



MAINTENANCE MANAGEMENT MANUAL

SUMMARY

PREFACE

This Maintenance Management Operations Manual has been prepared by the County Road Administration Board for the counties of Washington State. The Manual is intended to support implementation and operation of a formal Maintenance Management System (MMS) and is intended for use by the individuals with responsibility for the development, implementation and operation of a county's Maintenance Management System. The general maintenance management concepts described in this manual are applicable to all counties. Specific details of maintenance management, however, may vary from county to county due to varying conditions and needs.

The summary below provides an overview of Maintenance Management and some guidance in "getting started" towards setting up and preparing to use more formal maintenance management procedures. Specific examples shown in this summary include some of the information necessary for the building blocks of an effective management system.

See this summary and other Maintenance Management materials at www.crab.wa.gov/maintenance

USING THE MANUAL—This manual can be used in a number of ways, including:

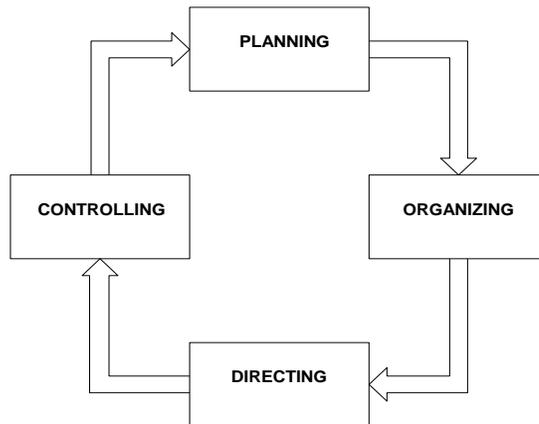
1. As an overview of Maintenance Management
2. As a guide to setting up a Maintenance Management System
3. As a step-by-step explanation of Maintenance Management
4. As a guide for field operations
5. As a guide for management
6. As an indicator of computer requirements
7. As a procedures manual for MMS operation and update
8. As a training guide
9. As a view of the organizational attributes of Maintenance Management

Overview of maintenance management...from general to specific.....

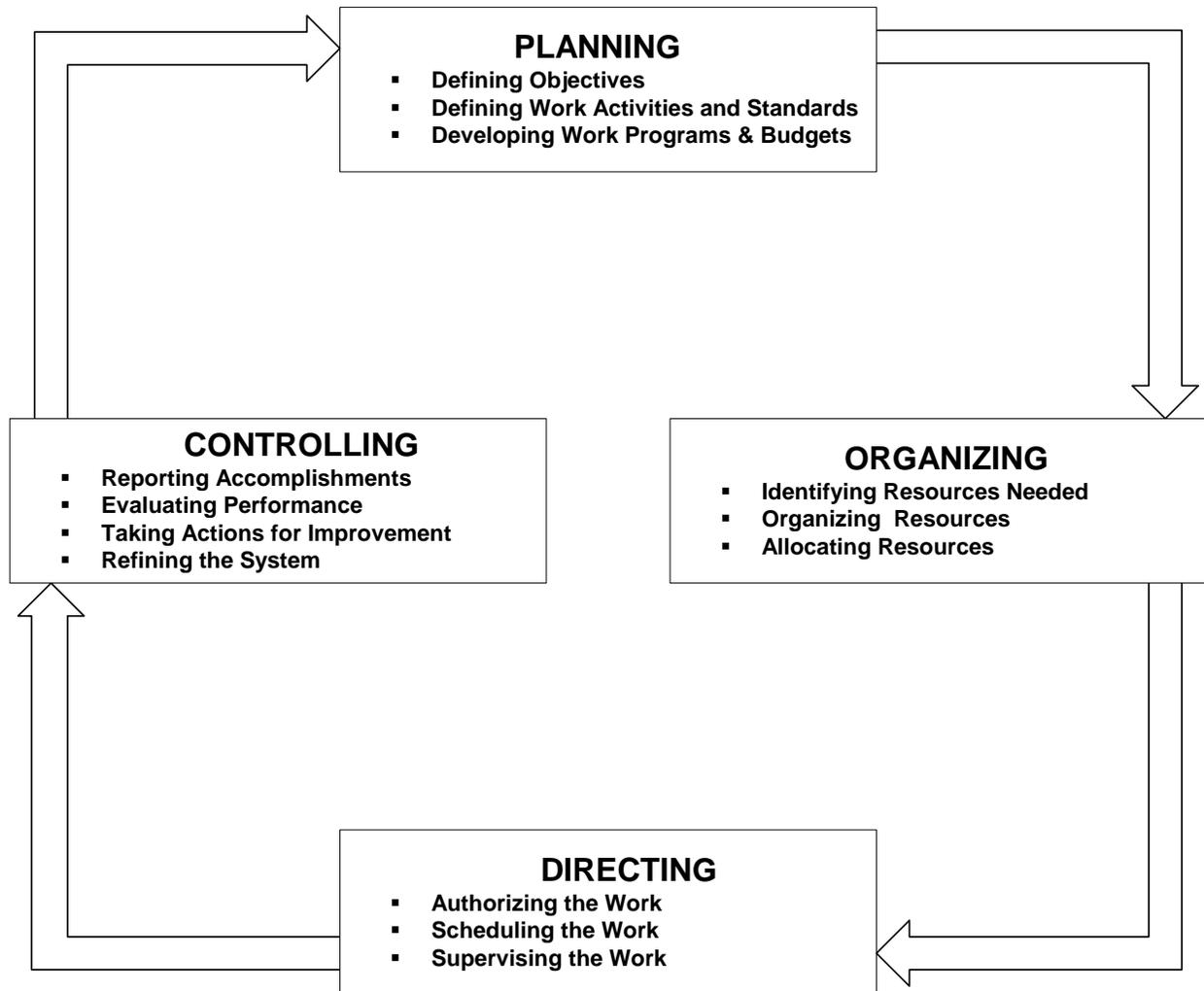
Maintenance management is a method of utilizing resources to accomplish a predetermined level of service for road assets. Formal maintenance management includes the primary management functions of planning, organizing, directing and controlling. A maintenance management system (MMS) can be described as a systematic process to manage a maintenance program. Another way of describing maintenance management—a systematic work management process that applies good common sense to help people work together to improve maintenance operations.

Starting from this brief description of maintenance management, the paragraphs and figures below provide additional, and increasingly detailed, descriptions of maintenance management procedures and elements of maintenance management systems.

