

## Appendix B

### GIS AS AN AUTOMATED INFORMATION SYSTEM

A Geographic Information System (GIS) is a computer system designed to store, process, and analyze spatial data. In some respects, geographic information systems are similar to other automated information systems in that they involve the following:

- Data acquisition, the collection and gathering of data;
- Data compilation, for plotting data on to a coordinate correct base, i.e., map or orthophotoquad;
- Data capture, for the collection of data, their transformation into machine readable form, and their storage and organization within the computer;
- Editing updating and reclassifying of the data files;
- Manipulation, analysis, synthesis, and retrieval of data for used defined areas;
- Generation of a variety of outputs and reports;
- Consideration of data management and system security.

But the ways in which these functions are performed are for the most part very different from other information systems—a result of the most significant characteristic of the GIS, location. Data in a GIS is of spatial or geographic nature, and must be geo-referenced, that is, tied to locations on the surface of the earth.

MAJOR GIS SYSTEM FUNCTIONS: The major GIS functions cover data capture, editing, analysis, output, and management.

The efficient integration of data base management, data capture, vector and raster processing, automated cartographic techniques and spatial analysis routines results in a unified GIS.

Excellent line work can be produced with the aid of the plotter, precise line work that rivals or exceeds that of a skilled cartographer and most computer installations have plotters.

Use of a GIS can reduce not only the physical space required to store the data, but also the time spent in entering, updating, cataloging and retrieving the data. Speed, accuracy, and the ability to analyze large quantities of complex spatial data are the main attributes of GIS technology. Since GIS is designed for referencing and retrieving spatially oriented geographic data, it provides the capability to analyze and interpret information for a broad range of applications.

Natural resource data is needed to respond to various policies, directives, and initiatives in support of national, regional and local decisions. The overall goals of implementing a GIS are to support the decision making process, to increase the amount of available information and to improve the utility of the information.

Use of a GIS can:

- (1) Provide management with state-of-the-art technical planning capability to analyze data quickly;
- (2) Provide offices with accurate information in an immediately usable and understandable form, with statistical summaries and maps at various scales;
- (3) Improve coordination and efficient exchange of data between agencies in the development of resource management plans;
- (4) Increased efficiency and productivity of staff resource specialists;
- (5) Provides a district-wide inventory of natural and cultural resources, land ownership, land use, in a common format;
- (6) Improve the consistency and quality of data;
- (7) Avoid duplication of agency efforts of data collection and storage;
- (8) Minimize the cost of information processing and storage facilities; and
- (9) Reduce the need for re-inventory by permitting easy updating.

The three overall goals of implementing most GIS systems are:

- (1) Supporting the decision making process,
- (2) Increasing the availability of information, and
- (3) Improve utility (for processing and data analysis)

A GIS would make various analytical techniques available to the resource specialists that are otherwise too costly or time consuming to apply on a regular basis with current capabilities. The ability of a GIS system to “model” resource conditions for answering “what if” questions greatly assists the manager in reviewing possible land management alternatives. Using various impact scenarios, these automated techniques can create models for a variety of land use proposals.

Provide land managers with accurate information in an immediately usable and understandable form, including statistical summaries and maps at a variety of scales.

Results of analyses can be presented in various statistical and graphic formats including charts, graphs, tables, reports, narratives, maps and three-dimensional perspectives. These products are direct outputs of the GIS.

GIS provides the ability to access information based on geographic location which is clearly advantageous because virtually all natural resource data is collected on a site-specific basis. Retrieval of data is generally simplified by giving an individual the option of specifying the geographic boundaries for the required data, thereby automatically retrieving only information which is relevant to the area or issue under consideration.

Improve coordination with State, local, and other Federal agencies in the development of Resource Management Plans or other land-use based documents.

Coordination of planning efforts among various agencies becomes even more critical with the increase in volume and scope of Federal legislation and regulations, budget reductions and the expanding desire of planning authorities to assert control over the use of their lands. The complexity of expanding demands and utilization of the land and its resources requires the greater capability, objectivity and flexibility that can be provided by a GIS.

Promote an efficient exchange of data among agencies. Consolidation of common data needs will help to standardize information, thus improving the accessibility of data to all data users. This also increases the ability of each agency to make better decisions. Because other agencies such as BLM, FWS, BIA, USGS, BPA, DOE, MMS, SCS, USES and State of Oregon, State of Washington are currently using GIS software, more effective and efficient means of data storage and retrieval will facilitate greater exchange of agency data.

Improve efficiency/productivity of staff resource specialists. The ability to access resource information within specific geographic boundaries and interact with other information in the system greatly adds to the efficiency and productivity of staff resource specialists in their day-to-day and special project activities. Managers and resource specialists can quickly retrieve selected data, interact that data with other resource data, make management assessments, test alternatives, and determine courses of action on individual plans, projects or resource B .

All data can be consolidated and reformatted into a consistent and usable format. Data which currently exists in several documents at several administrative locations can be collected and entered into the system where it will be centrally located. Procedures for updating the data and interfacing with other agency data systems must also be included. Remote sensing technology offers some potential advantages as a mechanism to monitor and update. Some forms of GIS data can be synthesized (through overlays) from other data which reduces the collection needs and costs.

Part of the reason for conflict between agency planning is the result of inconsistent information. Some of these conflicts would be resolved through mutual access to each agency's data base (exchange of data). This should enhance the quality of the information available by allowing the selection of information most compatible to each agency.

Data needs common to more than one agency are presently maintained separately by each agency. This represents a duplication of agency efforts and a waste of public funds. Interfacing and/or sharing data with other government agencies greatly increases data sources and reduces duplication of efforts in collecting and analyzing the data.

The computer is the most powerful tool and the most efficient for handling extremely large amounts of information. Information stored in the computer is viewed as a central library which can be easily and quickly accessed by a number of people from different locations. Easy access to this central storage mechanism not only reduces the cost and physical storage space, but also capitalizes on the efficiency and computer speed to handle the information. Cost of processing information can thus be kept to a minimum.

Resource information stored in a computer can be easily updated, changed or added to the data base as new information is collected, allowing the district to maintain current status of the original inventory data. This greatly reduces repetitious inventory when there are new data needs.

The increased multiple use of this information not only promotes cooperation among individuals and agencies, but also reduces duplication of efforts in collecting, storing, and processing information within same office.

In addition to the benefit/cost ratio, field offices intending to automate for resource management should consider additional variables:

- resource management priorities
- value of the resources present
- characteristics of the land pattern
- repetitive nature of work
- activities mandated by law
- quality or accuracy of the products required
- use and life span of the products
- current level of automation available

The vast majority of resource management work performed in the field makes use of maps in some form, often in combination with the alphanumeric data bases mentioned. Using maps and analyzing the spatial relationships of data are a daily occurrence for most resource specialists and managers in the

district and other land management agencies and is a vital component to conveying the work that is done to other specialists, management, public land users, and the general public. Therefore, any system that is configured for use by resource specialists in field offices must be geo-referenced and have some analytical spatial graphic capability. Without the spatial graphic component, the alphanumeric data bases have only limited utility and applicability to the work performed in resource management.

The more times the data is used once it is captured, the higher the benefit/cost ratio. Many of the benefits will not be realized within the first five years. With continuing pressure from Washington to reduce budgets and personnel, it will be essential to use existing dollars and personnel in the most efficient manner. The re-utilization of data over and over rather than recapturing it each time will help managers meet these requirements. In all cases, the real savings and usefulness of GIS is in aiding the resource decision maker to make more informed decisions by providing comprehensive data. The data is spatially related to the managers area of interest, and is accessible in a timely fashion via state-of-the-art technology.

**GIS ANNUAL COST  
FEBRUARY 1989  
HARDWARE**

FY	DEPPEC		SOFTWARE					MAINT	SITE PR	TRAIN	IMO SUP	SOFTW	TOTAL
	PLT INC	DEPPEC	PLT INC	INS	DEPPEC	PLT INC							
88	0	0	0	0	0	0	2000	1200	5000	37900	56900		
89	43464	10851	6000	600	1628	23339	0	0	17000	312	103134		
90	48913	15271	16000	1630	1884	39548	0	0	17000	1800	152046		
91	64013	17309	40000	4050	1633	50308	0	0	17000	5400	199714		
92	64013	18175	3000	3150	1153	50308	0	0	17000	0	183799		
93	64013	19084	0	0	673	50308	0	0	17000	0	151078		
94	20609	20038	0	0	193	50308	0	0	17000	0	108148		
											954819		

**GIS ORGANIZATIONAL COSTS  
FEBRUARY 1989**

ORG	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94	TOTAL
PLANNING	34965	66001	90326	112668	104743	88416	60316	557435
OPERATIONS	13041	25987	38248	63836	55782	39315	28283	264492
REAL ESTATE	5929	7431	15648	15474	15516	15564	13032	88594
ENGINEERING	2965	3715	7824	7737	7758	7782	6517	44298
	56900	103134	152046	199714	183799	151078	108148	954819

**CADD ANNUAL COST  
FEBRUARY 1989  
HARDWARE**

**SOFTWARE**

FY	DEPPEC		PLT INC	DEPPEC	PLT INC	INS	MAINT	SITE PR	TRAIN	IMO SUP	SOFTW	TOTAL
88	0	0	0	0	0	0	2000	5000	5000	31670	43670	
89	63375	15844	0	0	2377	36461	0	0	17000	0	135057	
90	69375	18136	0	0	2126	34852	0	0	17000	0	141490	
91	69375	19043	0	0	1606	34852	0	0	17000	0	141876	
92	69375	19995	0	0	1086	34852	0	0	17000	0	142308	
93	69375	20995	0	0	565	34852	0	0	17000	0	142787	
94	6000	22044	0	0	45	34852	0	0	17000	0	79941	
											827130	

CAD/GIS SOFTWARE  
FY 88

FY 89

PROGRAM	CLIN NO	MNT	UNIT COST	QUA	TOT CST	CAD CST	GIS CST	QUA	TOT CST	CAD CST	GIS CST	CAD MNT	GIS MNT
FORTRAN, LRG SYS	0047	504	5270	1	5270	3420	1850					328	176
DATA VIEW	0072		1500	1	1500	1500							
ENGRG TABLES	0073		1250	1	1250	1250							
BITS	0077		500	1	500	500							
IGES/ISIF	0078		2800	1	2800	1300	1300						
ENGR SITE PACK	0085		10500	1	10500	10500							
DTM	0086		8000	1	8000	4000	4000						
ARCHITECTURA L	0087		6500	1	6500	6500							
ELECTRICAL	0089		1100	1	1100	1100							
MASTER PLAN SYS	0095		23850	1	23850		23850						
INTERPLOT	0136	312	2500	1	2500	1800	900					208	104
USGS DLG-IN			3000	1	3000		3000						
USGS DLG-OUT			3000	1	3000		3000						
WORLD MAPPING			12000	1	12000			1	12000		12000		
ACTEM	GSA	240	312					1	312		312		240
MICROSTATION, WS		720	1800										
WS GIS EDIT/MAP		1000	10000										
WS GIS ANALYST		1000	10000										
			69570		69570	31670	37900		12312	0	12312	538	520

CAD/GIS SOFTWARE

FY 80

PROGRAM	CLIN NO	MAINT	UNIT COST	QUA	TOT CST	CAD CST	GIS CST	CAD MNT	GIS MNT
FORTRAN, LRG SYS	0047	504	5270						
DATA VIEW	0072		1500						
ENGRG TABLES	0073		1250						
BITS	0077		500						
IGES/ISIF	0078		2600						
ENGR SITE PACK	0085		10500						
DTM	0086		8000						
ARCHITECTURAL	0087		6500						
ELECTRICAL	0089		1100						
MASTER PLAN SYS	0096		23650						
INTERPLOT	0136	312	2500						
USGS DLG-IN			3000						
USGS DLG-OUT			3000						
WORLD MAPPING			12000						
ACTEM	GSA	240	312						
MICROSTATION, WS		720	1800	1	1800		1800		720
WS GIS EDIT/MAP		1000	10000	1	10000		10000		1000
WS GIS ANALYST		1000	10000	1	10000		10000		1000
					21800	0	21800	0	2720

CAD/GIS SOFTWARE

FY 91

PROGRAM	CLIN NO	MAINT	UNIT COST	QUA	TOT CST	CAD CST	GIS CST	CAD MNT	GIS MNT
FORTRAN LRG SYS	0047	504	5270						
DATA VIEW	0072		1500						
ENGRG TABLES	0073		1250						
BITS	0077		500						
IGESIS/IF	0078		2800						
ENGR SITE PACK	0085		10500						
DTM	0086		8900						
ARCHITECTURAL	0087		6500						
ELECTRICAL	0089		1100						
MASTER PLAN SYS	0095		23850						
INTERPLOT	0136	312	2500						
USGS DLG-IN			3900						
USGS DLG-OUT			3900						
WORLD MAPPING			12000						
ACTEM	GSA	240	312						
MICROSTATION IWS		720	1800	3	5400		5400		2160
WS GIS EDIT/MAP		1000	10000	3	30000		30000		3000
WS GIS ANALYST		1000	10000	3	30000		30000		3000
					65400	0	65400	0	6180

