pass — Dubors													
Mtn. Pass — Togwotee Pass													

Rural ITS Priority Corrido



Rural ITS Priority Corridor

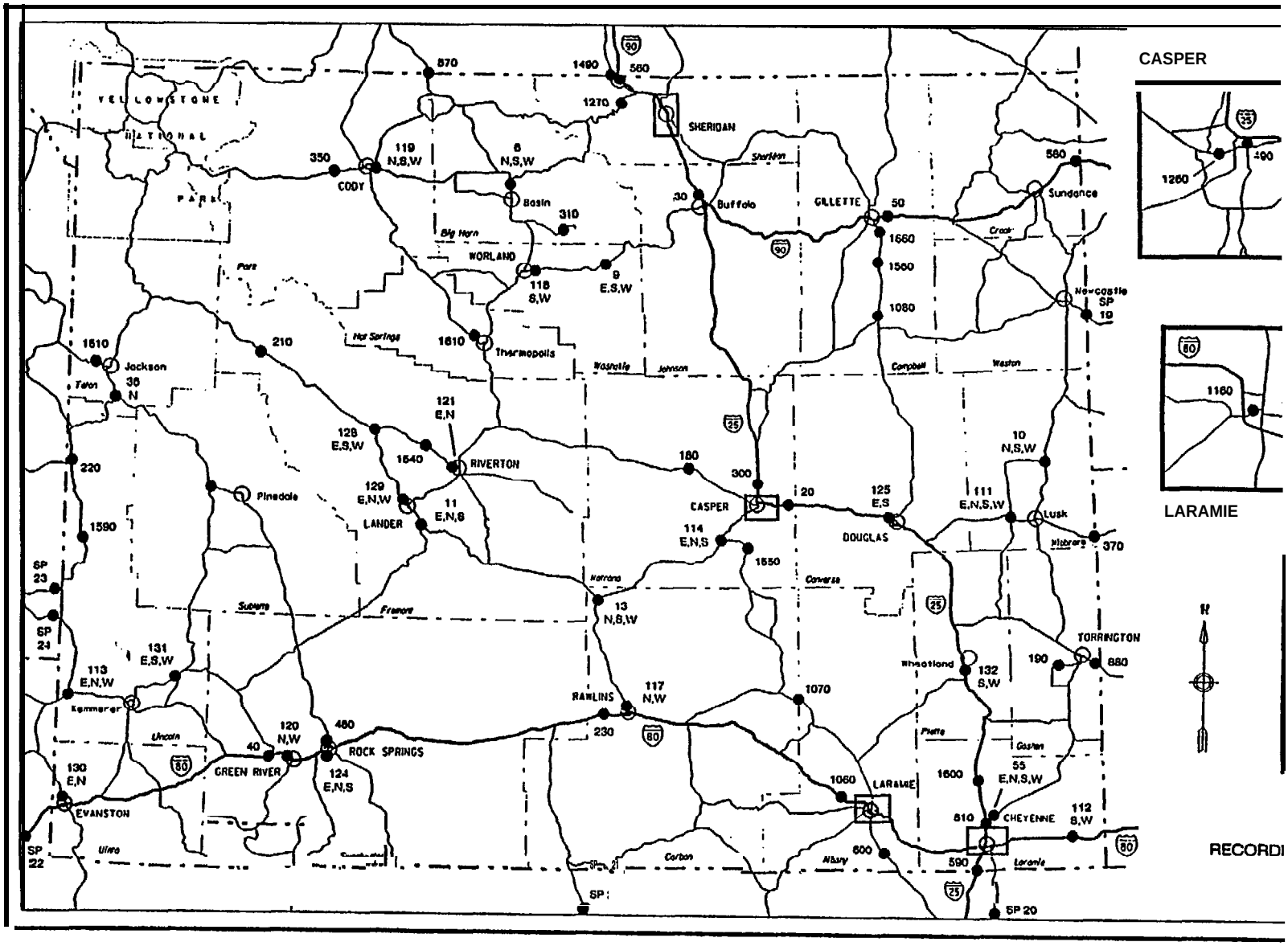


1996

Advanced Transportation Systems

AUTOMATIC TRAFFIC RECORDER LOCATIONS

STATE OF WYOMING



Attachment #5

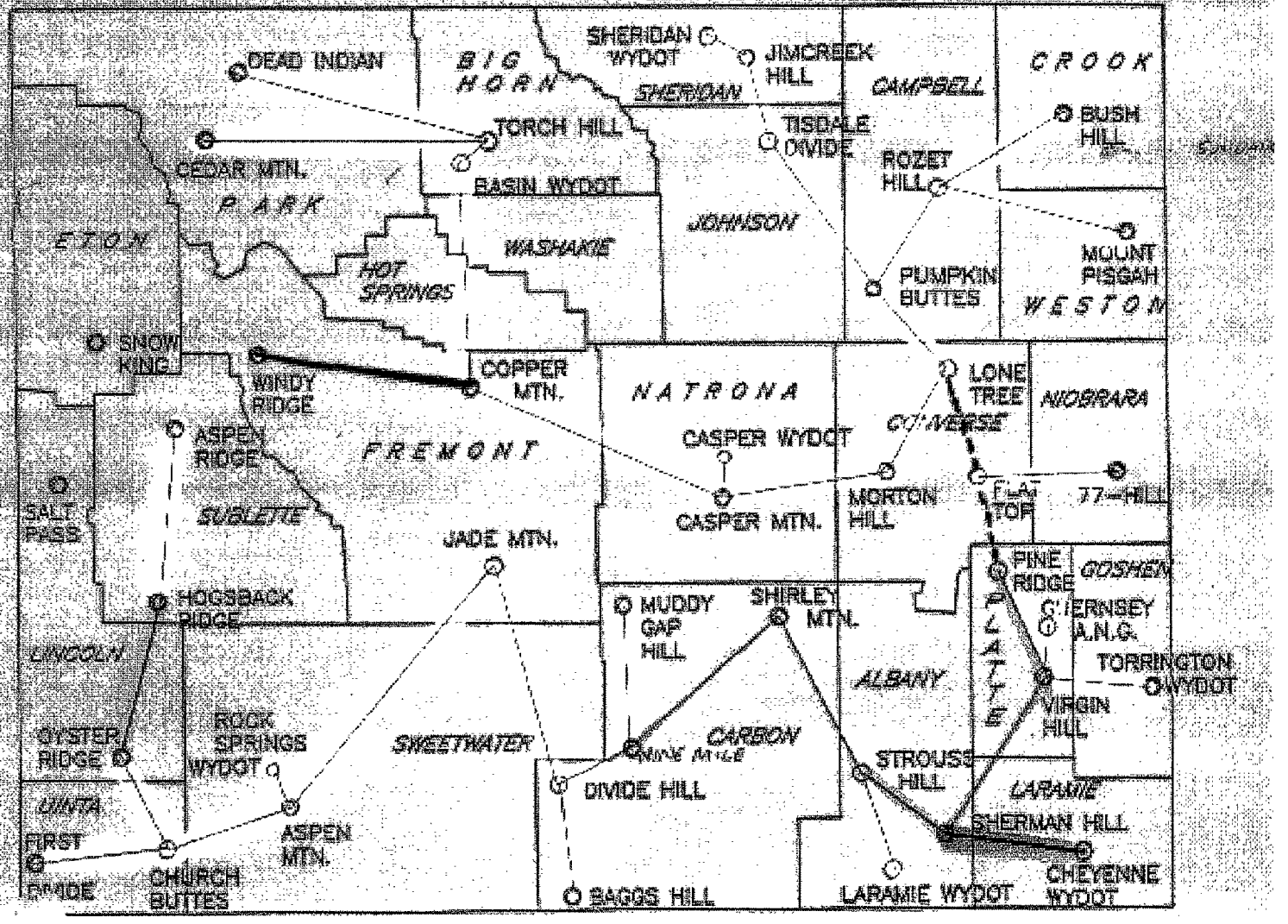
STATE OF WYOMING

DEPARTMENT OF TRANSPORTATION