Applying management principles to county road maintenance operations recognizes that many county road activities can be planned, scheduled and accomplished in a defined manner. Maintenance management provides a framework for developing maintenance plans, tracking work accomplishment and preparing reports that compare planned and actual performance. Beginning with a basic framework for management which includes planning, organizing, directing and controlling, an overview of maintenance management can be presented as:



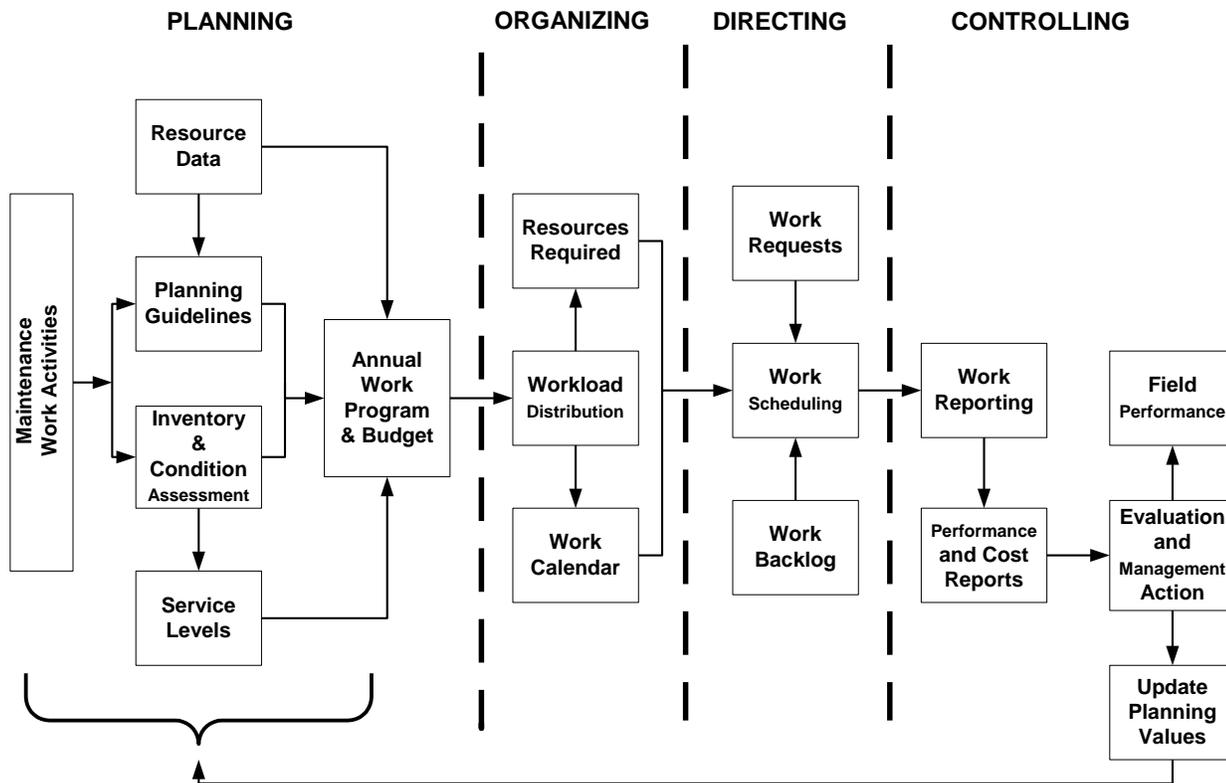
Including more descriptive, though still fairly general, details provides the following:



Further description of these elements of maintenance management could include the following:

- Planning maintenance activities based upon the road features to be maintained, the resources (labor, equipment & materials) needed to provide maintenance and the level of service to be provided by the maintenance. This includes preparing budgets based upon maintenance performance standards to define the specific types and amounts of maintenance work.
- Organizing the labor, equipment and material resources to ensure that planned maintenance activities can be accomplished with the budget available.
- Directing maintenance operations by authorizing, scheduling and supervising maintenance activities and preparing the annual, seasonal and short-term schedules needed for guidance.
- Controlling maintenance operations by monitoring work accomplishment and expenditures to ensure that planned work programs are actually achieved within available resource levels.

The flow of information throughout the maintenance management process provides another, yet more detailed, view of a formalized maintenance program:



The above information flow depicts the primary elements and sub-elements of a formalized maintenance management system (MMS). Maintenance management systems are used by public works directors and field managers to plan, organize, schedule, control and evaluate road maintenance programs. With maintenance responsibilities involving many miles of roads, many employees and often millions of dollars, the management requirements are complex and require consistent procedures to ensure the success of a maintenance program.

Essentially, maintenance management systems are orderly processes for recording, analyzing and displaying information about the road system, the work performed in maintaining the system and the resulting costs and condition of the system. For small operations, manual recording and analysis may be a suitable means of operating the system, though with availability of microcomputers, almost all agencies can benefit from the use of electronic data processing for management systems.

Regardless of the way in which the data is processed, the concepts of a maintenance management system remain the same. The basic components of maintenance management systems developed and generally accepted by road maintenance organizations include:

- The development of performance standards for principal maintenance activities describing the procedures to be followed, the labor, equipment and materials to be used and the rate of production to be achieved.
- The determination of workloads through the measurement of quantities of the various elements of the road system (system inventory) and the evaluation of external influences (such as weather and traffic) acting upon these elements which create a need for maintenance.
- The budgeting (dollars) of resources (labor, equipment, materials) to meet the predicted workload in terms of specific programs (activities, quantities, locations) to be achieved.

- The scheduling of activities within the budgeted program to utilize resources in the most efficient manner, to reduce fluctuations in manpower and equipment requirements, and to keep the roadway system operating in a safe, convenient manner.
- The establishment of a management information system which provides the basic knowledge required by operating managers for routine decisions and the special reports required by management for control and improvement of the program.

A fundamental element of a maintenance management system is timely reporting of pertinent, accurate data. This permits performance evaluations and management decisions to be based upon documented facts. The facts include information as to how effectively and economically the available resources were utilized by the field forces and how much work was done in comparison with the amount originally planned. Problem areas can then be identified and corrective action can be taken to ensure effective accomplishment of the work program.

In addition to the normal fiscal information provided by the county's accounting function, many public works agencies use systems that account for the cost of work, activity by activity. This "activity costing" does not replace line-item reporting of expenditures. It simply provides another basis for evaluating work being done. Such "activity costing" or "cost accounting" systems come in many forms, from custom tailored systems related to the county's general accounting system to customized "off-the-shelf" maintenance, work or resource management systems from a range of computer software vendors. The attributes of any such system employed by the county will influence the manner in which the above noted MMS information flow can be accommodated. Although cost accounting systems allow the detailed tracking of maintenance activity costs, such systems may not accommodate the details of the budget development process, workload distribution and the generation of work schedules that may be desired.