**CAD/GIS HARDWARE**

FY 89

FY 88

PROGRAM	CLIN NO	MAINT	UNIT COST	QUA	TOT CST	CAD CST	GIS CST	QUA	TOT CST	CAD CST	GIS CST	CAD MNT	GIS MNT
CPU, LARGE SYS	0001	16440	144050	1	144650	92479	53471					8220	8220
ADDNL MEMORY	0005	80	531	8	4248	1418	2832					80	80
COMM SERVER	0007	880	7025	1	7025	4884	2341		4248	4248		330	330
DISK STORE, 337MB	0010	1176	11200	2	22400	14900	7500					1176	1176
DUAL POET	0011	2652	23100	2	46200	23100	23100					2652	2652
DISK STOR, 337MB	0014	1588	12700	2	25500	17000	8500					1588	1588
DUAL POET, INTRBLUS	0020	4284	35160	1	35160	35160						4284	4284
MAG TAPE UNIT	0021	4284	35160	2	70320	47080	23280					4284	4284
WS, INTERACT 32C	0024	2804	24980	3	74880	48820	24960					2804	2804
WS, INTERVIEW 32C	0035	1044	8500	2	17000	8500	8500					1044	1044
W/MENU TABLET	0038	0	4	2120	7420	4845	2475	678	2374	2374		66	66
DIGITIZE, 36X48	0098	132	850	1	850	585	265						
ADDNL CABLING	0100										2374		
CRT CONSOLE													
PLOT SERVER	0134	2400	19350	1	18950	12900	6450					1600	1600
INTERSERVE 200	0142	2316	18050	1	18050			1	18050				800
DISK STOR, 559MB	GSA	4656	33622					1	33622				578
WS, INTERPRO 340		4656	37597										1164
WS, INTERPRO 340		3000	45000										
PLOTTER		600	5500										
DISK STORAGE		1000	10000										
PLOT SERVER													
UPGRADE													
					475303	312829	152674		58604	4248	54346	32316	22810

CAD/GIS SOFTWARE

FY 90

PROGRAM	CLIN NO	MAINT	UNIT COST	QUA	TOT CST	CAD CST	GIS CST	CAD MNT	GIS MNT
CPU, LARGE SYS	0001	16440	144950						
ADDNL MEMORY	0005	80	531						
COMM SERVER	0007	680	7025						
DISK STOR, 337MB	0010	1176	11200						
DUAL PORT									
DISK STOR, 337MB	0011	2852	23100						
DUAL PORT, INTRBUS									
MAG TAPE UNIT	0014	1596	12750						
WS, INTERACT 32C	0020	4284	35180						
WS, INTERACT 32C	0021	4284	35180						
WS, INTERPRO 220	0024	2804	24960	1	24960		24960		2804
W/MENU TABLET									
DIGITIZER, 36X48	0035	1044	8500						
ADDNL CABLING	0098	0	4						
CRT CONSOLE,	0109	132	850						
PLOT SERVER									
INTERSERVE 200	0134	2400	19350						
DISK STOR, 558MB	0142	2316	18050						1737
WS, INTERPRO 340	GSA	4856	33922						3492
WS, INTERPRO 340		4856	37587	1	37587		37587		4856
PLOTTER		3000	45000	1	45000	30000	15000	2000	1000
DISK STORAGE		600	5500						
PLOT SERVER									
UPGRADE		1000	10000						
					107547	30000	77547	2000	13489

CAD/GIS SOFTWARE

FY 81

PROGRAM	CLIN NO	MAINT	UNIT COST	QUA	TOT CST	CAD CST	GIS CST	CAD MNT	GIS MNT
CPU, LARGE SYS	0001	16440	144950						
ADDNL MEMORY	0005	80	531						
COMM SERVER	0007	660	7025						
DISK STOR, 337MB	0010	1175	11200						
DUAL PORT									
DISK STOR, 337MB	0011	2652	23100						
DUAL PORT, INTRBUS									
MAG TAPE UNIT	0014	1556	12750						
WS, INTERACT 32C	0020	4264	35160						
WS, INTERACT 32C	0021	4264	35160						
WS, INTERPRO 220	0024	2604	24960						
W/MENU TABLET									
DIGITIZER, 36X48	0035	1044	8500						
ADDNL CABLING	0098	0	4						
CRT CONSOLE	0109	132	850						
PLOT SERVER									
INTERSERVE 200	0134	2400	19350						
DISK STOR, 559MB	0142	2316	18050						
WS, INTERPRO 340	GSA	4656	33922						
WS, INTERPRO 340		4656	37587						
PLOTTER		3000	45000						
DISK STORAGE		600	5500	1	5500		5500		600
PLOT SERVER									
UPGRADE		1000	10000	2	20000		20000		2000
					25500	0	25500	0	2800

– GEOGRAPHIC INFORMATION SYSTEM –

BACKGROUND

- PGS Proposal #150
  - Planning Division
- PGS Review Panel
  - Recommended District GIS Study
- Information Meeting
  - Affected Division Chiefs
  - Video and Discussion
  - Concur with District GIS Study
  - IMO Tasked with Study

— GEOGRAPHIC INFORMATION SYSTEM —

STUDY TEAM

■ LEADER --- Gus Kajita

■ MEMBERS

- Steve Gale --- RE
- Dick Gilman --- ENGR
- Blaise Grden --- PLAN
- Chris Hartman --- ENGR
- Al Sutlick --- OCR
- Tom Seiner --- IMO

— GEOGRAPHIC INFORMATION SYSTEM —

STUDY APPROACH

- Assessment Of Needs
- Data Base Development
- Software Requirements
- Hardware Architecture
- Implementation Plan
- Organizational Structure
- Cost
- Benefits

– GEOGRAPHIC INFORMATION SYSTEM –

ASSESSMENT OF NEED

- Planning Division
  - Master Planning
  - Habitat Evaluation and Mapping
  - Cultural Resources
  - Environmental Impact
  - Fish Analysis
  - Watershed Studies
- 7-year Manual Labor Projection
  - 500 Man-months, 41.7 Man-years

– GEOGRAPHIC INFORMATION SYSTEM –

ASSESSMENT OF NEED

- OCR Division
  - Habitat Management
  - Recreation
  - Contracts
  - Navigation
  - Regulatory
- 7-year Manual Labor Projection
  - 180 Man-months, 15 Man-years

– GEOGRAPHIC INFORMATION SYSTEM –

ASSESSMENT OF NEED

- Real Estate
  - Management and Disposal
  - Planning and Control
  - Acquisition and Project Plan
- 7-year Manual Labor Projection
  - 84 Man-months, 7 Man-years

– GEOGRAPHIC INFORMATION SYSTEM –

ASSESSMENT OF NEED

▣ Engineering Division

– Master Plan

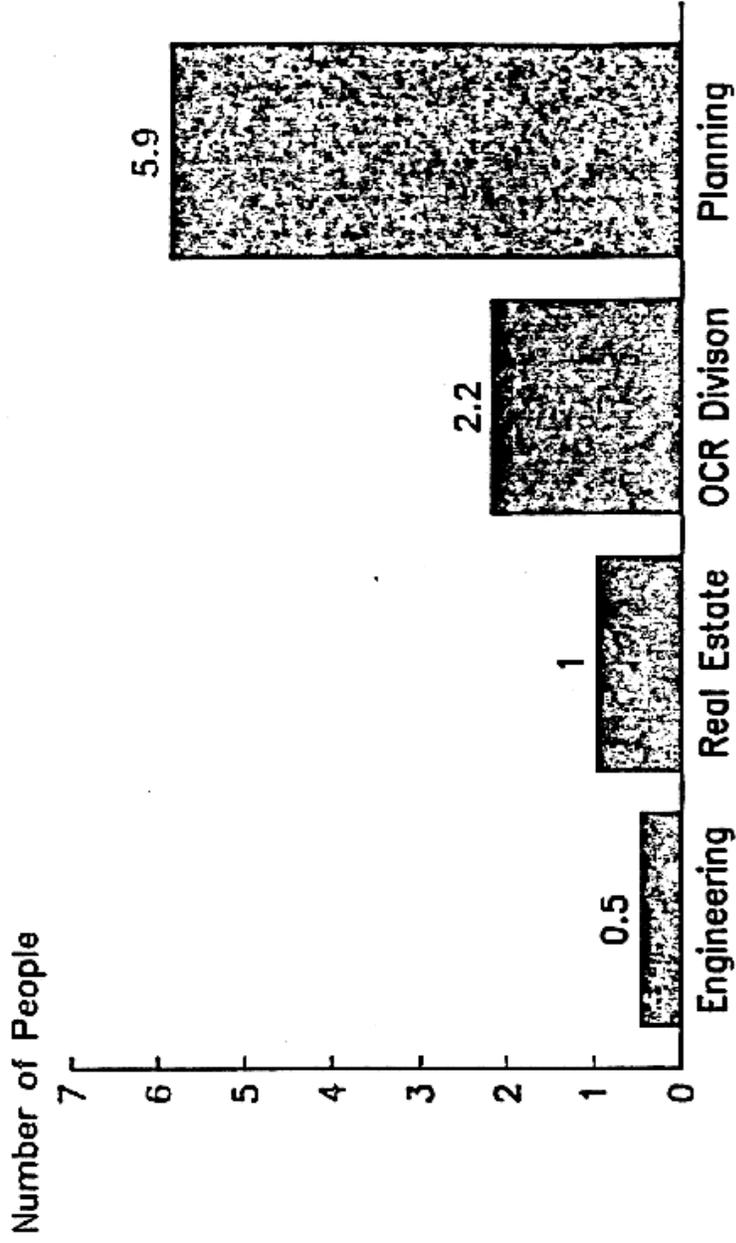
– Scope Maps (FAA Projection)

– As Built Maps

▣ 7-year Manual Labor Projection

– 42 Man-months, 3.5 Man-years

— GEOGRAPHIC INFORMATION SYSTEM —



Annual manual effort required to complete assessed GIS applications

— GEOGRAPHIC INFORMATION SYSTEM —

DATA BASE

- Basic to GIS
- Applications Broaden as Basic Data Becomes Available
- Sources
  - Manual Entry
  - Zeiss Stereoplottter
  - CADD
  - Government Agencies
  - Private Agencies

## — GEOGRAPHIC INFORMATION SYSTEM —

### SOFTWARE REQUIREMENTS

- Input/edit basic data
- Digitize information
- Analyze proposed actions
- Display maps
- Integration with CADD

— GEOGRAPHIC INFORMATION SYSTEM —

HARDWARE ARCHITECTURE

- Data Entry
  - Keyboard
  - Digitizer
  - Magnetic Tape
- File Storage
  - Disk
  - Magnetic Tape
- Display Device
  - Plotter
  - Screen
- Processing Unit
  - Central Processing Unit
  - Intelligent Workstation

— GEOGRAPHIC INFORMATION SYSTEM —

IMPLEMENTATION PLAN

- Phased Procurement
  - First Year
    - Build Database
    - GIS—Plan
  - Second Year
    - GIS—OCR
  - Third Year
    - GIS—ENGR
    - GIS—RE
  - Fourth Year
    - GIS—Site Manager

