

**IMPACT OF  
REVISED PROJECT PLANS**

**B. BARISH  
6 APRIL 1994**

## CONSTRUCTION PHASE STAFFING

	PROJECT MANAGEMENT PLAN (PEAK) (FTE's)	AUGMENTED PLAN (PEAK) (FTE's)
MANAGEMENT	4	7
ADMINISTRATION	6	9
TECHNICAL STAFF	41	54
GRADUATE STUDENTS	12	12
	<u>63</u>	<u>82</u>

- STAFFING ADJUSTMENTS ACCOMMODATE SIGNIFICANT OUTSIDE DEMANDS AND LOWER IMPLEMENTATION RISK
- POLICY-MAKING MANAGEMENT SIGNIFICANTLY STRENGTHENED
- FINANCE / PLANNING ADMINISTRATION STRENGTHENED
- 7 OF 13 NEW TECHNICAL STAFF POSITIONS ARE LINE MANAGEMENT — ELIMINATED DUAL ROLES OF POLICY-MAKING MANAGEMENT AND STRENGTHENS EXISTING ROLES
- ADDITIONAL TECHNICAL STAFF STRENGTHENS OPERATIONS

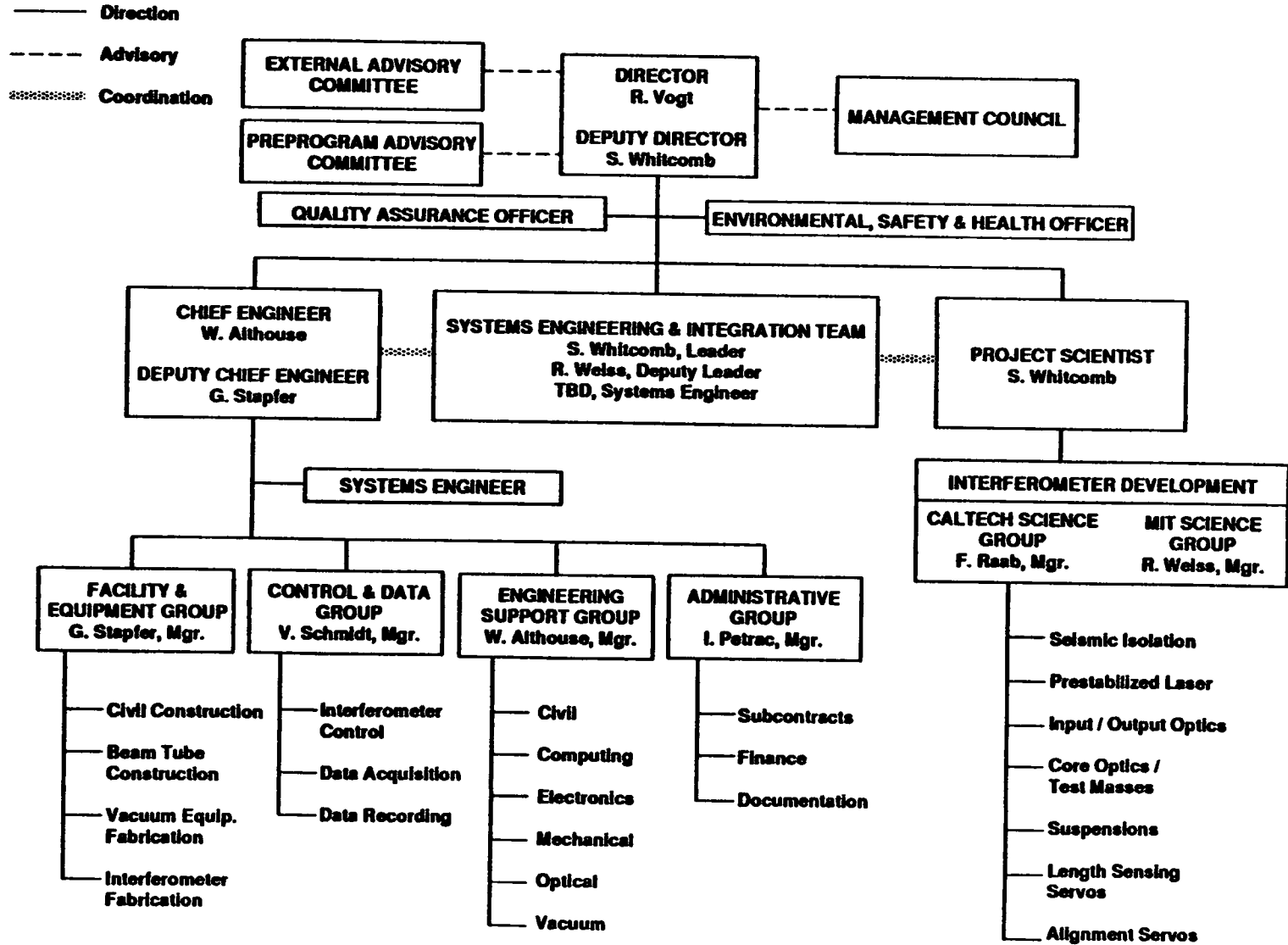
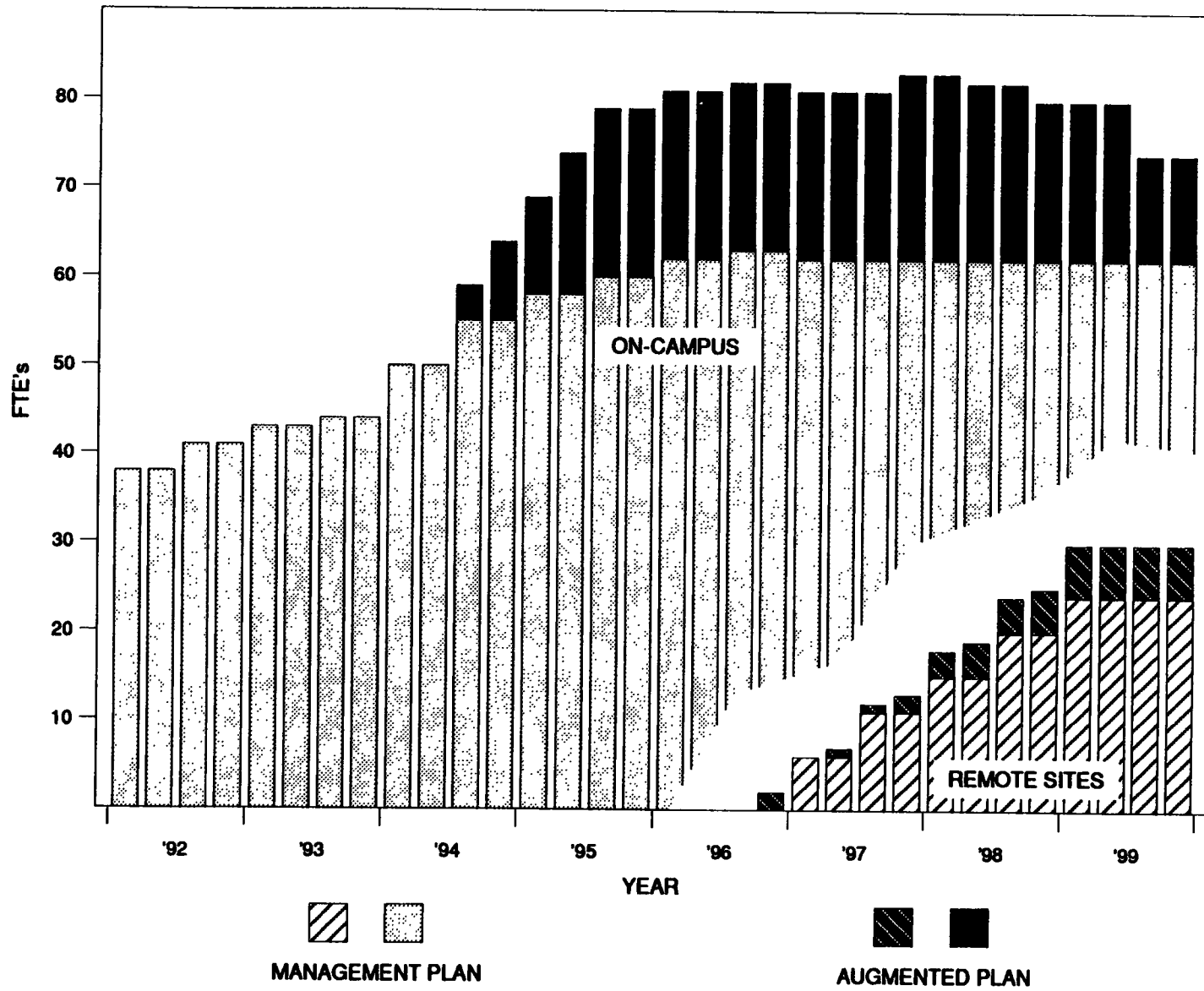