What can a formalized maintenance management system (MMS) do for a county? It can do what county engineers, maintenance managers and supervisors want it to do — no more, no less. The system is a management tool, one that can be employed to achieve a number of benefits or one that can be used to attain only certain limited objectives. Typical benefits are summarized below:

- *Improved Resource Utilization* — The maintenance management system helps county engineers use their labor, equipment, and materials more efficiently. For example, workload peaking can be reduced considerably, improving labor/productivity. Such efficiency improvements give the county better road maintenance for the same tax dollars. Alternatively, the county can reduce its maintenance expenditures while retaining the level of service it has enjoyed in the past.
- *Equitable Resource Allocation* — In the maintenance management system, expenditures in each area of the county are based on the road requirement in that particular area. Thus, expenditures in each area have an objective basis and all parts of the county have comparable levels of service.
- *Budget Evaluation* — In the maintenance management system, a proposed budget is derived from a work program that specifies exactly how the money will be used. If available funds are less than the amount needed, someone in authority must decide which maintenance services are to be reduced or eliminated. If the elected officials direct that additional services or higher levels of maintenance service be carried out, the cost can readily be determined. After a budget has been approved and the money spent, elected officials can compare the actual results with those in the approved work program.
- *Employee Morale* — Field supervisors and their crews like to know what is expected of them. The maintenance management system provides them with clear performance standards and timely information about their actual performance. Experience has shown that improved morale is particularly evident when supervisors participate in the development of performance standards and system procedures and in the actual reporting of daily work accomplishment.

....and some possible problems:

Even though the basic concepts and procedures for the maintenance management system are quite logical and simple, some managers encounter problems when they try to adapt and implement such systems. Some pitfalls and ways to avoid them are described below.

- *Insufficient Management Support*—Normally, the county engineer and his staff will be responsible for developing the details of the system. Elected officials, however, should be kept informed 1) of the system operation and 2) of the consequences associated with managing within the system approach. They must have a sincere commitment to the system objectives and procedures.
- *Over-refinement*—Some managers seek unrealistic precision in the system. Excessive numbers of defined work activities, application of sophisticated time and motion studies as a prerequisite for adopting work performance standards, and unduly complicated procedures for reporting and summarizing work performance all delay implementation and acceptance of the system. The fact that many maintenance agencies employ performance standards suggests that there is no need to “reinvent the wheel.” Nor is there any need for time-and-motion studies. Instead, there is need only to adapt and refine existing standards. A county can adopt standards that work for another county, revising them as experience is gained.
- *Lack of Adequate Orientation and Training*—Inadequate orientation and training of field personnel can cause problems and confusion during the initial periods of implementation. Do not expect operations and procedures to change automatically because a memo is issued or a manual of instructions is distributed. Special efforts are essential to bring about understanding and acceptance of new methods and procedures, such as a series of carefully planned workshops for supervisors. Advanced orientation and training will pay off with quicker and more effective results. Without such training, implementation will be painful at best, and perhaps even unsuccessful.
- *Labor Union Opposition*—A few special considerations can arise when maintenance forces are unionized. To alleviate the concern and skepticism of union workers regarding new techniques and procedures affecting their jobs, management must discuss the new system early in order to establish a mutual understanding and alleviate apprehension. Union support and endorsement of new systems and procedures generally occur when labor union representatives participate in discussions with management regarding the impacts of system implementation on union employees.

GETTING STARTED—In setting up and preparing to use more formal maintenance management procedures, details of the planning element should be addressed. Specifically, the important building blocks of maintenance management—activity guidelines and feature inventory should be addressed. Note that the PLANNING and other elements of maintenance management address the following questions:

What kinds of information are needed to set up a maintenance management system?

- Management unit data
- Maintenance feature inventory data
- Labor, equipment and materials cost and inventory data
- Maintenance activity information
- Location information

What are the specific procedures and questions addressed by maintenance management?

- How is the maintenance operation organized? (management units—districts, areas)
- What is maintained and what condition is it in? (feature inventory and condition assessment)
- What type of maintenance work is done? (activity list)
- How often or how much maintenance work should be done? (quantity standard and service level)
- What people, equipment and materials are needed? (resources and costs)
- When is work done? (work calendar)
- When, where, why, and how is the maintenance activity performed? (activity guideline)
- Where is work done? (location)
- What is the optimum level of maintenance? (desired work program and budget)
- What level of maintenance is funded? (planned work program)
- What is the difference between the desired and planned programs? (deferred maintenance)
- How much work is actually accomplished or requested? (work reporting)
- How does the planned work program compare to actual work accomplished? (evaluation reports)

Documenting your maintenance work program

To begin, obtain and compile details of the current maintenance program:

- *Organization chart*
- *Map—useful in identifying maintenance areas....and responsibilities*
- *Current expenditures....BARS provides detailed tracking of maintenance costs*

***Document inventory of maintainable features
(maintenance assets)....***

What gets maintained?

A sample form for use in compiling such data is presented below. Note—the inventory may also be broken down by maintenance area to better document the maintenance feature inventory (assets) being maintained in each Supervisor’s area.

MAINTENANCE FEATURE INVENTORY DATA
COUNTY ROAD ADMINISTRATION BOARD
Maintenance Management Program

	FEATURE NAME	MEAS UNITS	MGMT UNIT	TOTAL INVENTORY
	gravel road	miles	ADAM	1,131
	paved road	miles	ADAM	648
	shoulder	miles	ADAM	1,296
	total road	miles	ADAM	1,779
	ditch	miles	ADAM	1,296
	culvert	each	ADAM	2,669
	catch basin	each	ADAM	1
	bridge	each	ADAM	124
	other structure	each	ADAM	124
	sidewalk	feet	ADAM	1
	path	feet	ADAM	1
	street light	each	ADAM	1
	signs	each	ADAM	45,000
	guardrail	feet	ADAM	3,240
	striping	miles	ADAM	1,944
	year	year	ADAM	1

Document unit costs and amounts of Labor, Equipment and Materials resources.

Such records are typically available from personnel/payroll files and ER&R files.

A sample form is presented below.