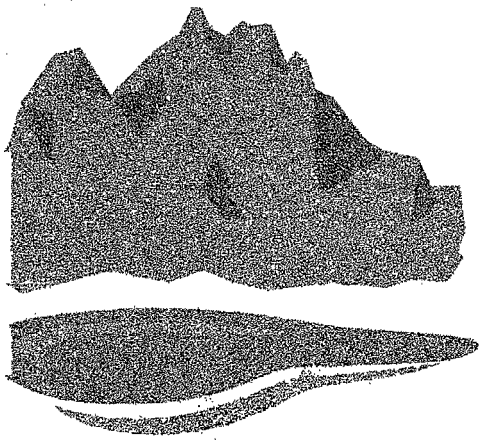
TELECOMMUNICATIONS PROGRAM

COMMUNICATIONS SITES

= 6GHZ, 600CH HOT SWITCHOVER
= 2GHZ, 96CH HOT SWITCHOVER
= 2GHZ, 96CH
= 6GHZ, 120CH
= 6GHZ, 480CH HOT SWITCHOVER
= 960MHZ, 6CH
= MOBILE RELAY



COVERAGE



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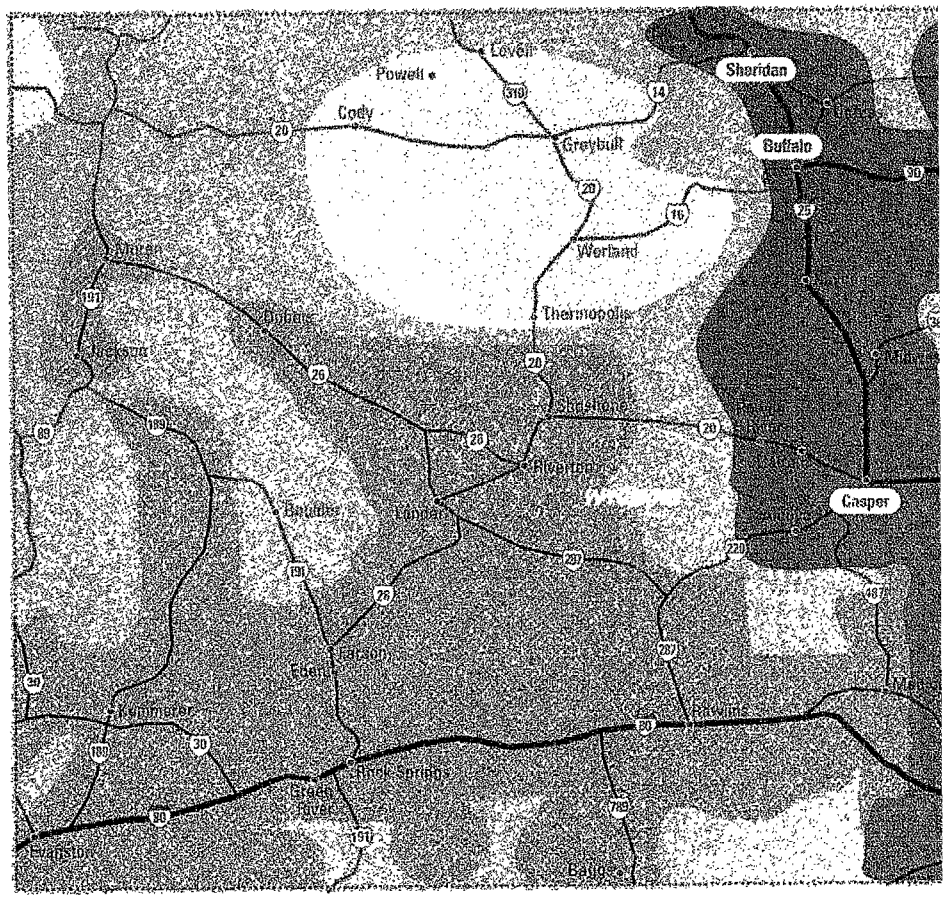

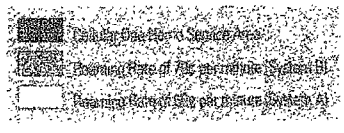

These are approximate system boundaries and the cellular service areas available. Actual coverage may vary due to weather conditions, terrain and customer equipment. For more information, call CellularOne Service toll-free at **1-800-635-0304** or **611** from your cellular phone.

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