

Seltzer

**ENGINEERING
TECHNICAL
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FIELD NOTES • TECHNICAL REPORTS • TEXTS
DATA RETRIEVAL • CURRENT AWARENESS

VOLUME 7 NUMBER 7

Field **Notes**

Forest Trail Maintenance Planning - A Case Study

**Administrative Considerations For Managers In
Water And Wastewater Facility Operation
And Maintenance**

**Equipment Development:
"Why Does It Take So Long???"**

Washington Office Engineering News



FOREST SERVICE

JULY 1975

U.S. DEPARTMENT OF AGRICULTURE



ENGINEERING FIELD NOTES

This publication is a monthly newsletter published to exchange engineering information and ideas of a technical or administrative nature among Forest Service personnel.

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<u>June 18-27 Begin 10-day hitch</u>	<u>Miles</u>
6/18-21 — Cut out Trail 108 Route Creek to Trail 110 at Wrong Creek and stay two nights at Wrong Creek while working on two days on Route Creek Trail. Then Trail 109 from Trail 108 to Pack Bridge. Be sure to repair any damaged bridges between Route Creek and Ray Creek. Drain all bogs and clean or replace all water bars.	14.5
6/22 — Cut out Trail 110 to junction with Trail 164 and 164 junction with 109. Any extra time can be used on Trail 110 beyond the junction, cutting out, draining and rerouting bogs.	2
6/23 — Cut out Headquarters Trail 165 as far as possible.	5
6/24 — Cut out Trail 111 to Rock Creek Cabin. Stay at Rock Creek Cabin.	9
6/25 — Meet at the bad bog on Trail 111 and try and bridge it.	
6/26 — Cut out Trail 110 from Gates Park to Wrong Creek. Check pasture fence with any extra time.	8
6/27 — Shovel rocks off switchbacks on east side of Route Creek Pass. Return stock to Ear Mountain for the weekend.	

Figure 1. — Portion of Annual Trail Maintenance Plan

FOREST TRAIL MAINTENANCE PLANNING – A CASE STUDY

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Region 1

This paper discusses the trail maintenance planning system that has been operating successfully on the Teton Ranger District since 1966. The Teton District, located on the Lewis and Clark National Forest, Region 1, is unique in regards to transportation facilities with 500 miles of trails and slightly more than 20 miles of roads. Together with the Sun River District to the south, it provides the primary access from the east side of the Rocky Mountains to the popular Bob Marshall Wilderness area and the spectacular mountains of the Continental Divide.

Some statistics may help put the Teton District situation in perspective. Total FY 1974 recreation visitor days experienced on the trail network are about 10,000, with approximately 60 percent of this use generated by population centers within a 150-mile radius of the District. Backpackers and commercial outfitters dominate the trail system during the summer months while big game hunters govern it during the fall. Demands on the trail system from recreationists and hunters continue to increase, while adequate maintenance funds for the District decrease. Because of this, a planning scheme was put into effect and found to be an efficient way to make use of every trail maintenance dollar.

Trail maintenance planning on the District is a year-round process. During the late spring, summer, and early fall, trail conditions and use information are collected. These data are developed from reports from fire prevention and wilderness patrol men, roving trail maintenance crews, condition surveys by the trail foreman, and reports from public users, particularly the commercial outfitters. The District trail foreman is also responsible for making snow surveys during the winter. These surveys afford him another opportunity to evaluate trail conditions and notice where immediate attention will be needed in the spring, as a result of snow slides or other snow/water damage. With over 10 years trail maintenance experience on the District, the judgmental contributions of the trail foreman are an invaluable input into the trail maintenance planning process.

From knowledge about trail use and conditions collected throughout the year, an annual trail maintenance plan is prepared that provides a detailed description of the trail maintenance job to be accomplished (fig. 1). A wall chart titled *Trail Maintenance* is also used in preparing the annual plans. This chart is updated annually and remains posted on the wall

TRAIL MAINTENANCE

NO.	NAME	STANDARD				PRIORITY	TRAFFIC INDEX	LENGTH	PERCENT OF STANDARD				YEAR MAINTAINED										REMARKS
		(3)	(4)	(5)	(6)				20	40	60	80	66	67	68	69	70	71	72	73	74	75	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)		
101	Two Meadow-Heart Butte	H	H	H	14																Signed and Blazed, 1971		
102	North Badger	H	M	M	6																100% to Std., 1970		
103	South Fork Birch Creek	M	L	M	10																Lower 3.5 Mile Realigned After 1969 Flood Damage		

Figure 2. — Trail Maintenance Chart

of the District office so that anyone may see at a glance the trail maintenance history, current status, and the relative significance of any trail on the District. Figure 2 depicts the format of the chart and the nature of the information that it contains.