LABOR, EQUIPMENT AND MATERIALS DATA
COUNTY ROAD ADMINISTRATION BOARD
Maintenance Management Program

	RESOURCE NAME	MGMT UNIT	RES. TYPE	UNIT COST	HOW MANY AVAILABLE?
	Grader	MTCE	E	28.00	
	Pickup	MTCE	E	4.00	
	Dump truck	MTCE	E	21.00	
	Water truck	MTCE	E	15.00	
	Loader	MTCE	E	30.00	
	Patch truck	MTCE	E	10.00	
	Air compressor	MTCE	E	6.00	
	Distributor	MTCE	E	60.00	
	Steel Roller	MTCE	E	20.00	
	Plate compactor	MTCE	E	3.00	
	Broom	MTCE	E	35.00	
	Rub tire roller	MTCE	E	20.00	
	Excavator	MTCE	E	45.00	
	Vactor	MTCE	E	45.00	
	Chipper	MTCE	E	25.00	
	Chainsaw	MTCE	E	3.00	
	Propane torch	MTCE	E	2.00	
	Maint Worker I	MTCE	L	20.00	
	Maint Worker II	MTCE	L	22.36	
	Maint WorkerIII	MTCE	L	28.64	
	Sign Tech	MTCE	L	28.64	
	Supervisor	MTCE	L	30.00	
	5/8" crush rock	MTCE	M	12.00	
	Cold Mix	MTCE	M	40.00	
	Crack filler	MTCE	M	2.00	
	Sand	MTCE	M	9.00	
	Tack oil	MTCE	M	0.80	
	Hot Mix Class G	MTCE	M	35.00	
	CRS2 or CMS2	MTCE	M	0.10	
	Culvert	MTCE	M	12.00	
	De-icer chem	MTCE	M	1.00	
	Markers	MTCE	M	0.10	
	Spray chemical	MTCE	M	12.00	
	Trash bags	MTCE	M	0.50	
	Misc materials	MTCE	M	1.00	
	Misc sign matrl	MTCE	M	1.00	

Develop, with Supervisors, complete descriptions of maintenance activities... the what, where, when, why, how and how much of maintenance activities....including cost also.

The Activity Guidelines below provide some suggestions and possible starting points for the discussion of maintenance activities. Note—this requires considerable attention and time as it is one of the most important steps in documenting the specifics of an individual maintenance program.

Activity Guidelines show details of maintenance activities and also include resource cost information. Shown below is an example of a Maintenance Activity Guideline. ...the first page presents a format for documenting the activity and the second form (on the next page) presents a format for identifying and documenting costs associated with the activity, as well as expected average daily production.

WASHINGTON COUNTIES Maintenance Management MAINTENANCE ACTIVITY PLANNING GUIDELINE														
ACTIVITY NAME:														
ACTIVITY CODE:														
ACTIVITY DESCRIPTION:														
MONTHLY SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
SCHEDULING CONSIDERATIONS:														
PERSONNEL						WORK CONSIDERATIONS								
CODE	CLASS	QTY												
EQUIPMENT														
CODE	CLASS	QTY												
REFERENCE AND SAFETY														
MATERIALS														
CODE	CLASS	QTY												
AVERAGE DAILY ACCOMPLISHMENT						MAINTENANCE FEATURE INVENTORY								
QUANTITY	WORK UNIT		FEATURE				UNIT		CODE					
PLANNING GUIDELINE APPROVAL														
BY:						EFFECTIVE DATE:				PREV:				

Activity cost form.....

WASHINGTON COUNTIES Maintenance Management ACTIVITY COSTING -- STANDARD DAILY COSTS									
ACTIVITY NAME:									
ACTIVITY CODE:									
MEASUREMENT UNIT:									
PERSONNEL/CREW COSTS									
CODE	CLASS	QTY	HOURS	HOURLY RATE		COST		% TOTAL COST	
CREW TOTAL		0	0			0.00		#####	
EQUIPMENT									
CODE	CLASS	QTY	HOURS	HOURLY RATE		COST		% TOTAL COST	
EQUIPMENT TOTAL		0	0			0.00		#####	
MATERIALS									
CODE	CLASS	QTY	UNIT COST			COST		% TOTAL COST	
MATERIALS TOTAL		0	0			0.00		#####	
CONTRACT SERVICES						0.00		#####	
SUMMARY:									
TOTAL DAILY COST						0.00			
AVERAGE DAILY ACCOMPLISHMENT									
UNIT COST (\$/UNIT)						#DIV/0!			

By combining the material developed from the previous steps, a Work Program and Budget can be developed. This is one of the primary outputs of the PLANNING element of maintenance management.

See sample below. This sample was developed using the activity guidelines and cost data, as well as county's maintenance cost data obtained from the annual report to the Secretary of Transportation.

WORK PROGRAM AND BUDGET REPORT
COUNTY ROAD ADMINISTRATION BOARD
Maintenance Management Program

ACTIVITY CODE	NAME	INVENTORY		PLANNED SERVICE LEVEL		PCT OF DES	ANNUAL WORK QTY	AVG DAILY PROD	CREW SIZE	PERSON DAYS	COST LABOR	DISTRIBUTION		TOTAL COST
		QTY	UNIT	QTY	UNIT							EQUIP	MAT/OTH	
ADAMS COUNTY														
2311	GRADING	1131	miles	8	pass mi	100	9048	12	1	754	134,876	193,024	0	327,900
2313	RE-GRAVELING	1131	miles	5	cu yd	100	5655	150	6	226	48,039	48,256	67,860	164,155
2321	POTHOLE REPAIR	648	miles	1	ton	100	648	2	2	648	115,914	25,920	25,920	167,754
2322	CRACK SEALING	648	miles	5	gal	100	3240	24	3	405	72,446	21,600	28,215	122,261
2323	BLADE PATCHING	648	miles	1	ton	100	648	75	10	86	16,355	12,522	46,182	75,059
2324	SEAL COATING (BST)	648	miles	0.2	road mi	100	130	2.5	21	1088	206,852	104,429	357,420	668,701
2331	SHOULDER BLADING	1296	miles	0.4	shld mi	100	518	4	4	518	105,754	69,466	0	175,220
2332	SHOULDER REPAIR	1296	miles	0.5	cu yd	100	648	20	4	130	26,438	15,552	77,760	119,750
2390	OTHER ROAD MAINT	1779	miles	1	hours	100	1779	16	2	222	39,783	3,558	2,224	45,565
2411	DITCHING W/GRADER	1296	miles	0.1	ditch mi	100	130	3	4	173	35,251	23,155	0	58,406
2412	DITCHING W/DITCHER	1296	miles	10	ditch ft	100	12960	500	6	155	33,003	18,855	0	51,858
2421	CULVERT CLEANING	2669	each	1	culverts	100	2669	20	2	267	54,468	4,272	0	58,740
2422	CULVERT REP/REPL	2669	each	0.2	lin ft	100	534	40	6	80	15,611	8,512	13,433	37,556
2490	OTHER DRAINAGE MTCE	1779	miles	1	hours	100	1779	16	2	222	45,370	22,240	0	67,610
2511	BRIDGE/STRUCT MTCE	124	each	0.5	hours	100	62	24	3	8	1,526	520	52	2,098
2512	BRIDGE/STRUCT REPAIR	124	each	0.3	hours	100	37	24	3	5	939	320	32	1,291
2590	OTHER BRG/STR MAINT	124	each	0.25	hours	100	31	24	3	4	763	260	26	1,049
2641	SIGN MAINTENANCE	45000	each	0.02	hours	100	900	24	2	75	17,184	6,000	3,000	26,184
2642	GUARDRAIL REPAIR	3240	feet	0.5	lin ft	100	1620	60	2	54	12,372	4,320	2,700	19,392
2643	TRAFFIC MARKINGS	1944	miles	2000	ft	100	3888000	8400	2	926	212,119	74,064	92,580	378,763
2660	SNOW & ICE CONTROL	1779	miles	2.2	hours	100	3914	8	1	489	112,086	82,186	58,704	252,976
2670	STREET CLEANING	1779	miles	1.3	hours	100	2313	32	4	289	55,364	31,234	0	86,598
2690	OTHER TRAFFIC MAINT	1779	miles	0.1	hours	100	178	16	2	22	5,086	1,776	444	7,306
2712	BRUSH CONTROL-MECH	1296	miles	0.1	shldr mi	100	130	3	3	130	25,353	22,464	864	48,681
2713	BRUSH CONTROL-MANUAL	1296	miles	1	hours	100	1296	48	4	108	22,032	12,960	1,350	36,342
2721	CHEM VEG CONTRL-MECH	1296	miles	0.1	shldr mi	100	130	12	2	22	4,406	3,802	1,620	9,828
2722	CHEM VEG CONTRL-MAN	1296	miles	0.1	hours	100	130	16	2	16	3,305	2,851	648	6,804
2731	LANDSCAPE MAINT	1296	miles	1	hours	100	1296	32	4	162	28,979	2,592	3,240	34,811
2751	LITTER CONTROL	1296	miles	1	hours	100	1296	16	2	162	28,979	2,592	1,620	33,191
2761	SLOPE REPAIR	1296	miles	0.7	hours	100	907	32	4	114	23,174	15,904	0	39,078
2790	OTHER ROADSIDE MAINT	1296	miles	0.1	hours	100	130	32	4	16	3,346	2,296	0	5,642
2910	MAINTENANCE ADMIN	1	year	5000	hours	100	5000	8	1	625	150,000	20,000	0	170,000
TOTALS:										8201	1,657,173	857,502	785,894	3,300,569