Geographic Information System  
FY-88 Equipment  
Configuration Proposal

Chart 1.1

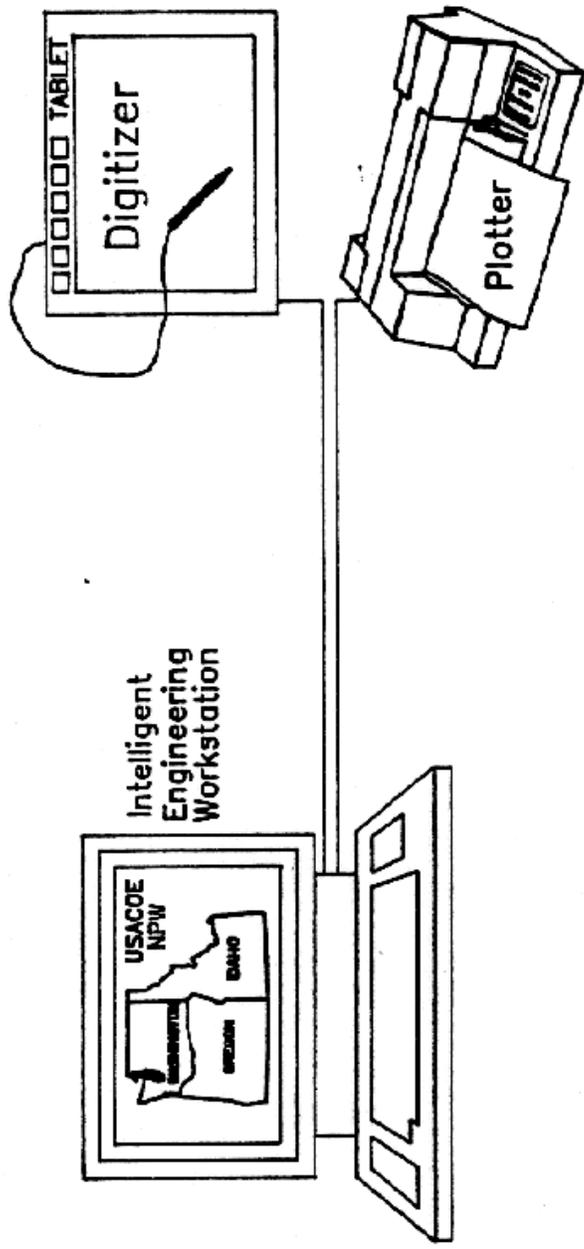


Chart 1.2

# Geographic Information System FY-89 Equipment Configuration Proposal

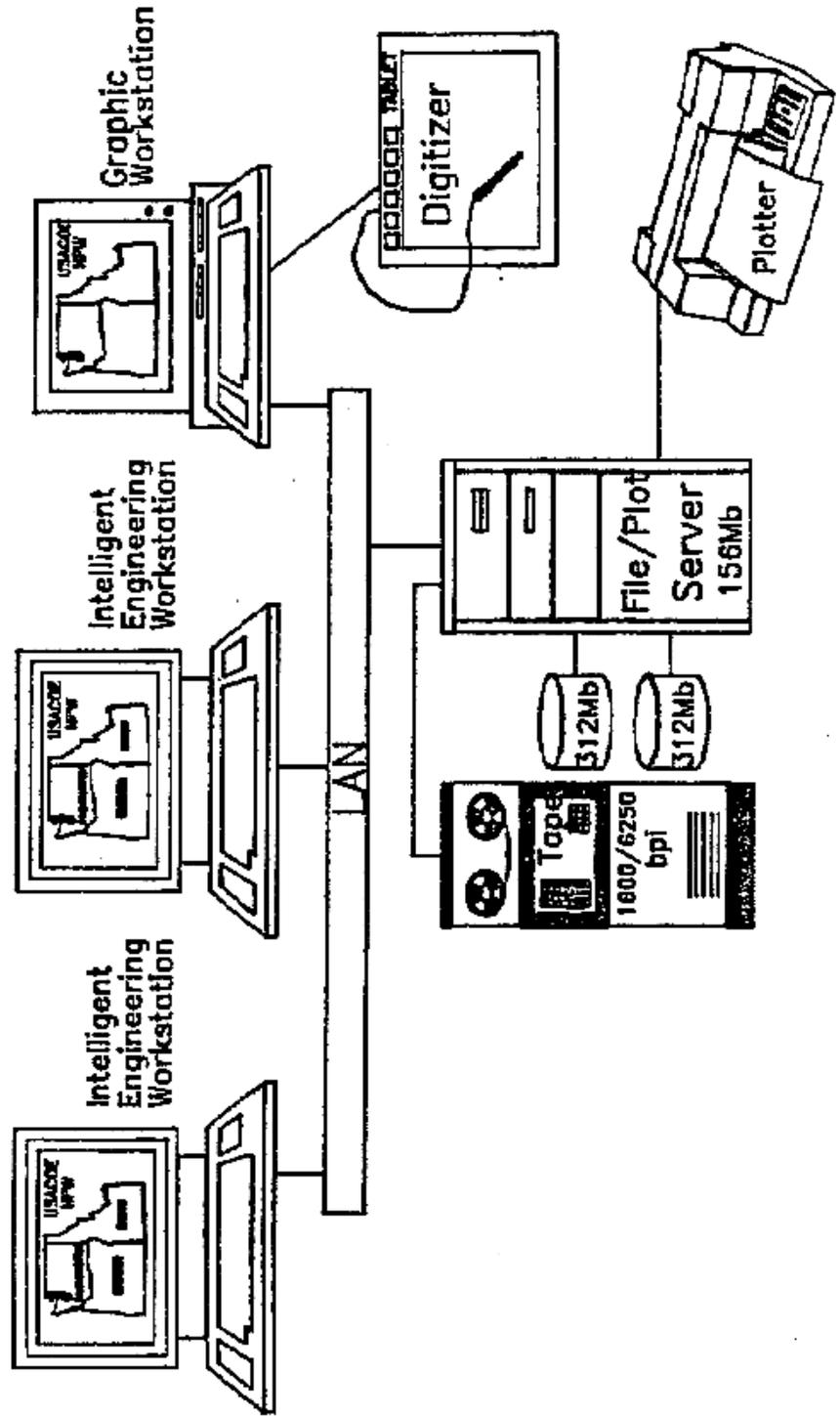


Chart 1.3

# Geographic Information System FY-90 Equipment Configuration Proposal

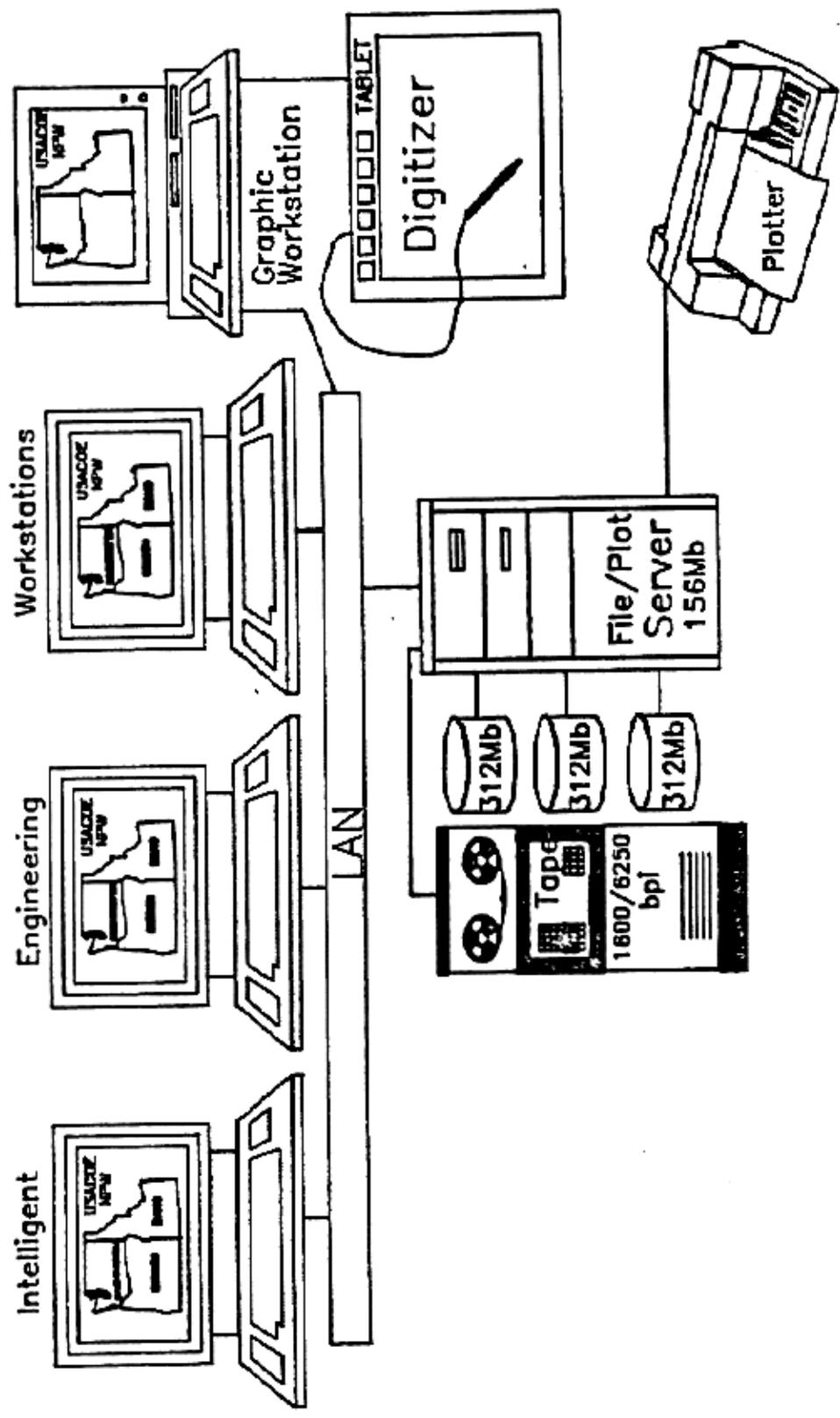
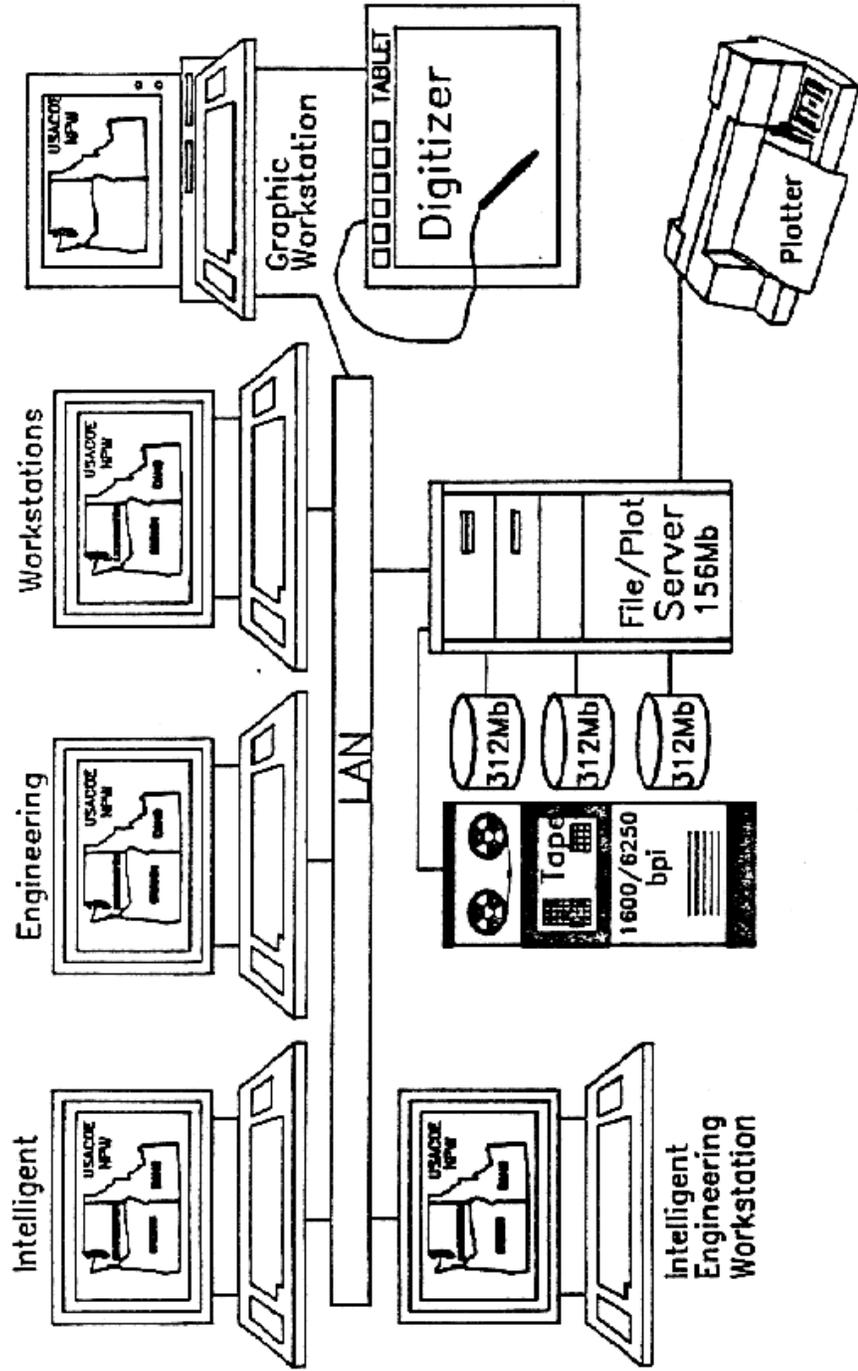
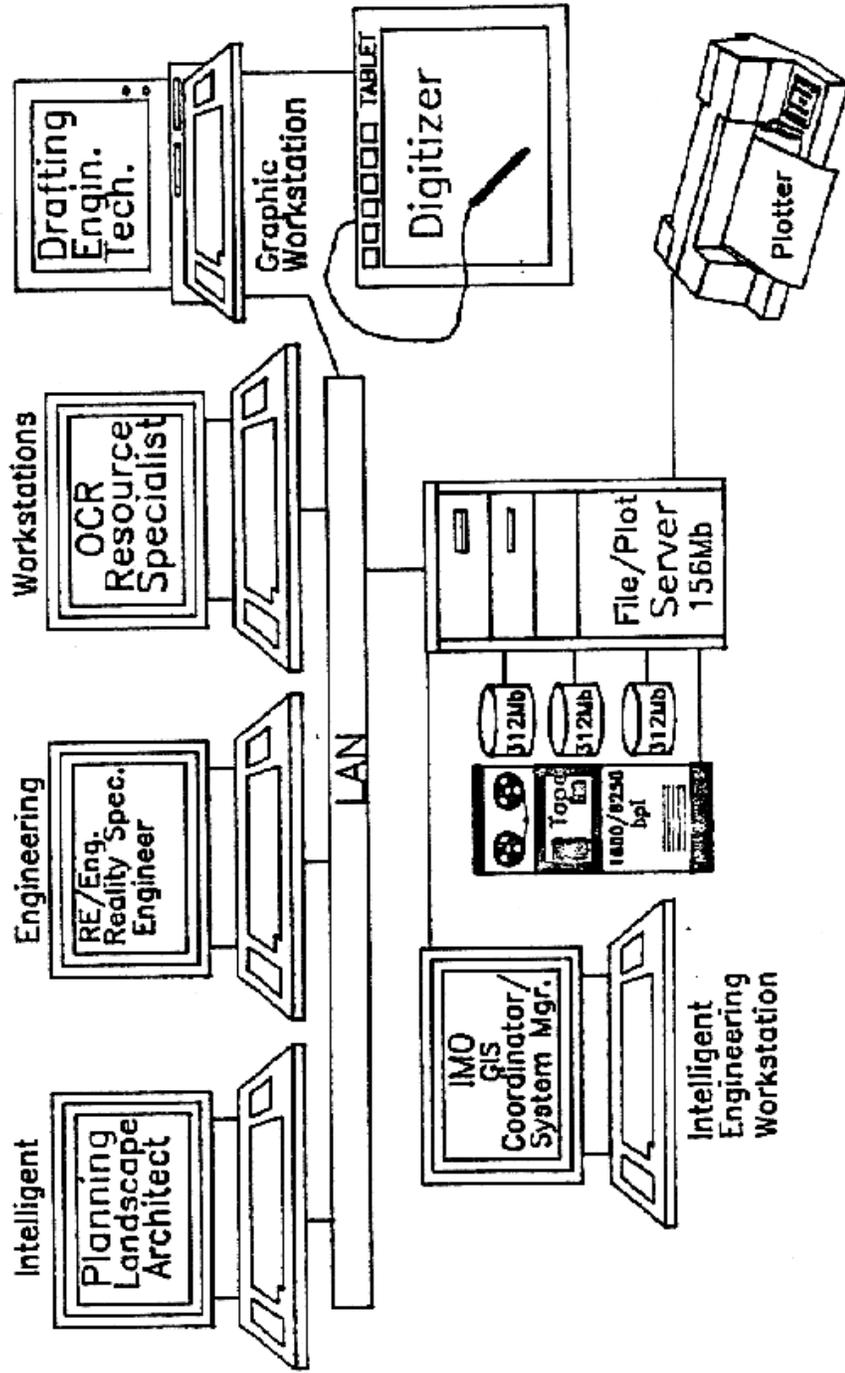