The chart (fig. 2, column 3) specifies planned maintenance standards, primarily determined by the management objectives to be served, for each trail. Although many factors are involved, it is convenient to express these criteria in terms of the desired ultimate use levels on a particular trail. The overall management objectives for the trail system are obtained from Forest Service Recreation Management and Engineering manuals, with more specific direction from the Bob Marshall Wilderness Plan and the Rocky Mountain Front Unit Plan. Within the framework of these documents, the Ranger and trail foreman give consideration to local conditions and needs in formulating the planning standards. Three standards are used on the chart and are defined as follows:

- **Heavy Use (H)** – Heavy use trails have been identified to serve as the primary routes for providing access to nonroaded areas of the District. Trail tread is intended to be relatively smooth and may involve special manipulation of existing native material or other surfacing treatments (grading). The trail is well drained for surface runoff without out-sloping, water bars, ditches, or other necessary measures. Bogs are drained or rerouted and corduroy or puncheon is used where necessary. Streams and other cross-drainage are crossed dry with bridges, culverts, or by other means.

If a dry crossing is impractical, then safe, wet crossings are established. The trail is brushed and limbed back to allow convenient passage of horseback riders, pack stock, snowmobiles, and other permitted trail vehicles. These trails are intended to receive high standard maintenance annually.

- **Moderate Use (M)** – Often these trails branch off from the heavily used ones. Tread conditions are intended to be only as smooth as allowed by existing native material and special measures to obtain smoothness are not employed unless they are necessary for user safety. Trail surface runoff is well drained with outsloping and water bars; bogs are drained or rerouted. Stream and cross drains are wet crossings unless structures are necessary for safety. The trail is brushed and limbed to allow slow but safe passage of horseback riders and pack stock. Blowdowns, washouts, and slopes are corrected to allow safe negotiation of the trail and to prevent resource damage due to reroutes by users.

- **Low Use (L)** – Tread conditions, except at hazardous locations, are not maintained. Surface runoff and cross-drainage are maintained only to the extent necessary to protect investment. Cleaning and brushing are accomplished only for purposes of defining the trail. Horseback travel is not encouraged. Blowdown, slides, and other obstructions are left unless they present potential resource damage. A game trail type facility is probably all that is intended in this standard. Typically, these trails are maintained once every three years.

The Trail Maintenance Chart, (fig. 2, column 4), also depicts maintenance priority. This priority level (High, Medium, Low) indicates to chart observers a measure of the importance placed by the District in allocating resources to bring the various trails up to their planned

VISITOR CONTACTS									
BOB MARSHALL WILDERNESS, LEWIS & CLARK NATIONAL FOREST									
No. _____ (1-2)	Day _____ (3-4)								
Yr. _____ (5-6)	Zip _____ (7-11)	(Mo.)	(Day)	(Yr.)	(NAME)	(STREET)	(CITY)	(STATE)	(ZIP)
No. _____ (12-13)	Stay _____ (14-15)								
Fish _____ (16)	Hunt _____ (17)	Method of travel:							
		(1) Hike (3) Hike w/stock							
		(2) Horseback (4) Other _____							
Photo _____ (18)	Mtn.C. _____ (19)	(No. in party)	(Length of stay)			(No. Saddle stock)	(No. pack stock)		
N.St. _____ (20)	Swim _____ (21)	Activities: ☐ Fishing ☐ Nature Study ☐ Hunting ☐ Swim ☐ Photography ☐ Hike ☐ Mountain Climb ☐ Ride ☐ Other _____				Route & Campsites: 			
Hike _____ (22)	Ride _____ (23)	Type: (1) With Outfitter (1) Private Party (2) No Outfitter (2) Organization (3) "Spot Pack" _____				Where Contacted: (Place, Name, and Compartment No.) (1) Camp (2) Trail (3) Road (4) Other			
Other _____ (24)									
Outfitter _____ (25)									
Pvt/Org. _____ (26)									
Contact (Compt.) _____ (27-28)									
Contact (Camp?) _____ (29)									
Info. Given: _____ (30) (31) (32) (33)		Visitors' questions or comments: 							
Questions Asked: _____ (34) (35) (36) (37)		By _____							

15-2300-2

Figure 3. – Trail User Information Card

maintenance standard. The decision of when and where to emphasize the District maintenance effort is based upon the melding of several factors. The management objectives, as previously discussed, are considered in combination with the type and amount of existing and desired use, the season of use, soil characteristics, vegetative cover, trail grades, and other factors related to the particular situation.