And, from the Work Program and Budget, the details of Labor, Equipment and Materials resource requirements can be documented and analyzed.

See samples of Labor, Equipment and Material resource requirements reports below.

LABOR REQUIREMENTS REPORT (SUMMARY)
COUNTY ROAD ADMINISTRATION BOARD
Maintenance Management Program

Mgmt Unit: ADAMS COUNTY

CODE	ACTIVITY NAME	OCT	NOV	DEC	PERSON DAYS BY MONTH									TOTAL NEED	TOTAL COST	
					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP			
L201	Maint Worker I	INVENTORY: 1		AVAILABILITY: 90%												
	PERSON DAYS REQUIRED:	0	0	0	0	0	0	0	0	0	4	90	89.6	40.8	224.4	35904
	AVG NO STAFF REQUIRED:	0	0	0	0	0	0	0	0	0	0.2	5	4.7	2.2	1	
L202	Maint Worker II	INVENTORY: 1		AVAILABILITY: 90%												
	PERSON DAYS REQUIRED:	360	383.3	278.5	243.7	318.9	395.5	533.9	411.7	265.5	386.8	385.7	290.4	4253.9	760937	
	AVG NO STAFF REQUIRED:	18.2	23.7	14.7	12.9	18.6	22	28.2	21.8	13.4	21.5	20.4	15.4	19.1		
L203	Maint WorkerIII	INVENTORY: 1		AVAILABILITY: 90%												
	PERSON DAYS REQUIRED:	83.8	95.3	149.2	147.4	154	200.6	313.1	220.3	86.1	193.9	193.4	131.9	1969	451138	
	AVG NO STAFF REQUIRED:	4.2	5.9	7.9	7.8	9	11.1	16.6	11.7	4.3	10.8	10.2	7	8.9		
L206	Sign Tech	INVENTORY: 1		AVAILABILITY: 90%												
	PERSON DAYS REQUIRED:	11.8	12.4	12.4	12.2	12.8	12.8	12.8	12.8	198.2	290.4	290.4	198	1077	246761	
	AVG NO STAFF REQUIRED:	0.6	0.8	0.7	0.6	0.7	0.7	0.7	0.7	10	16.1	15.4	10.5	4.8		
L209	Supervisor	INVENTORY: 1		AVAILABILITY: 90%												
	PERSON DAYS REQUIRED:	52.8	52.8	52.5	52.5	51.8	51.8	51.8	51.8	51.8	73.2	73.1	60.9	676.8	162432	
	AVG NO STAFF REQUIRED:	2.7	3.3	2.8	2.8	3	2.9	2.7	2.7	2.6	4.1	3.9	3.2	3		
														TOTAL COST:	1657172	

EQUIPMENT REQUIREMENTS REPORT (SUMMARY)
COUNTY ROAD ADMINISTRATION BOARD
Maintenance Management Program