Chart 1.4

# Geographic Information System FY-91 Equipment Configuration Proposal



# Geographic Information System Equipment—Primary User Configuration



— GEOGRAPHIC INFORMATION SYSTEM —

ECONOMIC ANALYSIS

- Basis
  - 7 Year Useful Life
  - Assessed GIS Workload
    - Currently being done
    - Currently not be done
- Analysis
  - Cost To Manually Complete Assessed Workload versus Cost
  - 5 Workstations To Complete Assessed Workload in 7 Years

Figure 1.1  
GIS Hardware/Software Costs

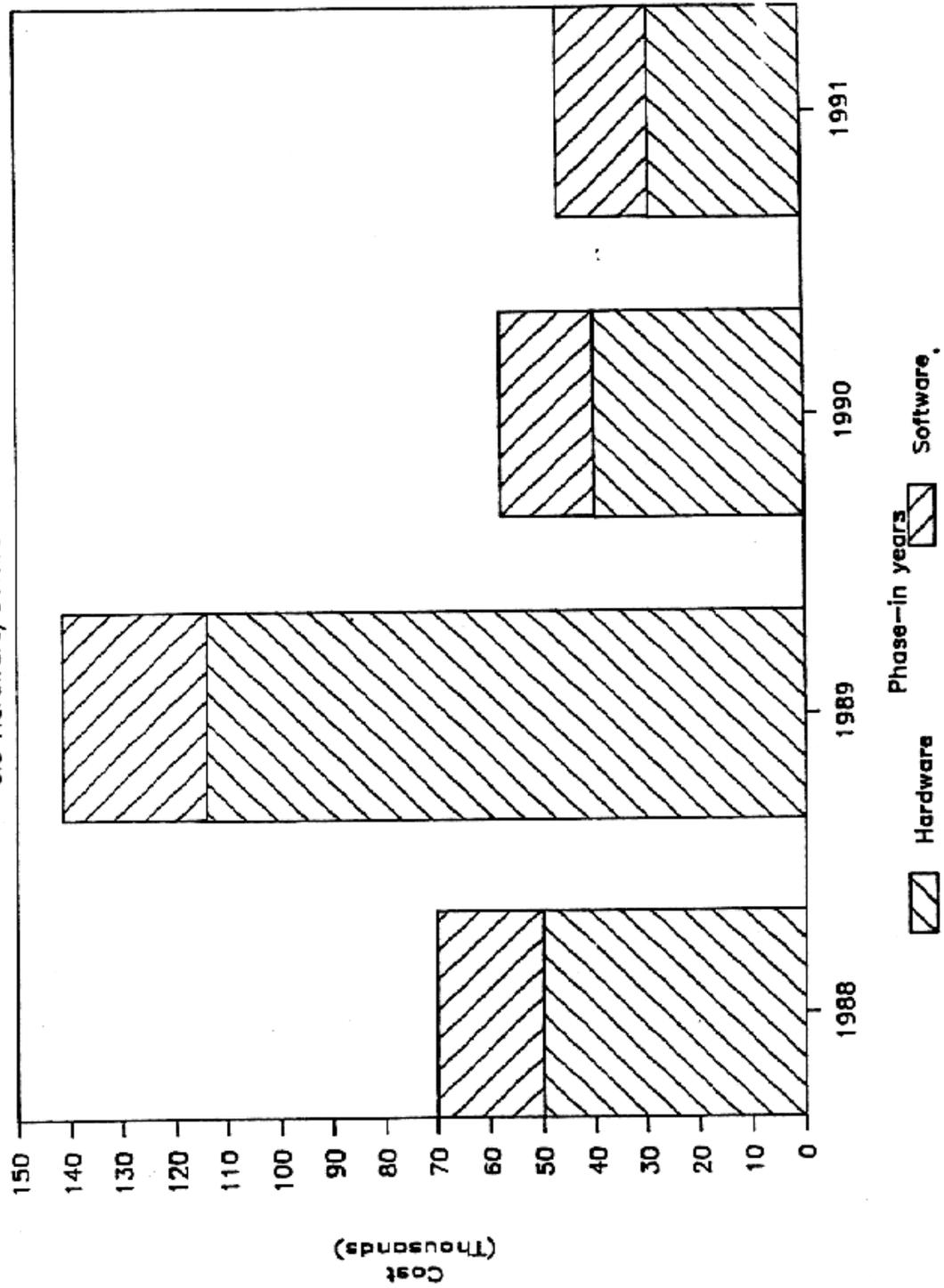
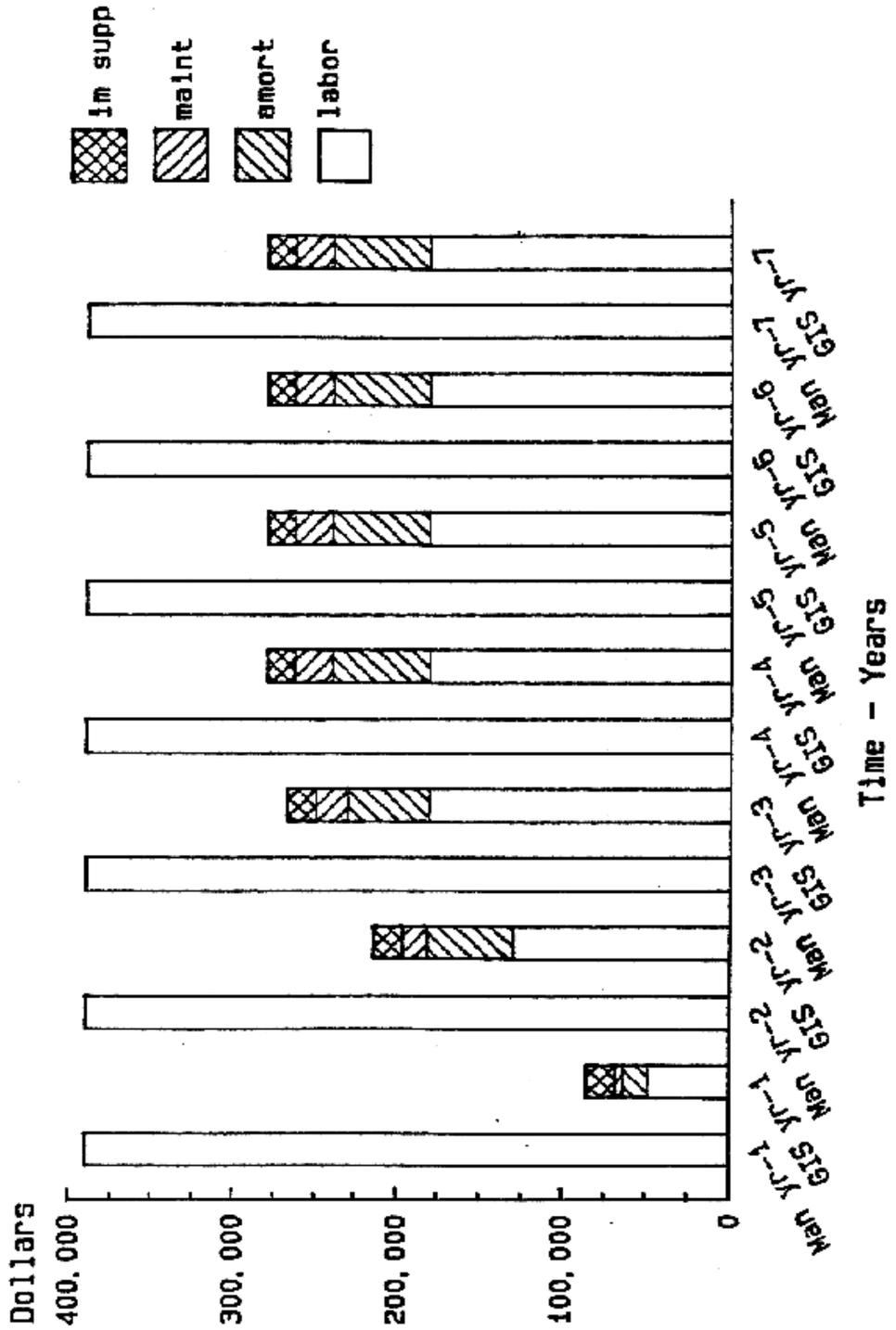


Figure 1.2  
 Annual Cost Comparison, GIS vs Manual  
 5 Station Configuration



3. GIS Software. Change to the original GIS software requirements was necessary to purchase the Master Plan program to process GIS from the mainframe CPU. The Master Plan version to process GIS independently at the workstation level is not yet available. The following table is the new approved software proposal:

GIS SOFTWARE COSTS

ITEM	FY-88	FY-89	FY-90	FY-91	TOTAL
FORTRAN	2,635				2,635
Master Plan	23,850				23,850
Plot Tape Output	3,000				3,000
GIS (Workstation)		30,000	15,000	15,000	60,000
Graphic (Workstation)		1,200	600	600	2,400
Interplot (Plot Server)		5,000			5,000
	29,485	36,200	15,600	15,600	96,885

ADDENDUM II  
APRIL 1988

1. General. This addendum covers the discrepancies between the GIS hardware and software as proposed in Addendum I and the actual hardware and software purchased in FY 1988. The initial GIS equipment installed in July 1988 were the 8 mb CPU and one 337 mb system disk with an additional 8 mb memory, magnetic tape drive, two 337 mb data disk drives, two intelligent color workstations one with a large digitizing table, and equipment shared with CADD, a communication server, a plot server, and a leased electrostatic plotter, all connected to an Ethernet network. The 8 mb additional memory, the magnetic tape drive, one 337 mb data disk drive, and the communication server are additions to the proposal in Addendum I. The magnetic tape drive and the communication server, contrary to the original belief that it was included with the basic system, had to be purchased separately. The additional memory and the 337 mb data disk drive were required to process the memory and data extensive Master Plan program. Also the purchase of the plot server was accelerated from FY 1989 to FY 1988 when it became available through modification to the Corps-wide contract. The plot server will act as a plot controller and allow the leasing of the electrostatic plotter without the plot controller until a decision on the type of plotter that best fit the needs of GIS and CADD is made. The purchase of a plotter is scheduled for FY 1989. Additional software include programs to translate data into the Intergraph data format and the Digital Terrain Modeling program which is a requirement of the Master Plan program. The following tables amends the GIS proposal of Addendum I:

ITEM	GIS HARDWARE COSTS				
	FY-88	FY-89	FY-90	FY-91	TOTAL
CPU and System Disk	52,471				52,471
8 MB Addnl Mem	2,832				2,832
Magnetic Tape	8,500				8,500
Comm Server	2,341				2,341
InterView WS	23,260				23,260
Digitizer	8,500				8,500
InterPro 220 WS	24,960	24,960	24,960	24,960	99,840
Disk Storage w/ File Processor	23,100				23,100
Disk Storage	7,500		11,200		18,700
Plot Server	7,020				7,020
Plotter		20,000			20,000
Disk Storage for Plot Server		5,500			5,500
Cabling	2,475	2,040			4,515
	162,959	52,500	36,160	24,960	276,579

GIS SOFTWARE COSTS

ITEM	FY-88	FY-89	FY-90	FY-91	TOTAL	
FORTRAN	1,850				1,850	
IGES	1,300				1,300	
Master Plan	23,850				23,850	
DTM	4,000				4,000	
Plot Tape Output (Deleted)	0				0	
GIS (Workstation)		30,000	15,000	15,000	60,000	
Graphic (Workstation)			1,200	600	600	2,400
Interplot (Plot Server)	900				900	
USGS DLG-IN	3,000				3,000	
USGS DLG-OUT	3,000				3,000	
	37,900	31,200	15,600	15,600	100,300	

ADDENDUM III  
FEBRUARY 1989

1. General. This addendum adjusts the FY 1989, FY 1990 and FY 1991 GIS hardware and software proposal. Due to the sooner than anticipated GIS activities within the District, the purchase of an additional disk storage was accelerated from FY 1990 to FY 1989. The workstation scheduled for FY 1991 was also accelerated to be purchased in FY 1990. However, the purchase of the plotter and the additional disk storage for the plot server scheduled for FY 1989 was deferred until FY 1990 and FY 1991 respectively. A 36 inch laser plotter to replace the leased electrostatic plotter is being studied. Software adjustment include the purchase of World Mapping program in FY 1989 which will translate coordinate systems within Master Plan. The workstation GIS Master Plan version is still in the testing stage and not yet released. The cost of the workstation GIS and graphic programs is anticipated to be higher than originally planned. The acquisition of those programs will be deferred until FY 1990 and FY 1991. Intergraph is continually modifying the Corps-wide CADD contract to include their latest products, thus when GIS required an additional disk storage for FY 1989, a 559 mb disk drive was available for purchase. However, the process of modifying the contract often is a lengthy procedure and the product requirement for a fiscal year may not yet be available on the contract. This was the case in FY 89 when purchasing the Planning Division's workstation which required additional features not offered on the original Corps-wide contract. Intergraph's first reaction was to offer their next higher 200 model workstation but since then have discontinued the sale of that model and is now in the process of offering one of their 300 models, the InterPro 340. Since the InterPro 340 workstation was not yet on the Corps-wide contract, it was purchased off the Intergraph - GSA contract. The need for the added features justified the higher cost of the workstation. Upgrading of the purchased InterPro 220 workstations to InterPro 240s is scheduled for FY 1991. The following tables are the adjusted GIS hardware and software proposals:

GIS HARDWARE COSTS

ITEM	FY-88	FY-89	FY-90	FY-91	TOTAL
CPU and System Disk	52,471				52,471
8 MB Addnl Mem	2,832				2,832
Magnetic Tape	8,500				8,500
Comm Server	2,341				2,341
InterView WS	23,260				23,260
Digitizer	8,500				8,500
InterPro 220 WS	24,960		24,960		49,920
InterPro 340 WS		33,922	37,587		71,509
Disk Storage w/ File Processor	23,100				23,100
Disk Storage	7,500	18,050			25,550
Plot Server	7,020				7,020
Plotter			15,000		15,000
Disk Storage for Plot Server				5,500	5,500
Workstation Upgrd				20,000	20,000
Cabling	2,475	2,374			4,849
	162,959	54,346	77,547	25,500	320,352

GIS SOFTWARE COSTS

ITEM	FY-88	FY-89	FY-90	FY-91	TOTAL
FORTRAN	1,850				1,850
IGES	1,300				1,300
Master Plan	23,850				23,850
DTM	4,000				4,000
World Mapping		12,000			12,000
GIS (Workstation)			20,000	60,000	80,000
Graphic (Workstation)			1,800	5,400	7,200
Interplot (Plot Server)	900				900
USGS DLG-IN	3,000				3,000
USGS DLG-OUT	3,000				3,000
ACTEM		312			312
	37,900	12,312	21,800	65,400	137,412

## MEMORANDUM FOR Chief, Real Estate Division

SUBJECT: Review and Approval of FY 90 GIS Equipment

1. At our last GIS subcommittee meeting of 17 November 1989, we discussed three computer hardware items that need to be corrected or added to our GIS hardware systems. These items include a plotter, a CD-ROM reader and a dual-port disk controller. Each has been discussed at length by the subcommittee with CADD representation and the following recommendations are submitted for your review and approval:

a. Color Electrostatic Plotter (purchase price = \$57,500, CADD shared cost = \$30,000, GIS shared cost = \$27,475). Our plotting system is a leased system that, according to the GIS acquisition and implementation and the CADD acquisition plans, was to be replaced in FY 90 with a better and more cost-effective alternative. This was to prevent excessive yearly lease costs and replace the B/W electrostatic plotter with better and more capable hardware not available at the time of original acquisition. PRIP funds were requested and approved for purchase of a CADD/GIS plotter in FY 90. Based upon the alternatives available, the subcommittee has decided to recommend the acquisition of a color electrostatic Verstep plotter. The benefits of acquiring a color plotter are as follows:

- (1) More information per map plotted to reduce number of plates.
- (2) Less plate development time due to less graphic differentiation of unique data themes required.
- (3) Desktop Publishing - color output directly to Master Plan plate or other finished map for direct addition to the Master Plan. This could reduce the number of data plates prepared for a publisher by 500 to 1,000 mylar blackouts (color separations) per Master Plan or other published produce, and would be cost effective for the relatively small number of published plans.
- (4) Less labor in defining graphic standards for any map.
- (5) Versus a published plate, much easier to edit a plate for replot.
- (6) Much more flexibility in developing maps for Master Plans, contracts, environmental analysis, etc.

CENPW-IM-R

SUBJECT: Review and Approval of FY 90 GIS Equipment

(7) No disruption to CADD operations, B/W would still be a CADD standard. However, engineering would have color capabilities plus enhanced B/W shading alternatives.

(8) The subcommittee feels that the color option will also increase our chances for additional outside GIS work and possibly becoming a GIS center of expertise.

b. CD-ROM Reader (purchase price = \$850, CADD shared cost = \$425, GIS shared cost = \$425). Our system and applications software for both the CADD and GIS will soon be delivered only on CD-ROM. We have a system requirement of adding one reader to our network that will service both the CADD and GIS systems. It will also reduce by several months the development to delivery time of software upgrades. It will greatly reduce the system managers workload for upgrading the systems. The benefits of this item can pay for it in one or two software installations.

c. Dual Port Controller (purchase price = \$3,500, GIS cost = \$3,500). The GIS system has one disk drive that has a single instead of a dual access controller. Now that all the disks are being fully utilized, it is important to upgrade this disk to improve access. The dual controller allows the GIS users to continue working by logging into the CADD CPC and crossing over to GIS data disks during system maintenance, GIS system failures, and system upgrades; and allows engineering users direct access to substantial downtimes (sometimes up to 3 days during system software upgrades), is extensive due to schedule interruptions. With the Dual-Port, all upgrades and system work can be done on regular time without disruptions to users.

2. The costs to GIS would be born according to the existing percentage breakdown as are existing plotting costs.



CENPW-IM-R

SUBJECT: Review and Approval of FY 90 GIS Equipment

CD-ROM:

Planning	.6145	x	\$425	= \$261
Operations	.2292	x	\$425	= \$97
Real Estate	.1042	x	\$425	= \$44
<u>Engineering</u>	<u>.0521</u>	x	<u>\$425</u>	<u>= \$23</u>
Total				\$425

Dual-Port Upgrade:

Planning	.6145	x	\$3,500	= \$2,151
Operations	.2292	x	\$3,500	= \$802
Real Estate	.1042	x	\$3,500	= \$365
<u>Engineering</u>	<u>.0521</u>	x	<u>\$3,500</u>	<u>= \$182</u>
Total				\$3,500

3. Request that each organization review the above proposed GIS hardware acquisitions and return their answer NLT 30 November 1989. Following approval, IMO will order. Any questions should be directed to your GIS coordinator or Tom Seiner at ext. 6421.

WILLIAM F. HOLMES

Chief, Information Management

CENPW-OP (CENPW-IM-R/27 Nov 89) (18-23) 1st End  
SUBJECT: Review and Approval of FY 90 GIS Equipment

Planning Division

FOR Chief, Information Management Office

- x Concur with proposed color plotter acquisition.
- o Do not concur with proposed color plotter acquisition.
- x Concur with proposed CD-ROM acquisition.
- o Do not concur with proposed CD-ROM acquisition.
- x Concur with proposed Dual-Port Upgrade.
- o Do not concur with proposed Dual-Port Upgrade.

Comments:

L.V. ARMACOST  
Chief, Planning Division

CENPW-OP (CENPW-IM-R/27 Nov 89) (18-23) 1st End  
SUBJECT: Review and Approval of FY 90 GIS Equipment

Real Estate Division

FOR Chief, Information Management Office

- x Concur with proposed color plotter acquisition.
- o Do not concur with proposed color plotter acquisition.
- x Concur with proposed CD-ROM acquisition.
- o Do not concur with proposed CD-ROM acquisition.
- x Concur with proposed Dual-Port Upgrade.
- o Do not concur with proposed Dual-Port Upgrade.

Comments:

RICHARD CARLTON  
Chief, Real Estate Division

CENPW-OP (CENPW-IM-R/27 Nov 89) (18-23) 1st End  
SUBJECT: Review and Approval of FY 90 GIS Equipment

Engineering Division

FOR Chief, Information Management Office

- x Concur with proposed color plotter acquisition.
- o Do not concur with proposed color plotter acquisition.
- x Concur with proposed CD-ROM acquisition.
- o Do not concur with proposed CD-ROM acquisition.
- x Concur with proposed Dual-Port Upgrade.
- o Do not concur with proposed Dual-Port Upgrade.

Comments:

MARVIN C. BRAMMER  
Chief, Engineering Division

CENPW-OP (CENPW-IM-R/27 Nov 89) (18-23) 1st End  
SUBJECT: Review and Approval of FY 90 GIS Equipment

Operation Division

FOR Chief, Information Management Office

- x Concur with proposed color plotter acquisition.
- o Do not concur with proposed color plotter acquisition.
- x Concur with proposed CD-ROM acquisition.
- o Do not concur with proposed CD-ROM acquisition.
- x Concur with proposed Dual-Port Upgrade.
- o Do not concur with proposed Dual-Port Upgrade.

Comments:

PAUL F. WINBORG  
Chief, Operation Division

JUSTIFICATION & ACQUISITION PLAN  
FOR WALLA WALLA DISTRICT  
GEOGRAPHIC INFORMATION SYSTEM  
COMPUTERIZED MAP & RESOURCE ANALYSIS

ADDENDUM I  
OCTOBER 1987

1. General. This addendum covers the changes made to the original GIS plan. The change with the greatest impact was the decision to purchase the GIS in conjunction with the CADD system through the Corps-wide CADD Contract DACW87-87-D-0092 awarded to the Intergraph Corporation on September of 1987. This eliminated the RFP process thus accelerating the GIS installation date by several months. The CADD/GIS system is a dual CPU, one CPU for the CADD and the other CPU for GIS, each with its own disk drives and magnetic tape drive, and a common ethernet network with intelligent workstations and a plotter attached to it. The dual system eliminates any compatibility problem between CADD and GIS. The Zeiss stereoplotter output can also be translated into Intergraph format, thus assuring the Zeiss of being an integral part of GIS.