Traffic Index and Trail Length (columns 5 and 6) are included on the chart as background information for making decisions. The Traffic Index relationships for the District trails were formally established by an origin-destination survey conducted on the heavy use trails in August 1971. Through field experience and observations, District personnel have extended the results of this survey to other trails in the system to show current trail use estimates. A trail counter program was tried for several years with poor results due to vandalism and technical difficulties with the counters. In order to make consistent a record of use data, the District uses a visitor-contact form, originally designed for the Bob Marshall Wilderness Plan, that is filled out by District personnel when they encounter users on a trail (fig. 3). Entries in the Traffic Index, Priority, and Standard columns, when considered together, provide a good display of trail management operations. For example, when a present low use trail is assigned a high maintenance priority, with a planned heavy use maintenance standard, this tells the observer that management trend is toward encouraging higher immediate use by lowering the impedance to travel though improved trail maintenance has shifted.

The Percentage of Standard section is a bar chart which is shaded to show the estimated percentage of the maintenance standard (columns 7 to 11) accomplished to date under the current maintenance cycle. For example, a trail which is totally up to its planned standard with the exception of several bogs that need draining, might be considered 80 percent accomplished and shaded accordingly. It is important to note that this is not a length proportional relationship.

The Year Maintained section of Figure 2 (columns 12 to 21) is a recordkeeping device that indicates the frequency and extent of maintenance work that has been performed on a trail. The boxes are shaded under the year number in proportion to the length of trail covered by the crew for the year. Column 22, Remarks, is a day-to-day schedule of work for the two trail crews working 10-day shifts on the District. The plan serves as a guide for completely experienced crew bosses who require little or no operating instructions.

Determination of realistic estimates for time, manpower, materials, and costs necessary in the planning of the trail maintenance job is the result of a systematic work accomplishment and cost accounting procedure established by the District. Figure 4 is an example of the form used for organizing and recording this data. The form is simple and self-explanatory, and yet quite comprehensive in its description of the type and amount of resources required to do a specific day's trail maintenance work. By referring to the historic information on these *Daily Records*, the Ranger, trail foreman, and crew bosses have a standard measure that may be applied to repetitive or routine work for determining:

- The most effective and economic crew size.
- Equipment performance and amounts required.

- Type and amount of materials that should be used.
- Recommended procedures for performing the activity.
- A standard of productivity in terms of accomplishment expected per day.
- Recommended scheduling of day-to-day work.
- Basis for requesting and budgeting trail maintenance funds.¹

Everyone involved with the standard measure realizes that the time and mileage estimates developed from the *Daily Records* provide only an appraisal of the average productivity. A number of variables come into play such as weather, equipment breakdowns, accidents, and crew skill levels that can rapidly create difficulties when adhering to a schedule. The schedule clearly defines overall maintenance and adjustments that can be made to assure that the total trail maintenance job is completed satisfactorily.

The trail maintenance planning scheme presented above works well for the Teton District, and represents the current state of the art of trail maintenance planning. More analytical approaches and methods certainly could make major contributions; however, such tools do not exist in forms that are operational at the field level. Hopefully, the reader of this paper will find parts of the Teton District approach adaptable to his particular situation.

ADMINISTRATIVE CONSIDERATIONS FOR MANAGERS IN WATER AND WASTEWATER FACILITY OPERATION AND MAINTENANCE

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William C. Kolzow
Sanitary Engineer
Washington Office — Engineering

Perhaps the most important aspect of operation and maintenance (O&M) for the Forest Service water supply and wastewater facilities is the framework which defines responsibility and accountability at various organizational levels, insures proper mixing of engineering and technical hands-on skills, and provides for audit and inspection procedures. Without this

¹ Clow, Hank and Russell, Phil, *Trail Maintenance Management Handbook* (Draft - 1970, Region 5). This Handbook, when printed, will be an excellent guide to trail maintenance management systems.

framework, the wide variance in operational skills, facility complexity, and organizational structures would contribute to inefficient and ineffective systems operation and maintenance. Therefore, it is imperative that the management of water and wastewater systems and groups of systems be well planned and structured.