Mgmt Unit: ADAMS COUNTY

RESOURCE CODE	NAME	EQUIPMENT HOURS BY MONTH												TOTAL NEED	TOTAL COST		
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP				
E101	Grader	INVENTORY:		1													
	EQUIP HOURS REQUIRE	D 681.6	1280.8	301.6	301.6	603.2	677.6	1799.2	1189.6	688	87.2	87.2	87.2	7784.8	217974		
	AVG UNITS REQUIRED:	4.8	11.1	2.2	2.2	5	5.3	13.4	8.9	4.9	0.7	0.6	0.6	4.9			
E102	Pickup	INVENTORY:		1	AVAIL	ABILI	TY	80									
	EQUIP HOURS REQUIRE	D 1732.8	2323.2	1312	1306.4	1626.4	1792	2916	2388.8	1796	1432.8	1431.2	1338.4	21396	85582		
	AVG UNITS REQUIRED:	12.3	20.2	9.8	9.7	13.4	14	21.7	17.8	12.8	11.2	10.6	10	13.5			
E103	Dump truck	INVENTORY:		1	AVAIL	ABILI	TY	80									
	EQUIP HOURS REQUIRE	D 356.0	399.2	936.8	929.6	951.2	1221.6	1149.6	268.8	274.4	964	960.8	566.4	8978.4	188547		
	AVG UNITS REQUIRED:	2.5	3.5	7	6.9	7.8	9.5	8.6	2	1.9	7.5	7.1	4.2	5.7			
E104	Sign Truck	INVENTORY:		1	AVAIL	ABILI	TY	80									
	EQUIP HOURS REQUIRE	D 47.2	49.6	49.6	48.8	51.2	51.2	51.2	51.2	792.8	1161.6	1161.6	792	4308	86160		
	AVG UNITS REQUIRED:	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	5.6	9.1	8.6	5.9	2.7			
E105	Water truck	INVENTORY:		1	AVAIL	ABILI	TY	80									
	EQUIP HOURS REQUIRE	D 126.4	123.2	48.8	48.8	48	122.4	122.4	48	48	219.2	218.4	120.8	1294.4	19416		
	AVG UNITS REQUIRED:	0.9	1.1	0.4	0.4	0.4	1	0.9	0.4	0.3	1.7	1.6	0.9	0.8			
E106	Loader	INVENTORY:		1	AVAIL	ABILI	TY	90									
	EQUIP HOURS REQUIRE	D 78.4	74.4	0	0	0	74.4	74.4	22.4	21.6	192	191.2	93.6	822.4	24672		
	AVG UNITS REQUIRED:	0.5	0.6	0	0	0	0.5	0.5	0.1	0.1	1.3	1.3	0.6	0.5			
E107	Patch truck	INVENTORY:		1	AVAIL	ABILI	TY	90									
	EQUIP HOURS REQUIRE	D 576.0	376	509.6	376	505.6	637.6	372	106.4	106.4	0	0	106.4	3672	36720		
	AVG UNITS REQUIRED:	3.6	2.9	3.4	2.5	3.7	4.4	2.5	0.7	0.7	0	0	0.7	2.1			
E108	Air compressor	INVENTORY:		1	AVAIL	ABILI	TY	90									
	EQUIP HOURS REQUIRE	D 110.4	110.4	110.4	110.4	106.4	106.4	106.4	106.4	106.4	0	0	106.4	1080	6480		
	AVG UNITS REQUIRED:	0.7	0.9	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0	0	0.7	0.6			
E109	Distributor	INVENTORY:		1	AVAIL	ABILI	TY	80									
	EQUIP HOURS REQUIRE	D .0	0	0	0	0	0	0	0	16	188.8	188	90.4	483.2	28992		
	AVG UNITS REQUIRED:	0	0	0	0	0	0	0	0	0.1	1.5	1.4	0.7	0.3			
E110	Steel Roller	INVENTORY:		1	AVAIL	ABILI	TY	80									
	EQUIP HOURS REQUIRE	D 78.4	74.4	0	0	0	74.4	74.4	0	16	17.6	17.6	17.6	370.4	7408		
	AVG UNITS REQUIRED:	0.6	0.6	0	0	0	0.6	0.6	0	0.1	0.1	0.1	0.1	0.2			
E111	Plate compactor	INVENTORY:		1	AVAIL	ABILI	TY	80									
	EQUIP HOURS REQUIRE	D .0	0	0	0	0	0	0	0	16	17.6	17.6	17.6	68.8	206		
	AVG UNITS REQUIRED:	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0			
E112	Broom	INVENTORY:		1	AVAIL	ABILI	TY	90									
	EQUIP HOURS REQUIRE	D 48.0	105.6	104.8	97.6	96.8	96.8	566.4	634.4	116.8	288.8	288	190.4	2634.4	92204		
	AVG UNITS REQUIRED:	0.3	0.8	0.7	0.6	0.7	0.7	3.7	4.2	0.7	2	1.9	1.3	1.5			
E113	Rub tire roller	INVENTORY:		1	AVAIL	ABILI	TY	90									
	EQUIP HOURS REQUIRE	D .0	0	0	0	0	0	0	0	0	171.2	170.4	72.8	414.4	8288		
	AVG UNITS REQUIRED:	0	0	0	0	0	0	0	0	0	1.2	1.1	0.5	0.2			
E114	Excavator	INVENTORY:		1	AVAIL	ABILI	TY	90									
	EQUIP HOURS REQUIRE	D 24.8	25.6	3.2	3.2	26.4	71.2	48	88.8	44	44	44	44	467.2	21024		
	AVG UNITS REQUIRED:	0.2	0.2	0	0	0.2	0.5	0.3	0.6	0.3	0.3	0.3	0.3	0.3			
E116	Chipper	INVENTORY:		1	AVAIL	ABILI	TY	80									
	EQUIP HOURS REQUIRE	D 51.2	51.2	48	48	44.8	44.8	45.6	45.6	45.6	45.6	45.6	45.6	561.6	14040		
	AVG UNITS REQUIRED:	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.4			
E117	Chainsaw	INVENTORY:		1	AVAIL	ABILI	TY	80									
	EQUIP HOURS REQUIRE	D 102.4	102.4	96	96	89.6	89.6	91.2	91.2	91.2	91.2	91.2	91.2	1123.2	3370		
	AVG UNITS REQUIRED:	0.7	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7			
E119	Mower	INVENTORY:		1	AVAIL	ABILI	TY	80									
	EQUIP HOURS REQUIRE	D 32.0	32	29.6	29.6	27.2	27.2	28	28	28	28	28	28	345.6	10368		

MATERIAL/OTHER RESOURCE REQUIREMENTS REPORT (SUMMARY)
COUNTY ROAD ADMINISTRATION BOARD
Maintenance Management Program

Mgmt Unit: ADAMS COUNTY

CODE	RESOURCE NAME/UNITS	MATERIAL/OTHER REQUIREMENTS BY MONTH											TOTAL NEED	TOTAL COST	
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG			SEP
M301	5/8" crush rock CY	1470	2815	1400	1220	1220	2615	1395	112	108	8664	8624	3744	33387	400644
M302	Cold Mix Ton	116.4	66.4	99.8	66.4	99.8	132.8	66.4	0	0	0	0	0	648	25920
M303	Crack filler Gal	1380	1380	1380	1380	1330	1330	1330	1330	1330	0	0	1330	13500	27000
M304	Sand CY	13.8	13.8	13.8	13.8	13.3	13.3	13.3	13.3	13.3	0	0	13.3	135	1215
M305	Tack oil Gal	0	0	0	0	0	0	0	0	300	330	330	330	1290	1032
M306	Hot Mix Class G Ton	0	0	0	0	0	0	0	0	300	330	330	330	1290	45150
M307	CRS2 or C1 Gal	0	0	0	0	0	0	0	0	0	321000	319500	136500	777000	77700
M308	Culvert Ft	0	0	0	0	0	0	0	112	108	104	104	104	532	6384
M311	Markers Ea	0	0	0	0	0	0	0	0	0	128400	127800	54600	310800	31080
M391	Misc materials \$	1220	878	12503	12497	12634	13006	13408	1776	1459	1458	1458	1448	73745	73745
M392	Misc sign material \$	260	272	272	272	296	296	296	296	18836	28056	28056	18816	96024	96024
													TOTAL	COST:	785894

And, more detailed use of resources can be shown by activity.....