2. GIS Hardware. The items in the Corps-wide contract may be purchased at any time within the first five years of the contract which is basically the same as the original four-year GIS plan. However, the order of purchase of certain items have been accelerated from the original plan and the original file server replaced by a mainframe CPU. The following table is the new approved GIS hardware proposal:

GIS HARDWARE COSTS

ITEM	FY-88	FY-89	FY-90	FY-91	TOTAL
CPU	52,471				52,471
InterView WS	23,260				23,260
Digitizer	8,500				8,500
InterPro 220 WS	24,960	24,969	24,960	24,960	99,840
Disk Storage w/ File Processor	23,100				23,100
Disk Storage			11,200		11,200
Plot Server		22,000			22,000
Disk Storage for Plot Server		5,500			5,500
	132,291	52,460	36,160	24,960	245,871

3. GIS Software. Change to the original GIS software requirements was necessary to purchase the Master Plan program to process GIS from the mainframe CPU. The standalone GIS is not as yet available. The following table is the new approved software proposal:

GIS SOFTWARE COSTS

ITEM	FY-88	FY-89	FY-90	FY-91	TOTAL
FORTTRAN	2,635				2,635
Master Plan	23,850				23,850
Plot Tape Output	3,000				3,000
GIS (Workstation)		30,000	15,000	15,000	60,000
Graphic (Workstation)		1,200	600	600	2,400
Interplot (Plot Server)		5,000			5,000
	29,485	36,200	15,600	15,600	96,885

ADDENDUM II  
APRIL 1988

1. General. This addendum covers the discrepancies between the GIS hardware and software as proposed in Addendum I and the actual hardware and software purchased in FY 1988. The initial GIS equipment installed in July 1988 were the 8 mb CPU with an additional 8 mb memory, magnetic tape drive, three 337 mb disk drives, two intelligent color workstations - one with a large digitizing table, and equipment shared with CADD, a communication server, a plot server, and a leased electrostatic plotter, all connected to an Ethernet network. The 8 mb additional memory, the magnetic tape drive, one of the three 337 mb disk drives, and the communication server are additions to the proposal in Addendum I. Also the plot server was accelerated from FY 1989 to FY 1988. The electrostatic plotter was leased until a decision is made on the type of plotter we want to purchase. Additional software include programs to translate data into the Intergraph data format and the Digital Terrain Modeling program which is a requirement of the Master Plan program. The following tables amends the GIS proposal of Addendum I:

GIS HARDWARE COSTS

ITEM	FY-88	FY-89	FY-90	FY-91	TOTAL
CPU	52,471				52,471
8 MB Addnl Mem	2,832				2,832
Magnetic Tare	8,500				8,500
Comm Serve.	2,341				2,341
InterView WS	23,260				23,260
Digitizer	8,500				8,500
InterPro 220 WS	24,960	24,960	24,960	24,960	99,840
Disk Storage w/ File Processor	23,100				23,100
Disk Storage	7,500		11,200		18,700
Plot Server	7,020				7,020
Plotter		20,000			20,000
Disk Storage for Plot Server		5,500			5,500
Cabling	2,475	2,040			4,515
	162,959	52,500	36,160	24,960	276,579

GIS SOFTWARE COSTS

ITEM	FY-88	FY-89	FY-90	FY-91	TOTAL
FORTRAN	1,850				1,850
IGES	1,300				1,300
Master Plan	23,850				23,850
DTM	4,000				4,000
Plot Tape Output (Deleted)	0				0
GIS (Workstation)		30,000	15,000	15,000	60,000
Graphic (Workstation)		1,200	600	600	2,400
Interplot (Plot Server)	900				900
USGS DLG-IN	3,000				3,000
USGS DLG-OUT	3,000				3,000
	37,900	31,200	15,600	15,600	100,300

ADDENDUM III  
FEBRUARY 1989

1. General. This addendum adjusts the FY 1989, FY 1990 and FY 1991 GIS hardware and software proposal. The purchase of an additional disk storage was accelerated from FY 1990 to FY 1989. The workstation scheduled for FY 1991 was also accelerated to be purchased in FY 1990. However, the purchase of the plotter and the additional disk storage for the plot server scheduled for FY 1989 was deferred until FY 1990 and FY 1991 respectively. Software adjustment include the purchase of World Mapping program in FY 1989 which will translate coordinate system within Master Plan. The GIS standalone programs are still in the testing stage and not yet released. The cost of the standalone GIS and graphic programs will be higher than originally planned. The acquisition of those programs will be deferred until FY 1990 and FY 1991. Intergraph is continually modifying the Corps-wide CADD contract to include their latest products, thus when GIS required an additional disk storage for FY 1989, a 559 mb disk drive was available for purchase. However, the process of modifying the contract often is a lengthy procedure and the product requirement for a fiscal year may not yet be available on the contract. This was the case in FY 89 when purchasing the Planning Division's workstation. Since the workstation with the required added features was not yet on the Corps-wide contract, it was purchased off the Intergraph GSA contract. The following tables are the adjusted GIS hardware and software proposals:

ITEM	GIS HARDWARE COSTS				
	FY-88	FY-89	FY-90	FY-91	TOTAL
CPU	52,471				52,471
8 MB Addnl Mem	2,832				2,832
Magnetic Tape	8,500				8,500
Comm Server	2,341				2,341
InterView WS	23,260				23,260
Digitizer	8,500				8,500
InterPro 220 WS	24,960		24,960		49,920
InterPro 340 WS		33,922	37,587		71,509
Disk Storage w/ File Processor	23,100				23,100
Disk Storage	7,500	18,050			25,550
Plot Server	7,020				7,020
Plotter			15,000		15,000
Disk Storage for Plot Server				5,500	5,500
Workstation Upgrade				20,000	20,000
Cabling	2,475	2,374			4,849
	162,959	54,346	77,547	25,500	320,352

## GIS SOFTWARE COSTS

ITEM	FY-88	FY-89	FY-90	FY-91	TOTAL
FORTRAN	1,850				1,850
IGES	1,300				1,300
Master Plan	23,850				23,850
DTM	4 000				4 000
World Mapping		12,000			12,000
GIS (Workstation)			20,000	60,000	80,000
Graphic (Workstation)			1,800	5,400	7,200
Interplot (Plot Server)	900				900
USGS DLG-IN	3,000				3,000
USGS DLG-OUT	3,000				3,000
ACTEM		312			
	37,900	12,312	21,800	65,400	137,412

Figure 1.3  
Project Cost GIS vs Manual

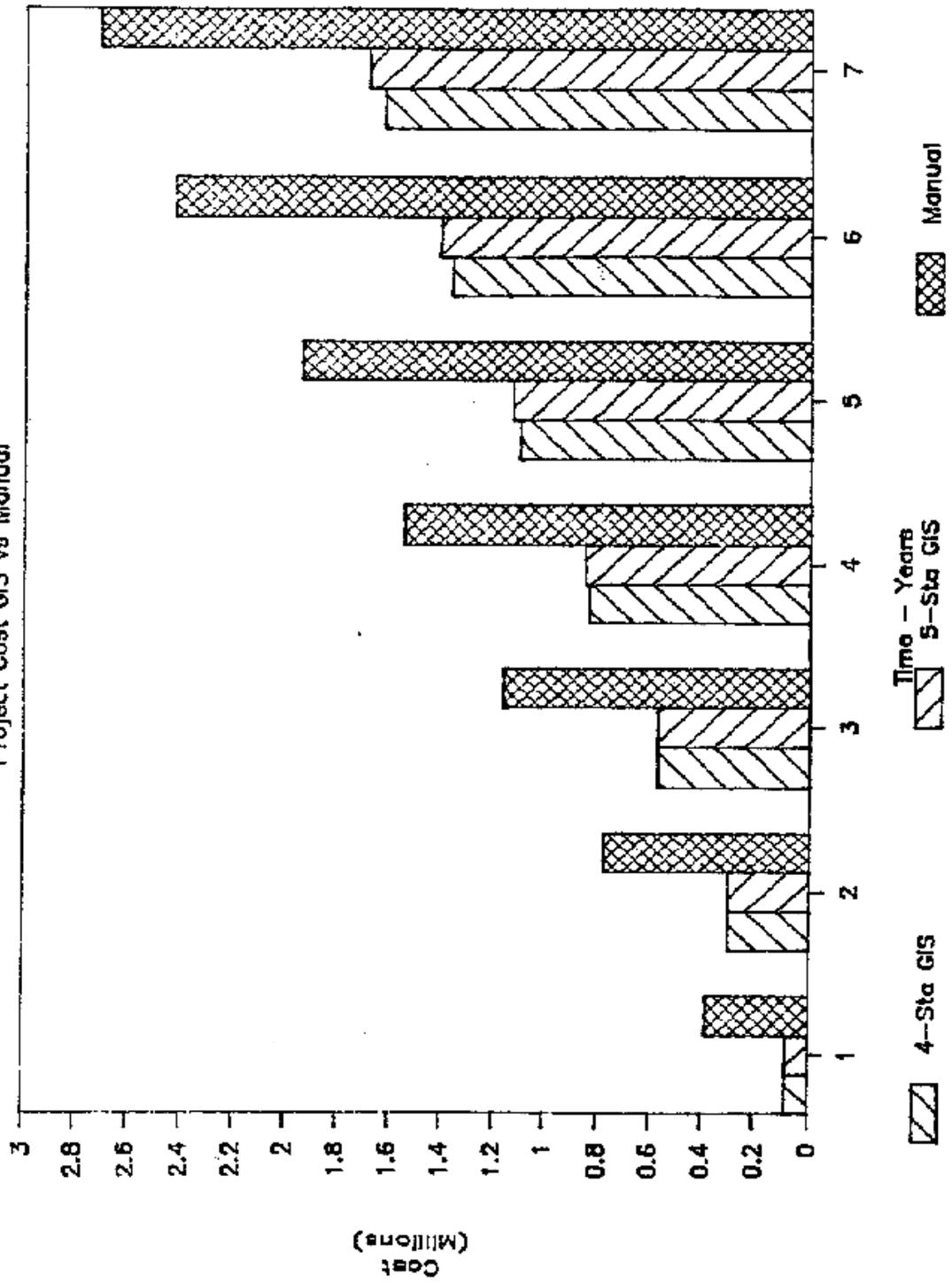
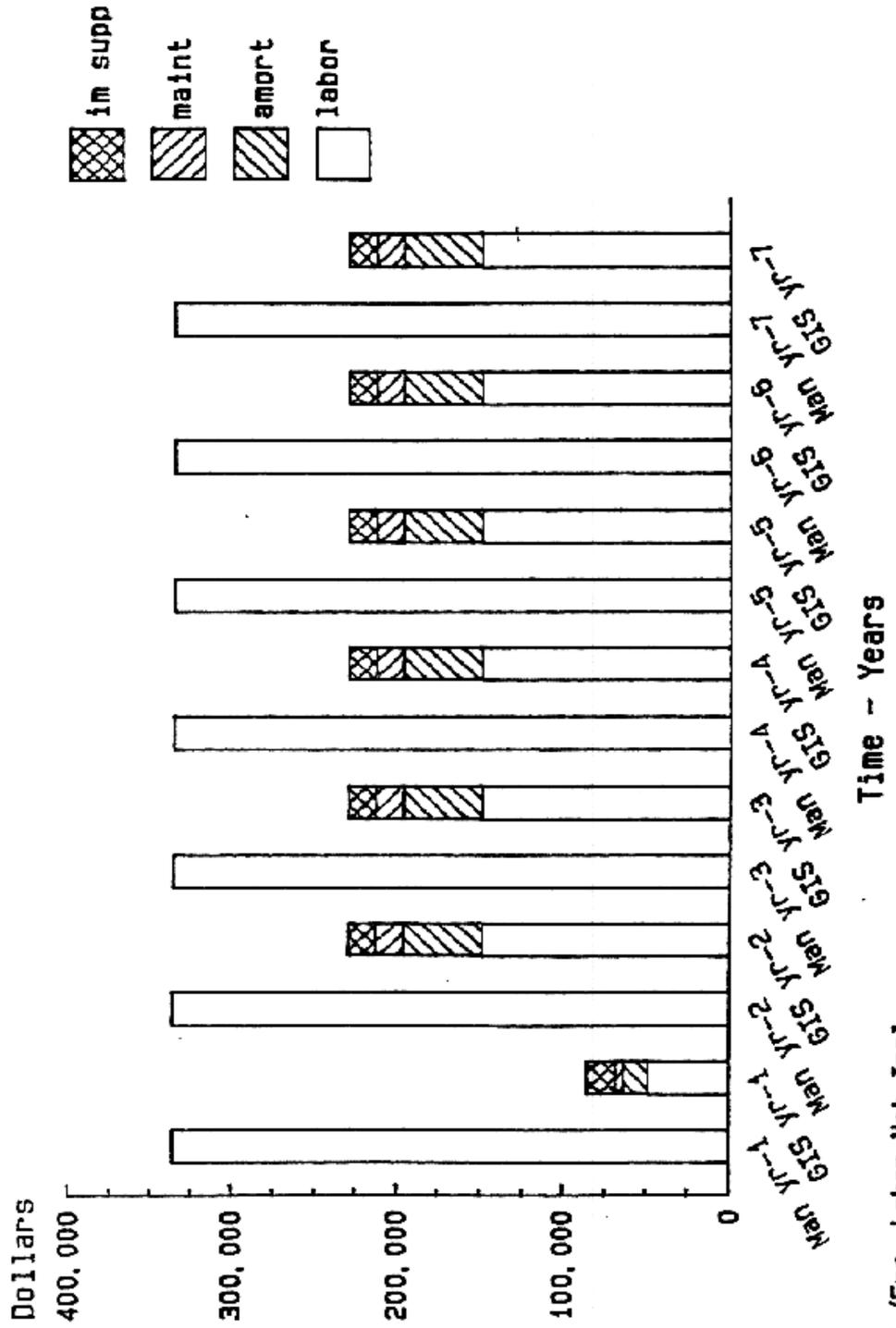