Organization

The manager for operation and maintenance activities is usually an engineer at the supervisory office level. Any level above that is too remote from the work area and, except in isolated instances, most levels below it do not possess the adequate technical skills for operation and maintenance. The manager is responsible for the coordination of activities with other agencies and levels [i.e., the Environmental Protection Agency (EPA) and the National Pollution Discharge Elimination System (NPDES)]. This individual also has responsibility for proper staffing of systems, operator training, programming and budgeting on a Forest-wide priority basis, proper recordkeeping, technical consultation, auditing, and inspection of systems as necessary. The engineer, therefore, is responsible for the effective and efficient technical operation of every water and wastewater system under his jurisdiction. The operators for each water and wastewater system should be technically accountable to the managing engineer.

Programming and Budgeting

Lack of funding is the reason heard throughout the Forest Service for poor operation and maintenance of water and wastewater systems. However, it seems the problem is not so much a lack of funds as it is the lack of foresight to program and budget the necessary funds at the proper time, or to efficiently utilize those funds already budgeted. Since pollution control, public health, safety, and welfare are directly related to proper operation and maintenance of water and wastewater systems, low funding priority is not considered an acceptable excuse for nonperformance. Closing those sites which cannot be funded for adequate operation and maintenance is an alternative which may have to be implemented if this situation is not resolved.

Personnel

The matching of proper technical skills with water or wastewater systems operation and maintenance requirements is the responsibility of management and requires a high degree of technical ability and good judgment. Factors contributing to operator staffing considerations include system complexity, operator skills, operator training, geographic location, and availability of contract test facilities. The possibility of assigning an operator to care for more than one system, of centralizing laboratory facilities, or of establishing Forest-wide test sample collection routes should not be overlooked.

In many cases, current District personnel can be trained and effectively utilized to operate and maintain relatively simple systems in conjunction with their other duties. However, care must be taken in establishing work schedules to insure that O&M activities are routinely accomplished without significant interference with other duties. For example, alternate operators should be designated and trained to assure the continued functioning of water and wastewater disinfection equipment when the primary operator is on call for fire, or other

emergency duties, and when he has his nonwork days (i.e., weekends, annual, and sick leave). The higher complexity of other systems will require the recruitment and additional training of competent operators. Operators certified at a specific level should be recruited for those systems requiring such skills.

Although not mandatory, the Forest Service is working toward a goal of formal certification for all water supply and wastewater system operators. Much of the training and the actual testing are accomplished through the *Short-Course* sessions administered by the State health departments and the Naashe, Missouri, Water and Wastewater Technical School. Operators of all major systems or group of systems should be encouraged to obtain the necessary training to become certified and recruitment of operators certified at a specific level should be considered.

Training is another function of the management engineer that requires a good overall knowledge of plant operations, system testing procedures, and maintenance requirements. Much of the training received by Forest Service operators is an on-the-job necessity. The management engineer is the logical person to accomplish or coordinate this training. In addition, he should be aware of the formal in-service and out-of-service training programs available in order to insure that operators take advantage of these opportunities.

A little used but extremely efficient method of operator utilization is the employment of one operator for a group of systems. Benefits which can be expected from such action include:

- Higher skill level operation of less complex systems.
- Reduction in manpower.
- Better manpower utilization.
- Better maintenance of specialized skill levels.
- Better opportunity to employ operator skills on a year-round basis.
- More efficient overall operation.

District and Forest boundaries should not restrict logical geographical work areas for this method of manpower utilization.

Testing

Adequate laboratory control is the only satisfactory method of measuring the degree of treatment and protection being obtained by a water or wastewater system. Many procedures are used to measure performance. They range from simple tests, which require only limited equipment and instructions, to complex examinations requiring elaborate equipment and considerable training to perform the tests and interpret the results. In some cases, regulatory agencies may dictate testing requirements in addition to those required for system control.

Engineering management must play a key role in establishing a framework for testing that will both be efficient and insure quality control. Options available include independent laboratories for each system, centralized laboratories for several systems, and contract testing by commercial or State laboratories. In many cases, it is most efficient to utilize Forest-wide sample collection routes for contract testing. This will also insure uniformity and quality control in sampling techniques and preservation.

EQUIPMENT DEVELOPMENT: “WHY DOES IT TAKE SO LONG???” –

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When working toward the development of a new device or equipment system, the time requirement – five years, four years, but seldom less than three – is a fact of life that must be accepted. There may be exceptions, but they are all too rare. To better understand this time-frame problem, follow the development of the Trail Traffic Counter.