LABOR REQUIREMENTS REPORT (DETAIL)
COUNTY ROAD ADMINISTRATION BOARD
Maintenance Management Program

CODE	ACTIVITY NAME	OCT	NOV	DEC	JAN	PERSON DAYS BY MONTH						TOTAL NEED	TOTAL COST		
						FEB	MAR	APR	MAY	JUN	JUL			AUG	SEP
						Maint Worker I		L201							
ADAM - ADAMS COUNTY															
2323	BLADE PATCHING	0	0	0	0	0	0	0	0	4	4.4	4.4	4.4	17.2	2752
ADAM - ADAMS COUNTY															
2324	SEAL COATING (BST)	0	0	0	0	0	0	0	0	0	85.6	85.2	36.4	207.2	33152
TOTAL:		0	0	0	0	0	0	0	0	4	90	89.6	40.8	224.4	35904
						Maint Worker II		L202							
ADAM - ADAMS COUNTY															
2311	GRADING	75.4	150.8	37.7	37.7	75.4	75.4	150.8	75.4	75.4	0	0	0	754	134876
ADAM - ADAMS COUNTY															
2313	RE-GRAVELING	19.6	18.6	0	0	0	18.6	18.6	0	0	0	0	0	75.4	13488
ADAM - ADAMS COUNTY															
2321	POTHOLE REPAIR	116.4	66.4	99.8	66.4	99.8	132.8	66.4	0	0	0	0	0	648	115914
ADAM - ADAMS COUNTY															
2322	CRACK SEALING	41.4	41.4	41.4	41.4	39.9	39.9	39.9	39.9	39.9	0	0	39.9	405	72446
ADAM - ADAMS COUNTY															
2323	BLADE PATCHING	0	0	0	0	0	0	0	0	10	11	11	11	43	7692
ADAM - ADAMS COUNTY															
2324	SEAL COATING (BST)	0	0	0	0	0	0	0	0	0	235.4	234.3	100.1	569.8	101926
ADAM - ADAMS COUNTY															
2331	SHOULDER BLADING	0	0	0	0	0	0	129.6	129.6	0	0	0	0	259.2	46366
ADAM - ADAMS COUNTY															
2332	SHOULDER REPAIR	0	14.2	14	12.2	12.2	12.2	0	0	0	0	0	0	64.8	11591
ADAM - ADAMS COUNTY															
2390	OTHER ROAD MAINT	18.6	18.6	19	19	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	222.4	39783
ADAM - ADAMS COUNTY															
2411	DITCHING W/GRADER	0	0	0	0	0	0	0	17	17.2	17.4	17.4	17.4	86.4	15455
ADAM - ADAMS COUNTY															
2412	DITCHING W/DITCHER	0	0	0	0	0	0	0	10.2	10.4	10.4	10.4	10.4	51.8	9266
ADAM - ADAMS COUNTY															
2421	CULVERT CLEANING	12.5	12.5	12.6	12.6	12.6	10.1	10.1	10.1	10.1	10.1	10.1	10.1	133.5	23880
ADAM - ADAMS COUNTY															
2422	CULVERT REP/REPL	0	0	0	0	0	0	0	11.2	10.8	10.4	10.4	10.4	53.2	9516
ADAM - ADAMS COUNTY															
2490	OTHER DRAINAGE MTCE	9.6	9.3	9.3	9.3	9.3	9.2	9.2	9.2	9.2	9.2	9.2	9.2	111.2	19891
ADAM - ADAMS COUNTY															
2511	BRIDGE/STRUCT MTCE	0	0	0	0	0	1	1	0.6	0.6	1	1	0	5.2	930
ADAM - ADAMS COUNTY															
2512	BRIDGE/STRUCT REPAIR	0	0	0	0	0	0	0	0	0.8	0.8	0.8	0.8	3.2	572
ADAM - ADAMS COUNTY															
2590	OTHER BRG/STR MAINT	0	0	0.4	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	2.6	465
ADAM - ADAMS COUNTY															
2670	STREET CLEANING	18	18.3	18.3	18.3	18	18	18	18	18	18	18	18	216.9	38799

To assist in leveling the workload over various months or specific periods of the year, and to assist in identifying resource needs on a month-to-month and annual basis, Work Calendars and Workload Distribution reports are useful.

The Work Calendar and Workload Distribution can be used as a baseline for scheduling specific maintenance work activities....often done on a weekly or bi-weekly basis.

Samples of a Work Calendar and a Workload Distribution report are shown below.