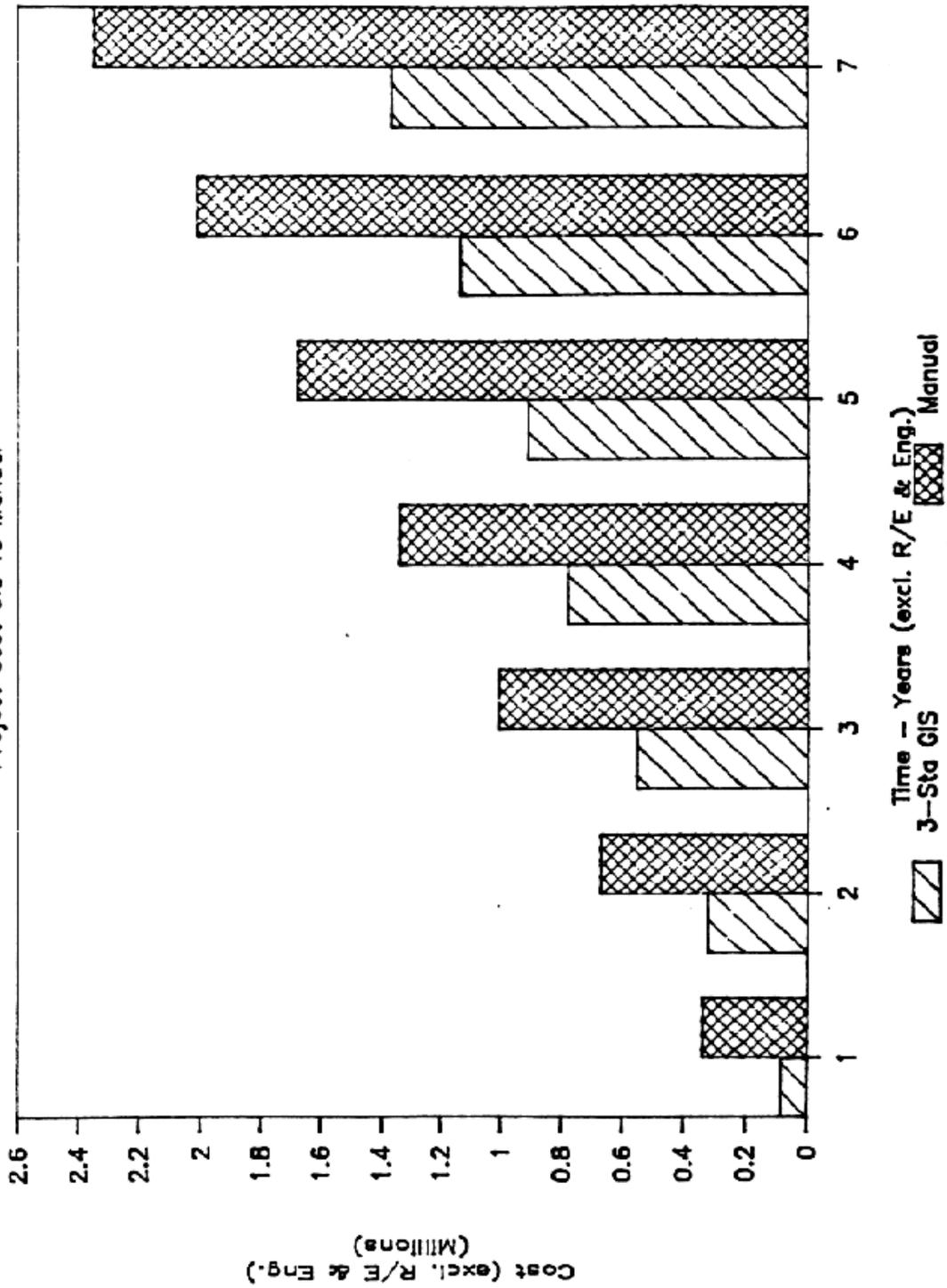
Figure 1.4  
 Annual Cost Comparison, GIS vs Manual  
 3 Station Configuration



R.E./Eng. Labor Not Incl.

# Figure 1.5

Project Cost GIS vs Manual



— GEOGRAPHIC INFORMATION SYSTEM —

REMARKS

PLUS

More work completed

More timely

Higher quality

Better managed

Outside work

MINUS

Added cost

No manpower savings

IS IT WORTH THE COST TO ACCOMPLISH  
THE PLUSES?

GIS PRIP (Hardware) Costs

Item	FY-88	FY-89	FY-90	FY-91	FY-92	Total
CPU	52,471					52,471
Workstation/ Digitizer	23,260					23,260
Digitizer	8,500					8,500
Workstation	24,960	24,960	24,960	24,960		99,840
Disk Storage/ File Server	23,100					23,100
Disk Storage				11,200		11,200
Plot Server		22,000				22,000
Disk Storage/ Plot Server		5,500				5,500
<b>Total</b>	<b>132,291</b>	<b>52,460</b>	<b>36,160</b>	<b>24,960</b>		<b>245,871</b>

## GIS Software Costs

Item	FY-88	FY-89	FY-90	FY-91	FY-92	Total
Fortran	2,635					2,635
Master Plan	23,850					23,850
Plot Tape Output	3,000					3,000
GIS (Workstation)		30,000	15,000	15,000		60,000
Graphic (Wrkstn)		1,200	600	600		2,400
Plot (Plot Server)		5,000				5,000
Total	29,485	36,200	15,600	15,600		96,885

JUSTIFICATION & ACQUISITION PLAN  
FOR WALLA WALLA DISTRICT  
GEOGRAPHIC INFORMATION SYSTEM  
COMPUTERIZED MAP & RESOURCE ANALYSIS

ADDENDUM I  
OCTOBER 1987

1. General. This addendum covers the changes made to the original GIS plan. The change with the greatest impact was the decision to purchase the GIS in conjunction with the CADD system through the Corps-wide CADD Contract DACW87-87-D-0092 awarded to the Intergraph Corporation on September of 1987. This eliminated the RFP process thus accelerating the GIS installation date by several months. The CADD/GIS system is a dual CPU, one CPU for the CADD and the other CPU for GIS, each with its own disk drives and magnetic tape drive, and a common Ethernet network with intelligent workstations and a plotter attached to it. The dual system eliminates any compatibility problem between CADD and GIS. The Zeiss stereoplotter output can also be translated into Intergraph format, thus assuring the Zeiss of being an integral part of GIS.

2. GIS Hardware. The items in the Corps-wide contract may be purchased at any time within the first five years of the contract which is basically the same as the original four-year GIS plan. However, the order of purchase of certain items have been accelerated from the original plan and the original file server to serve multiple workstations, each capable of processing GIS independently, have been replaced by a mainframe CPU that allows the workstations the option of either processing GIS interactively on the CPU or downloading data on to the workstation to process GIS independently. The dual CPU concept allows accessing data files on either the GIS or CADD system. The following table is the new approved GIS hardware proposal:

ITEM	GIS HARDWARE COSTS				
	FY-88	FY-89	FY-90	FY-91	TOTAL
CPU and System Disk	52,471				52,471
InterView WS	23,260				23,260
Digitizer	8,500				8,500
InterPro 220 WS	24,960	24,969	24,960	24,960	99,840
Disk Storage w/ File Processor	23,100				23,100
Disk Storage 11,200				11,200	
Plot Server		22,000			22,000
Disk Storage for Plot Server		5,500			5,500
	132,291	52,460	36,160	24,960	245,871

S: 18 August 1989

CENPW-IM-R (18)

19 July 1989

MEMORANDUM FOR Chief, Operation Division

SUBJECT: Geographic Information System (GIS) Planning for FY 92-94

1. Enclosed is Addendum IV to the Justification and Acquisition Plan for the Walla Walla District Geographic Information System. The addendum covers additional GIS hardware and software for the Dworshak, Ice Harbor, and McNary Projects, and Clarkston Resource Office. The addendum was prepared by the District's GIS Subcommittee.
2. Request the addendum be staffed for review and comments. The GIS Subcommittee will incorporate any changes into a final plan. That plan will be provided to Operations Division for their approval then presented to the Information Management Steering Committee for District approval.
3. Review comments should be provided to the Information Management Office, ATTN: Jim Krussel, NLT 18 August 1989.

Encl

WILLIAM F. HOLMES      Krussel/IM/emd  
Chief, Information Mgt Ofc  
Holmes/IM

CF:  
IM-I (Seiner)

IM/Files

JUSTIFICATION & ACQUISITION PLAN  
FOR WALLA WALLA DISTRICT  
GEOGRAPHIC INFORMATION SYSTEM  
COMPUTERIZED MAP & RESOURCE ANALYSIS

ADDENDUM IV  
JULY 1989

1. General. This addendum proposes additions to the original GIS acquisition plan during the period FY 92 - FY 94. The current plan with addenda covers the GIS hardware and software needs through FY 91. After FY 91, additional Engineering Workstations will be needed at four project sites: Dworshak, Ice Harbor, Clarkston Resource Office, and McNary.

At this time, substantial digital geographic information systems will have been constructed for Dworshak and the Lower Snake River system. The Project Master Plans will be mostly complete and the GIS system will be utilized by the Project Offices and the Operations Division for Operational Management Plans (database and map coordination between Project and Operations Division), Environmental Analysis, and to support Project resource management operations (HMU analysis and management, fire prevention, forest inventory maintenance and management, cultural inventories, recreation management, and construction site analysis).

The Projects have supplied data requirements (data resolutions, entities, and attributes) to the database structure and most GIS data themes have been constructed with the use of the Project Offices in mind. The Operations Division has coordinated with Project Resource Managers on development of the data. Many of the data themes have a long life cycle and maintenance of the more dynamic data themes will be coordinated directly through the Project Workstations and on-site data managers. The District host will still provide digitizing support, database management support, mass storage, backup security, hardware, software, analytical support, system and data conversion, and large format plotting support.

The master databases for each Project will still reside on the Host VAX system in the District. The additional stand-alone Workstations will reduce the time-sharing CPU load on the VAX, but will increase file serving functions such as, communications server hookup to the Projects for file transfers, disk I/O, and tape transfers of Project files. Increased mass storage on the Project Workstations should offset the need for an additional Host disk drive in the FY 92 - FY 94 period. The Projects will also utilize floppy disk drives for design file backups offsystem and transferring files for plots that are not time critical.

2. GIS Hardware. The hardware needed to support the Project offices includes 4 Engineering Workstations of moderate to high level capability: 3 - 220 InterPro, 1 - 340 InterPro class machines. The 340 class machine should be acquired for the Dworshak Project to support additional software requirements needed to handle high-resolution, high color definition satellite imagery for vegetation monitoring. All Workstations will have a 1.2 MB floppy disk drive and should also have a minimum of 300 MB disk storage. The Workstations will be stand-alone at each Project site with a standard telecommunications linkage to the District VAX file-server. Files can also be transferred through the mail by floppy. Local plotting requirements are for small to medium format color. All Workstations will have a small/medium format color plotter for work plots. Large format plotting will still be done at the District Office.

#### GIS HARDWARE COSTS

Proj	ITEM	FY-92	FY-93	FY-94	TOTAL
Dworshak	340 InterPro	40,000			40,000
	Plotter	3,500			3,500
Clarkston	220 InterPro		30,000		30,000
	Plotter		3,500		3,500
Ice Harbor	220 InterPro			30,000	30,000
	Plotter			3,500	3,500
McNary	220 InterPro			30,000	30,000
	Plotter			3,500	3,500
		43,500	33,500	67,000	144,000

3. GIS Software. Software for the Project site GIS Workstations must include the stand-alone MicroStation 32, MicroStation GIS (includes the needed plot drivers), and relational database products. Satellite image processing software for Dworshak is expected to be the GRASS software provided by CERL. Data will continue to be prepared, organized, and archived at the District VAX mini-computer. Project data will be electronically transferred to the Project and utilized for management and local planning.