The Need

In the mid-60's, it became evident that recreation specialists and other forest managers needed better methods of trail traffic surveillance to make accurate assessments of the recreational impact. A rapid increase in use of the forest by hikers, horsemen, trailbikes, and snowmobiles complicated the traffic measurement task. The only tools available for this work were manual tallies, treadle switches, and photoelectric cells requiring AC line power; however, they all had serious shortcomings, and the need for new or improved methods was recognized throughout the Forest Service.

The Innovator

This problem stimulated Louis Felton, a Forest Service Technician, early in 1967 to submit an employee suggestion for a new counting system based on an ultrasonic intrusion alarm – a security device.

Early that summer, Felton's idea was forwarded to the Missoula Equipment Development Center (MEDC) for evaluation. By the following summer, data from the evaluation showed that the ultrasonic device did not give accurate counts under ambient wind conditions; even a light forest breeze caused spurious counts. Some 16 months had elapsed since Felton submitted his suggestion.

Those lost months were not wasted. Evaluation of Felton's idea was the platform from which MEDC launched their search for the trail traffic counter that would meet all of the Forest Service needs.

The Search

The initial stages of the search were focused on identification of specific attributes, both physical and qualitative, of the desired device. This is known as development of the criteria, in the equipment development trade. The criteria for the MEDC counter, as established in a field survey, were as follows:

- invisible (as nearly as possible), to reduce vandalism;
- lightweight and portable (self-contained power source), to provide easy transport and eliminate connecting lines;
- operable for 30 days, to minimize maintenance;
- capable of recording cumulative counts to 9999.000, to reduce recording requirements;
- cost less than \$250, the price of a good *talley-whacker*;
- operable under all weather conditions, all day and all night, and in temperatures ranging from -30° to $+120^{\circ}\text{F}$, to accommodate the conditions encountered in all Forest Service sites; and
- reliable and accurate to provide usable assessments.

These criteria were established in the first three months of 1968, and shortly thereafter the ultrasonic device was proven unreliable. MEDC then began a search for a commercial product that would meet the specified criteria. Such an inquiry is a fundamental requirement for any Equipment Development Center in order to avoid developing equipment which may exist in the commercial-industrial field and which can be used or adapted by the center.

Only one company was found with a product that came close to meeting any of the established criteria; for our purposes we'll call that company GCO. With encouragement from MEDC, GCO provided a prototype counter in the late summer. Felton's counters were retrieved and the GCO counter was sent to the field for testing. The field trials went well and the unit produced accurate data, even during periods of cold and snow. However, there were some problems: the unit weighed 50 pounds, required 115-volt 60-Hz power, and had a range of only 30 feet. Nevertheless, it demonstrated accuracy and reliability never before seen in a traffic counter. Thus, MEDC decided to stay with the optoelectronic¹ approach and work with GCO to streamline the electronics and reduce the power requirements for conversion to a battery-operated unit.

¹ *Optoelectronic is a system using a light source (a light-emitting diode (LED) in this case) that produces a pulsed beam of light through a given lens. A reflector located at the distance, across a trail, returns the light through a second lens to a photosensitive device. Interruptions in the receiving light are sensed by an electronic circuit that triggers an impulse counter.*

After a number of discussions with GCO's engineers, a contract was negotiated for 20 DC-powered production prototype counters. They were received and sent to the field for testing in June 1969 — 26 months after Felton's suggestion.

With the project going well, MEDC decided to do some design studies on counter circuits to become more familiar with optoelectronic technology. During this period they tried to locate additional companies that could build counters — the extra effort paid off. A small, highly-technological company that we'll call DCO was discovered.

As it turned out, DCO had a unit with a fullium aernside injection laser device that was two years ahead of any counter MEDC had seen. Efforts were then directed toward negotiating a contract for a prototype of DCO's new development.

At the same time the project took a turn for the worse. Information received daily from the field units reported that the 20 GCO counters were giving inaccurate counts and having battery failures; the counters were inadequate for field needs. In addition, DCO prototypes were proving unstable and having battery problems and the projected cost for production rose from \$250 to \$1,000 per unit.

MEDC had made a commitment to have counters available for the 1970 field season and time was running out! Another effort was made to encourage GCO to make improvements in their counter, but all they could offer was a new, untested design with production projected for 1971. DCO proposed several new ideas, but these were also untested and the cost was high. With no other viable alternative and only eight months before the 1970 field season, MEDC decided to initiate an improved optoelectronic design developed by their engineer, David Gasvoda.