**WORK CALENDAR
COUNTY ROAD ADMINISTRATION BOARD
Maintenance Management Program**

CODE	ACTIVITY NAME/ANNUAL WORK QTY	CREW SIZE	CREW DAYS PLANNED												ANNUAL TOTAL	AVG DAILY PROD
			OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
ADAM ADAMS COUNTY																
2311	GRADING 9048 pass mi	1	75.4	150.8	37.7	37.7	75.4	75.4	150.8	75.4	75.4	0	0	0	754	12
2313	RE-GRAVELLING 5655 cu yd	6	9.8	9.3	0	0	0	9.3	9.3	0	0	0	0	0	37.7	150
2321	POTHOLE REPAIR 648 ton	2	58.2	33.2	49.9	33.2	49.9	66.4	33.2	0	0	0	0	0	324	2
2322	CRACK SEALING 3240 gal	3	13.8	13.8	13.8	13.8	13.3	13.3	13.3	13.3	13.3	0	0	13.3	135	24
2323	BLADE PATCHING 648 ton	10	0	0	0	0	0	0	0	0	2	2.2	2.2	2.2	8.6	75
2324	SEAL COATING (BST) 130 road mi	21	0	0	0	0	0	0	0	0	0	21.4	21.3	9.1	51.8	2.5
2331	SHOULDER BLADING 518 shld mi	4	0	0	0	0	0	0	64.8	64.8	0	0	0	0	129.6	4
2332	SHOULDER REPAIR 648 cu yd	4	0	7.1	7	6.1	6.1	6.1	0	0	0	0	0	0	32.4	20
2390	OTHER ROAD MAINT 1779 hours	2	9.3	9.3	9.5	9.5	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	111.2	16
2411	DITCHING W/GRADER 130 ditch mi	4	0	0	0	0	0	0	0	8.5	8.6	8.7	8.7	8.7	43.2	3
2412	DITCHING W/DITCHER 12960 ditch ft	6	0	0	0	0	0	0	0	5.1	5.2	5.2	5.2	5.2	25.9	500
2421	CULVERT CLEANING 2669 culverts	2	12.5	12.5	12.6	12.6	12.6	10.1	10.1	10.1	10.1	10.1	10.1	10.1	133.5	20
2422	CULVERT REP/REPL 534 lin ft	6	0	0	0	0	0	0	0	2.8	2.7	2.6	2.6	2.6	13.3	40
2490	OTHER DRAINAGE MTCE 1779 hours	2	9.6	9.3	9.3	9.3	9.3	9.2	9.2	9.2	9.2	9.2	9.2	9.2	111.2	16
2511	BRIDGE/STRUCT MTCE 62 hours	3	0	0	0	0	0	0.5	0.5	0.3	0.3	0.5	0.5	0	2.6	24
2512	BRIDGE/STRUCT REPAIR 37 hours	3	0	0	0	0	0	0	0	0	0.4	0.4	0.4	0.4	1.6	24
2590	OTHER BRG/STR MAINT 31 hours	3	0	0	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.3	24
2641	SIGN MAINTENANCE 900 hours	2	2.9	3	3	3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	37.5	24
2642	GUARDRAIL REPAIR 1620 lin ft	2	2.3	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	27	60
2643	TRAFFIC MARKINGS 3888000 ft	2	0	0	0	0	0	0	0	0	92.7	138.8	138.8	92.6	462.9	8400
2660	SNOW & ICE CONTROL 3914 hours	1	0	0	97.9	97.9	97.8	97.8	97.8	0	0	0	0	0	489.2	8
2670	STREET CLEANING 2313 hours	4	6	6.1	6.1	6.1	6	6	6	6	6	6	6	6	72.3	32
2690	OTHER TRAFFIC MAINT 178 hours	2	0.7	0.8	0.8	0.8	1	1	1	1	1	1	1	1	11.1	16
2712	BRUSH CONTROL-MECH 130 shldr mi	3	4	4	3.7	3.7	3.4	3.4	3.5	3.5	3.5	3.5	3.5	3.5	43.2	3
2713	BRUSH CONTROL-MANUAL 1296 hours	4	2.4	2.4	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	27	48
2721	CHEM VEG CONTRL-MECH 130 shldr mi	2	0.8	0.8	0	0	0.8	1.2	1.2	1.2	1.2	1.2	1.2	1.2	10.8	12
2722	CHEM VEG CONTRL-MAN 130 hours	2	0.7	0	0	0	0.7	0.7	1.5	0.9	0.9	0.9	0.9	0.9	8.1	16
2731	LANDSCAPE MAINT 1296 hours	4	3.7	0	0	0	0	3.8	8	8.2	4.2	4.2	4.2	4.2	40.5	32
2751	LITTER CONTROL 1296 hours	2	6.6	6.6	6.6	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	81	16
2761	SLOPE REPAIR 907 hours	4	2.7	2.8	0	0	2.9	8.6	5.7	5.7	0	0	0	0	28.4	32
2790	OTHER ROADSIDE MAINT 130 hours	4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	4.1	32
2910	MAINTENANCE ADMIN 5000 hours	1	52.8	52.8	52.5	52.5	51.8	51.8	51.8	51.8	51.8	51.8	51.8	51.8	625	8

WORKLOAD DISTRIBUTION REPORT
COUNTY ROAD ADMINISTRATION BOARD
Maintenance Management Program

ACTIVITY CODE	NAME	Person Days Per Month												TOTAL	CREW SIZE	CREW DAYS	
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP				
ADAM ADAMS COUNTY																	
2311	GRADING	75	151	38	38	75	75	151	75	75					754	1	754
2313	RE-GRAVELING	59	56				56	56							226	6	38
2321	POTHOLE REPAIR	116	66	100	66	100	133	66						648	2	324	
2322	CRACK SEALING	41	41	41	41	40	40	40	40					405	3	135	
2323	BLADE PATCHING									20		22	22	86	10	9	
2324	SEAL COATING (BST)										449	447	191	1088	21	52	
2331	SHOULDER BLADING							259	259					518	4	130	
2332	SHOULDER REPAIR		28	28	24	24	24							130	4	32	
2390	OTHER ROAD MAINT	19	19	19	19	18	18	18	18	18	18	18	18	222	2	111	
2411	DITCHING W/GRADER							34	34	35	35	35	35	173	4	43	
2412	DITCHING W/DITCHER							31	31	31	31	31	31	155	6	26	
2421	CULVERT CLEANING	25	25	25	25	25	20	20	20	20	20	20	20	267	2	134	
2422	CULVERT REP/REPL							17	16	16	16	16	16	80	6	13	
2490	OTHER DRAINAGE MTCE	19	19	19	19	19	18	18	18	18	18	18	18	222	2	111	
2511	BRIDGE/STRUCT MTCE						2	2	1	1	2	2	2	8	3	3	
2512	BRIDGE/STRUCT REPAIR									1	1	1	1	5	3	2	
2590	OTHER BRG/STR MAINT			1	1	1	0	0	0	0	0	0	0	4	3	1	
2641	SIGN MAINTENANCE	6	6	6	6	6	6	6	6	6	6	6	6	75	2	38	
2642	GUARDRAIL REPAIR	5	5	5	5	4	4	4	4	4	4	4	4	54	2	27	
2643	TRAFFIC MARKINGS									185	278	278	185	926	2	463	
2660	SNOW & ICE CONTROL			98	98	98	98	98						489	1	489	
2670	STREET CLEANING	24	24	24	24	24	24	24	24	24	24	24	24	289	4	72	
2690	OTHER TRAFFIC MAINT	1	2	2	2	2	2	2	2	2	2	2	2	22	2	11	
2712	BRUSH CONTROL-MECH	12	12	11	11	10	10	11	11	11	11	11	11	130	3	43	
2713	BRUSH CONTROL-MANUAL	10	10	9	9	9	9	9	9	9	9	9	9	108	4	27	
2721	CHEM VEG CONTRL-MECH	2	2			2	2	2	2	2	2	2	2	22	2	11	
2722	CHEM VEG CONTRL-MAN	1				1	1	3	2	2	2	2	2	16	2	8	
2731	LANDSCAPE MAINT	15					15	32	33	17	17	17	17	162	4	41	
2751	LITTER CONTROL	13	13	13	14	14	14	14	14	14	14	14	14	162	2	81	
2761	SLOPE REPAIR	11	11			12	34	23	23					114	4	28	
2790	OTHER ROADSIDE MAINT	2	2	2	2	2	1	1	1	1	1	1	1	16	4	4	
2910	MAINTENANCE ADMIN	53	53	53	53	52	52	52	52	52	52	52	52	625	1	625	
TOTAL PERSON DAYS:		508	544	493	456	538	661	912	697	606	1034	1032	722	8201			
WORK DAYS/MONTH/PERSON:		22	18	21	21	19	20	21	21	22	20	21	21				
ESTIMATED STAFF NEEDED:		23	30	24	22	28	33	43	33	28	52	49	34	33			