#### GIS SOFTWARE COSTS

All Projects

ITEM	FY-92	FY-93	FY-94	TOTAL
MicroStation 32	\$1,600	\$1,600	\$3,200	\$6,400
Relational Database	8,600	8,600	17,200	34,400
MicroStation GIS	8,000	8,000	16,000	32,000
	\$18,200	\$18,200	\$36,400	\$72,800

Walla Walla District  
 Geographic Information System (GIS)  
 Information Request per Frank McDonald NPD 1/30/90

Enclosed is the CAD/GIS cost report prepared in December 1989.

The Active Project List currently includes:

Mill Creek Master Plan data preparation*, analysis, project plates	
Regional/District Database acquisition, analysis, plates for Mill Creek,	Dworshak,
Lower Granite-Little Goose, Ice Harbor-McNary Master Plans	
Dworshak Master Plan data acquisition*, conversion, analysis, project	plates.
Dworshak Project Road 1989 Inventory data conversion, maps.	
Dworshak Project Forest Inventory project layout, site preselection for stand	inven-
tory.	
Dworshak Project Hydrography database preparation, conversion.	
Jackson Hole, Wyoming Flood Control Project vegetation cover analysis by	year
(1956,1974,1986).	
Lower Snake River HEP Study data preparation, analysis, reports.	

\* See Data Theme List

The Project Proposals include:

Lower Granite, Little Goose, Ice Harbor, Lower Monumental, McNary Project	Master
Plans.	
Dworshak HEP study.	
Lower Granite In-Water Disposal Test.	
Real Estate database for Lower Granite Project as a model for District Real	Estate
operations.	
Emergency Management model project applications for Boise, Idaho flood	con-
trol and Gowen Field.	
Regulatory Functions model project of a portion of Idaho for map and	data-
base preparation and analysis.	

The personnel using GIS hardware/software include:

1 full-time	data preparation	
1 part-time	data preparation	
1 full-time	project development, database design, analysis,	train-
ing, applications management.		
3 part-time	Planning Environmental Analysis	
1 part-time	Real Estate	
1 part-time	Operations	
1 part-time	Surveying, mapping	

## Data Theme List

Master Plans:

Theme	Extent	
	Project	District/Regional
boundaries		
Project	x	x
State		x
County		x
City	x	x
Elevation zones	x	
Slope zones	x	
Aspect zones	x	
Buildings	x	
Fences	x	
Habitat structures	x	
Water structures	x	x
Hydrography	x	x
Outgrants	x	
Disposals	x	
Tracts	x	
Management Units	x	
Zoning	x	
Roads	x	x
Trails/Walks	x	
Soils	x	
Vegetation	x	
Archaeology	x	
Wildlife Ranges	x	x
Endangered Species	x	x
Utilities/Transmission Lines	x	
Signs	x	
Recreation Areas	x	x
Forest Stands	x	
Wildfire	x	
Vegetation Plantings	x	

## INSTRUCTIONS FOR COMPUTING CAD/GIS ANNUAL COSTS

1. General. A Lotus 1-2-3 spreadsheet of the Intergraph CAD/GIS equipment and software with separate CADD and GIS purchase and maintenance costs from FY 88 through FY 94 has been written and saved under the filename CADGIS.WK1. Separate CADD and GIS annual costs, updated automatically as items are added, modified or purchased to the CADD/GIS system, are also part of the spreadsheet. CADD annual cost is charged entirely to Engineering Division; GIS annual cost is distributed to Planning, Operations, Real Estate, and Engineering divisions. GIS organizational costs for depreciation, plant increment, insurance, maintenance, and software are also part of the spreadsheet.

2. Annual Cost. The annual cost for FY 88 through FY 94 includes depreciation, plant increment, insurance, maintenance, software, site preparation, training, and IMO support.

Depreciation. PRIP hardware items are depreciated in 7 years. Software costing \$5,000 or greater are depreciated in 2 years.

Plant Increment. Plant increment is a equipment replacement amount set aside each year until a PRIP equipment is surplus. Plant increment for a year is computed at 5% of the price of any equipment purchased under PRIP during the year plus 105% of the previous year's plant increment. Plant increment for software \$5,000 or greater is computed only until the item is depreciated.

Insurance. Insurance is computed each year at .75% of the nondepreciated amount of PRIP hardware item.

Maintenance. Maintenance for a year is the hardware maintenance and the software support costs for the all items.

Software. Software costs are for software costing less than \$5,000 purchased during the year.

Hardware. Hardware costs are for hardware costing less than \$5,000 purchased during the year and not under PRIP.

Site Preparation, Training, and IMO Support. Self explanatory.

3. GIS Organizational Costs. The above GIS costs are distributed to Planning, Operations, Real Estate, and Engineering divisions. All shared item costs are distributed as follows:

Planning 61.45%

Operations 22.92%

Real Estate 10.42%

Engineering 5.21%

Since Real Estate and Engineering will share a workstation, all item costs pertaining to their workstation will be split 66.6% Real Estate and 33.4% Engineering.

The workstation GIS software packages will be installed on the GIS Manager's InterPro 340 in FY-90 and on the Planning InterPro 340, the InterView 32C, and on the Operations Interpro 220 in FY-91. The cost of the four packages will be split 50% Planning and 50% Operations.

4. Printing the Spreadsheet. The spreadsheet has been programmed to print the item description and the unit cost of the item (cols. A-E) on every printout page thus range of the printout will begin at col. F. The spreadsheet of the equipment and software purchases from FY88 through FY-94 is too large column wise to print on a single 11 X 14 paper. After setting the setup option to compressed type (\015) for the Epson LQ-1000, print FY-88 through FY-90 (cols. F-U) on the first sheet, FY-91 through FY-93 (cols. V-AM) on second sheet, and FY-94 (cols. AN-AS) on the third sheet. The CADD and GIS annual costs can be printed on the HP LaserJet printer by setting the setup option to compressed type (\027E\027(s16.66H), remembering that columns A-E automatically gets printed.

CAD ANNUAL COST  
NOVEMBER 1989

FY	HARDWARE		SOFTWARE		INS	MAINT	SITE PR	TRAIN	IMO SUP	SOFTW	HARDW	TOTAL
	DEPREC	PLT INC	DEPREC	PLT INC								
88	0	0	0	0	0	0	2000	5000	5000	31670	0	43670
89	45066	15773	0	0	2366	36570	0	0	17000	0	10475	127250
90	49352	18062	0	0	2253	35775	0	0	17000	0	9658	132099
91	49352	18965	0	0	1883	37854	0	0	17000	0	0	125053
92	49352	19913	0	0	1513	37856	0	0	17000	0	0	125631
93	49352	20909	0	0	1143	37854	0	0	17000	0	0	126257
94	49352	21954	0	0	772	37854	0	0	17000	0	0	<u>126932</u>
												806892

GIS ANNUAL COST  
NOVEMBER 1989

FY	HARDWARE		SOFTWARE		INS	MAINT	SITE PR	TRAIN	IMO SUP	SOFTW	HARDW	TOTAL
	DEPREC	PLT INC	DEPREC	PLT INC								
88	0	0	0	0	0	0	2000	12000	5000	37900	0	56900
89	30755	10764	6000	600	1615	25624	0	0	17000	2812	1058	102228
90	44317	16049	6000	630	2096	33416	0	0	17000	13810	6806	140124
91	47174	17852	0	0	1914	49740	0	0	17000	34950	7400	176029
92	47174	18744	0	0	1560	57342	0	0	17000	0	0	141820
93	47174	19681	0	0	1206	57342	0	0	17000	0	0	142404
94	47174	20665	0	0	852	57342	0	0	17000	0	0	<u>143034</u>
												902539

GIS ORGANIZATIONAL COSTS  
SUMMARY

ORG	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94	TOTAL
PLANNING	34965	63731	84965	98756	80714	81045	81403	525579
OPERATIONS	13041	26934	34431	52806	36450	36590	36742	236994
REAL ESTATE	5929	7708	13815	16304	16430	16505	16585	93277
ENGINEERING	<u>2964</u>	<u>3854</u>	<u>6913</u>	<u>8163</u>	<u>8226</u>	<u>8264</u>	<u>8304</u>	<u>46689</u>
	56900	102228	140124	176029	141820	142404	143034	902539

GIS ORGANIZATIONAL COSTS  
SUMMARY

ORG	<u>FY 88</u>	<u>FY 89</u>	<u>FY 90</u>	<u>FY 91</u>	<u>FY 92</u>	<u>FY 93</u>	<u>FY 94</u>	<u>TOTAL</u>
PLANNING	34965	63731	84965	98756	80714	81045	81403	525579
OPERATIONS	13041	26934	34431	52806	36450	36590	36742	236994
REAL ESTATE	5929	7708	13815	16304	16430	16505	16585	93277
<u>ENGINEERING</u>	<u>2964</u>	<u>3854</u>	<u>6913</u>	<u>8163</u>	<u>8226</u>	<u>8264</u>	<u>8304</u>	<u>46689</u>
	56900	102228	140124	176029	141820	142404	143034	902539

GIS ORGANIZATIONAL COSTS  
DEPRECIATION

ORG	<u>FY 88</u>	<u>FY 89</u>	<u>FY 90</u>	<u>FY 91</u>	<u>FY 92</u>	<u>FY 93</u>	<u>FY 94</u>	<u>TOTAL</u>
PLANNING	0	23969	30112	26425	26425	26425	26425	159781
OPERATIONS	0	9048	11339	11392	11392	11392	11392	65955
REAL ESTATE	0	2492	5909	6235	6235	6235	6235	33340
<u>ENGINEERING</u>	<u>0</u>	<u>1246</u>	<u>2958</u>	<u>3122</u>	<u>3122</u>	<u>3122</u>	<u>3122</u>	<u>16693</u>
	0	36755	50317	47174	47174	47174	47174	275768

GIS ORGANIZATIONAL COSTS  
PLANT INCREMENT

ORG	<u>FY 88</u>	<u>FY 89</u>	<u>FY 90</u>	<u>FY 91</u>	<u>FY 92</u>	<u>FY 93</u>	<u>FY 94</u>	<u>TOTAL</u>
PLANNING	0	7467	9991	10084	10588	11117	11673	60921
OPERATIONS	0	2823	3766	4303	4518	4744	4981	25133
REAL ESTATE	0	716	1947	2309	2424	2546	2673	12615
<u>ENGINEERING</u>	<u>0</u>	<u>358</u>	<u>975</u>	<u>1156</u>	<u>1214</u>	<u>1275</u>	<u>1339</u>	<u>6317</u>
	0	11364	16679	17852	18744	19681	20665	104986

GIS ORGANIZATIONAL COSTS  
INSURANCE

ORG	<u>FY 88</u>	<u>FY 89</u>	<u>FY 90</u>	<u>FY 91</u>	<u>FY 92</u>	<u>FY 93</u>	<u>FY 94</u>	<u>TOTAL</u>
PLANNING	0	1065	1235	1037	839	641	442	5259
OPERATIONS	0	403	466	466	380	295	209	2219
REAL ESTATE	0	98	263	274	227	180	133	1176
<u>ENGINEERING</u>	<u>0</u>	<u>49</u>	<u>132</u>	<u>137</u>	<u>114</u>	<u>90</u>	<u>67</u>	<u>589</u>
	0	1615	2096	1914	1560	1206	852	9242

GIS ORGANIZATIONAL COSTS  
MAINTENANCE

ORG	<u>FY 88</u>	<u>FY 89</u>	<u>FY 90</u>	<u>FY 91</u>	<u>FY 92</u>	<u>FY 93</u>	<u>FY 94</u>	<u>TOTAL</u>
PLANNING	0	16056	21657	29322	32416	32416	32416	164283
OPERATIONS	0	6744	7531	12615	16263	16263	16263	75679
REAL ESTATE	0	1882	2818	5200	5773	5773	5773	27218
ENGINEERING	0	941	1410	2603	2891	2891	2891	13626
	0	25624	33416	49740	57342	57342	57342	280806

GIS ORGANIZATIONAL COSTS  
SOFTWARE

ORG	<u>FY 88</u>	<u>FY 89</u>	<u>FY 90</u>	<u>FY 91</u>	<u>FY 92</u>	<u>FY 93</u>	<u>FY 94</u>	<u>TOTAL</u>
PLANNING	23290	1848	7341	18042	0	0	0	50521
OPERATIONS	8687	573	5873	16135	0	0	0	31267
REAL ESTATE	3949	261	397	516	0	0	0	5122
ENGINEERING	1975	130	199	258	0	0	0	2561
	37900	2812	13810	34950	0	0	0	89472

GIS ORGANIZATIONAL COSTS  
HARDWARE

ORG	<u>FY 88</u>	<u>FY 89</u>	<u>FY 90</u>	<u>FY 91</u>	<u>FY 92</u>	<u>FY 93</u>	<u>FY 94</u>	<u>TOTAL</u>
PLANNING	0	2878	4182	3400	0	0	0	10461
OPERATIONS	0	3448	1560	4000	0	0	0	9008
REAL ESTATE	0	488	709	0	0	0	0	1197
ENGINEERING	0	244	355	0	0	0	0	599
	0	7058	6806	7400	0	0	0	21264