Gasvoda's Design

The circuitry of Gasvoda's unit differed from that of any of the units that had previously been examined; however, the advantages made the risk worth taking. Power consumption was one-fourth that of GCO's best unit and the range was doubled (50 feet). A timing circuit to insure count-accuracy had been added, which enabled the counter to reject spurious events. Power consumption was reduced by using dry cells that lasted 60 days under continuous operation.

The project was moving again and so was the clock. The first prototype of Gasvoda's design was completed by February 1970. Tests indicated that some of the components were too sensitive and had to be relocated to avoid electronic interference with other components. A second prototype was assembled — this time all performance criteria were met and the design was frozen.

MEDC called back 10 of GCO's counters to use as housing units for the new Gasvoda-designed counter. With these on hand, a contract was awarded for the construction of the necessary circuit boards. By May, MEDC had assembled, adjusted, tested, and delivered 10 Gasvoda trail traffic counters to the Rocky Mountain Region. They had met the deadline!

With the deadline behind them, MEDC received the 10 remaining GCO units and modified them for field trials at various locations. They were confident that Gasvoda design would work and contracted for the necessary redesign work of the optical system and housing unit to permit mass production. This redesign effort progressed rapidly, and after a few minor changes the new design was frozen and five prototypes were built. Next, MEDC directed their efforts toward quantity purchase of counters for Service-wide use. The specifications and drawings for mass production were finalized in January 1971. Four years of searching and testing should have ended the development of the traffic trail counter, but it didn't. The Forest Service now had 20 hand-built counters that worked, but these did not meet all the field needs.

A contract was negotiated for mass production of the counters; requests for bids were issued in January, and in March 29 bidders had responded. The contract to produce 205 counters was awarded to the lowest bidder, Scientific Dimensions, Incorporated (SDI), a small company in Albuquerque, New Mexico. The counters were targeted for delivery by mid-July so that MEDC could meet a new goal of having 60 counters available for a Recreation Information Management (RIM) study by August 1.

The contract progressed smoothly and an additional 51 counters were added for a total of 256. The first signs of serious trouble developed July 23, when SDI reported that the counters were not achieving the specified 90-foot operating range. With only a few days left before the RIM study, a team of MEDC engineers flew to SDI's plant. They found that the problem could not be isolated; the counters had to be rejected. The only alternative was to suspend the contract and attempt to isolate the problem.

The \$59,000 Question

Each component system tested seemed to perform better than the specifications required. Why weren't the counters achieving the 75-foot range? Extensive tests and measurements were made yielding reams of data; a computer was used for analysis in an attempt to establish a correlation between design criteria and performance. No progress was made. As a last effort, the manufacturer's batch numbers, stamped on the phototransistors used in the earlier prototypes were compared with those used in the SDI production units. The problem was finally identified. The phototransistor manufacturer had changed his product, but not the part number. MEDC then made efforts to find a new semiconductor manufacturer that could provide a workable and reasonably priced phototransistor. They found a phototransistor and reinstated the SDI contract with a new delivery date of April 1972. Four field seasons had passed, but Felton's suggestion had not been in vain; the project was alive and moving forward in a positive direction. The final inspection was made on schedule; all 256 trail traffic counters were acceptable and met, or exceeded, the contract specifications. A happy ending to a five-year equipment development project.

Note: Under a GSA contract, Scientific Dimensions, Incorporated, is still manufacturing the Gasvoda-designed trail traffic counter as their model TCS-90 at a cost of \$275 for single units, with quantity discounts. This model meets or exceeds the original counter criteria (except it is slightly visible during daylight hours). Also, there is an improved model TCS 90-1 that has an increased range of 120 feet, as compared to 75 feet for the TCS-90.

WASHINGTON OFFICE ENGINEERING NEWS

CONSULTATION AND STANDARDS

Charles R. Weller
Assistant Director

WATER RESOURCES – FEDERAL POWER COMMISSION WORKSHOP

These two sessions resulted in several recommendations which will be of interest to engineers and others working in the water resource development area. Basically, there were two separate sessions held end-to-end during the week of April 7 in San Francisco, California: the first 2-1/2 days were devoted to Water Resources Engineering, while the last 2-1/2 days were a joint Federal Power Commission-Forest Service Coordination Workshop. Some of the more significant decisions and recommendations involved: the Forest Service dam inventory; coordination agreements with the Soil Conservation Service; training and certification of the people designing and inspecting dams; manual revisions; acquisition of existing dams; environmental coordination of proposed water projects; national dam safety program; and coordination procedures involving issuance of Federal Power Commission licenses. Of the foregoing, there are several which will be most visible at the Forest level.

The recommendation to establish the dam inventory at the Fort Collins Computer Center will make it possible for Forests with terminals to generate special listings and reports on an *as needed* basis. The workshop group developed the recommendation that the inventory system should be studied to make it more compatible with the users' needs.

Another item of specific interest involves the certification program. The consensus of the task group was that there does not seem to be a need to have a certification category in dams, either in design or inspection. Although more training probably is needed and specific job performance requirements will be helpful, it was felt that this can be accomplished without a certification program.

Decisions developed from the FPC Coordination Workshop will result in FS Manual changes which will be forthcoming over the next year.

For more detailed information on the meeting, contact Regional Office attendees of the workshop. People in attendance were mostly those working in water resource engineering in the Regional Offices, Regional Federal Power Commission Coordinators, and Washington Office representatives.

Guest speakers from other than the two participating Federal agencies included: Neil Bogner, Director of Engineering, Soil Conservation Service; Robert Simmons, Attorney, Office of the General Counsel; Sam Miles, Structural Engineer, Corps of Engineers; William Clevenger, Chairman of the Board, Woodard Clyde & Associates; William Wahler,

W.A. Wahler & Associates; and Gordon Dukleth and James Lay, California Division of Safety of Dams.

FOREST SERVICE ACTIVITY IN THE NATIONAL DAM SAFETY ACT

The National Dam Safety Act (PL 92-367) was passed because of the concern by Congress of the large number of dams in the United States which are in questionable condition in respect to safety. Many of these dams could endanger human life if a failure should occur. Of the Federal agencies, the Forest Service is more deeply involved than others in this law because of the large number of dams built on National Forest land, in fact, the Forest Service has some degree of administrative control over approximately 1300 dams of a size and capacity to be covered by the Act, more dams than any other single Federal agency.

To date, acting under the terms in the Dam Safety Act, the Corps of Engineers (COE) has been developing a national dam inventory and is preparing recommended dam inspection guidelines and procedures. PL 92-367 does not require the institution of an actual inspection program by agencies other than the COE.

The Forest Service (FS) inputs or coordination with the COE activity can be divided into two types: the technical activity, as contrasted with the coordination of administrative requirements.

The technical activity inputs consisted of providing comments on the COE publication, *Proposed Guidelines for Safety Inspections of Dams*; and providing COE with inventory data on dams within the National Forests.

The other major input, the administrative coordination, involves working with the Corps on planning the actual implementation of the safety program. Recommendations regarding conducting inspections, financing and staffing problems, and State versus Federal inspections were all discussed in detail on several occasions.

Expanding on these two major types of activity, the first action which occurred involved the inventory data. Through efforts by Region 4, Regional Staff engineers, and computer people in the Washington Office, the FS report on the dam inventory was given to the COE in early January 1974; the report on the 1300 dams covered by the Dam Safety Act filled seven boxes of computer cards. The Technical Guidelines for dam safety inspections were distributed by the COE last August for review and comments. In order to best reflect FS problems and at the same time serve Department-wide needs, it was decided to combine the Forest Service comments with those of the Soil Conservation Service (SCS). By resolving differences within the USDA before involving the COE, it was felt the comments would be interpreted to the best advantage of both the SCS and FS. Review comments were received from each Region, compiled into a FS reply, then combined with those of the SCS. The Departmental recommendations were submitted in early October 1974.

The actual administration of the inspection program is also the subject of recommendations being developed by the COE. These recommendations were to cover subject such as:

- Who will be responsible for inspections?
- How will the inspections be financed?
- Of the approximate 60,000 dams covered by the Dam Safety Act, which need to be inspected?

FS and SCS comments and suggestions were forwarded to COE as Department level letters on two occasions, one prior to publication by the COE of the suggested *National Program of Inspection of Dams*, and a second as comments on the program after publication. The comments on the program were provided on April 18, 1975 by a letter signed by Robert Long, Assistant Secretary for Conservation, Research and Education. The following key points summarize the Department of Agriculture comments:

- A program for dam safety is urgently needed to assure protection of life and property located below or adjacent to dams.
- The proposed program should be revised to require that private dams, located on Federal lands, be included in the respective State's area of responsibility.
- Federally-owned dams should remain the responsibility of the Federal agency that is charged with management of the dam.
- The program needs a comprehensive implementation plan to establish time frames, financial arrangements, and staffing adjustments.

The COE is currently preparing final recommendations for standards and implementation for the National Dam Safety Program, and is also completing the national dam inventory. COE plans to present the final package to Congress before July 1975; it is not known how it will reflect the foregoing Agriculture suggestions in the report to Congress. There will be continuing coordination efforts between the Washington Office and the engineers that are setting policy for the Corps.

TECHNOLOGICAL IMPROVEMENTS

Heyward T. Taylor
Assistant Director of Engineering

NCHRP REPORT, "THE USE OF BITUMINOUS EMULSIONS"

By mid- or late-summer, the Transportation Research Board will be distributing a comprehensive report on the use of bituminous emulsions. The report will be issued as a *Synthesis of Highway Practice* report under the National Cooperative Highway Research Program

(NCHRP). Forest Service engineers have been active in initiating this NCHRP study, as well as co-authoring the report and serving on the Advisory Panel giving direction to the study and to the development of the report. The study was jointly sponsored by the American Association of State Highway and Transportation officials and the Federal Energy Administration.

The report is well done. It contains considerable information that should be of direct use to Forest Service engineers having responsibilities in the roads and trail program. Design, materials, construction, and maintenance engineers will find the report particularly useful. Among the topics discussed are:

- **Chapter One – Introduction.** Development of emulsified asphalt, use of asphalt materials, energy comparisons, environmental considerations, safety, history of emulsions, cationic emulsions, emulsion asphalt needs, selection of type and grade, construction specifications, technical service, technical training, cost analysis.
- **Chapter Two – Structural Design.** General considerations, AASHTO design, Asphalt Institute design, Chevron design, discussion.
- **Chapter Three – Materials selection and mix design, spray application, slurry seals, emulsion-aggregate mixtures.**
- **Chapter Four – Aggregates.** Mineralogical composition, hardness, abrasion, density, porosity, absorption, durability, particle shape, surface texture, surface chemistry, deleterious materials, gradation, discussion.
- **Chapter Five – Construction.** Introduction, emulsion storage and pumping systems, aggregate stockpile management, preparation of surfaces, central plant operations, laydown of central plant mixes, road mixing of aggregates, compaction of emulsion mixes, control tests for emulsion mixes, spray applications, hints on construction.
- **Chapter Six – Maintenance.** Asphalt surfaces, maintenance of aggregate surfaces, roadside uses of emulsified asphalts.
- **Chapter Seven – Research**
- **Appendix A – Glossary**
- **Appendix B – Emulsion test methods and their significance.**
- **Appendix C – Gradations and application rates for seal coats and surface treatments.**
- **Appendix D – Aggregate gradations for slurry seals.**
- **Appendix E – Estimate of asphalt emulsion content using surface area procedure.**

In the past several years, bituminous emulsions have been increasingly used for surfacing Forest Service roads. In general, the material has performed well, but it has been by no means problem free. Some of these problems were described in the following paper: *Some Forest Service Experiences with Emulsified Asphalt Pavements*, by A. Pelzner and L. Hendrickson, Proceedings, First Annual Meeting of Asphalt Emulsion Manufacturers Association, Washington, D.C., 1974.¹ The NCHRP report, *The Use of Bituminous Emulsions*, considers many of the identified problem areas and describes ways and means for designing, constructing, and maintaining better bituminous emulsion surfaces.

We have asked the Transportation Research Board to furnish us extra copies of the report when it is issued this summer. We will be sending at least one copy to each Region as we consider the report a valuable information source. After reviewing the contents and assessing their own needs, the Regions may wish to acquire additional copies directly from the Transportation Research Board.

OPERATIONS

Harold L. Strickland
Assistant Director

GEOMETRONICS SERVICE CENTER UPDATE

With the approval for the Geometronics Service Center (GSC) now a matter of record, the big task of putting together an organization, securing space, and all the other complexities has begun. Roger R. Chamard, Assistant Regional Engineer for Operations in Region 6, has been selected as the Director; James F. Dixon, Washington Office Geometronics, and Ross Snedeker, were named to fill the Assistant Director positions. Chamard and his assistants will begin their new assignments in July to start putting together the GSC.

Presently, General Services Administration is preparing a proposal to secure space for our GSC facility which will be co-located with the Agricultural Stabilization and Conservation Service (ASCS) in the Ogden/Salt Lake City, Utah, area. As now planned, the GSC will begin full operation during fiscal year 1977.

¹ Distributed by Memorandum – File Designation: 1630; To: Regional Information Coordinators; From: M.R. Howlett; Subject: Proceedings of the First Annual Meeting of Asphalt Emulsion Manufacturers Association.