Figure 2-3 LIGO organization.

# LIGO STAFFING PLANS



## LIGO PROJECT PHASES

### DESIGN / CONSTRUCTION PHASE:

- **BEGINS 12/1/91 (DEFINED IN COOPERATION AGREEMENT)**
- **ENDS WITH ACCEPTANCE OF VACUUM SYSTEMS (BOTH SITES) AND COMPLETION OF THIRD "INITIAL" INTERFEROMETER FABRICATION**
- **INCLUDES FACILITY DESIGN AND CONSTRUCTION, SUPPORT EQUIPMENT ACQUISITION, INITIAL INTERFEROMETER FABRICATION AND TEST, AND INTERFEROMETER R&D**

### PRE-OPERATION PHASE:

- **BEGINS WITH ACCEPTANCE OF FIRST BUILDINGS**
- **ENDS WITH DECLARATION OF THREE OPERATIONAL INTERFEROMETERS (ONE DETECTOR)**
- **INCLUDES FACILITY SUPPORT EQUIPMENT AND INTERFEROMETER INTEGRATION AND SHAKEDOWN**

### OPERATIONS PHASE:

- **BEGINS WHEN FIRST REMOTE SITE IS OPERATIONAL**
- **FULL OPERATION WHEN BOTH SITES ARE OPERATIONAL**

## DESIGN / CONSTRUCTION PHASE COST

('93 \$M)

	'92	'93	'94	'95	'96	'97	'98	TOTAL
<b>PROJECT MANAGEMENT PLAN:</b>								
WBS 1.	0.3	4.4	9.7	2.6	1.4	1.8		20.2
WBS 2.		3.1	25.9	17.3	14.1	39.1		99.5
WBS 3.			12.6	32.4	29.8			74.8
WBS 4.*	4.8	5.6	7.7	7.9	8.4	8.3		42.7
<b>TOTAL</b>	<u>5.1</u>	<u>13.1</u>	<u>55.9</u>	<u>60.2</u>	<u>53.7</u>	<u>49.2</u>		<u>237.2</u>
 <b>AUGMENTED PLAN:</b>								
WBS 1-3.	----- <b>SAME</b> -----							194.5
WBS 4.	<u>4.8</u>	<u>5.6</u>	<u>8.4</u>	<u>11.5</u>	<u>12.0</u>	<u>9.8</u>	<u>4.8</u>	<u>56.9</u>
<b>TOTAL</b>	<u>5.1</u>	<u>13.1</u>	<u>56.6</u>	<u>63.8</u>	<u>57.3</u>	<u>50.7</u>	<u>4.8</u>	<u>251.4</u>
							<b>DIFFERENCE:</b>	<b>14.2</b>

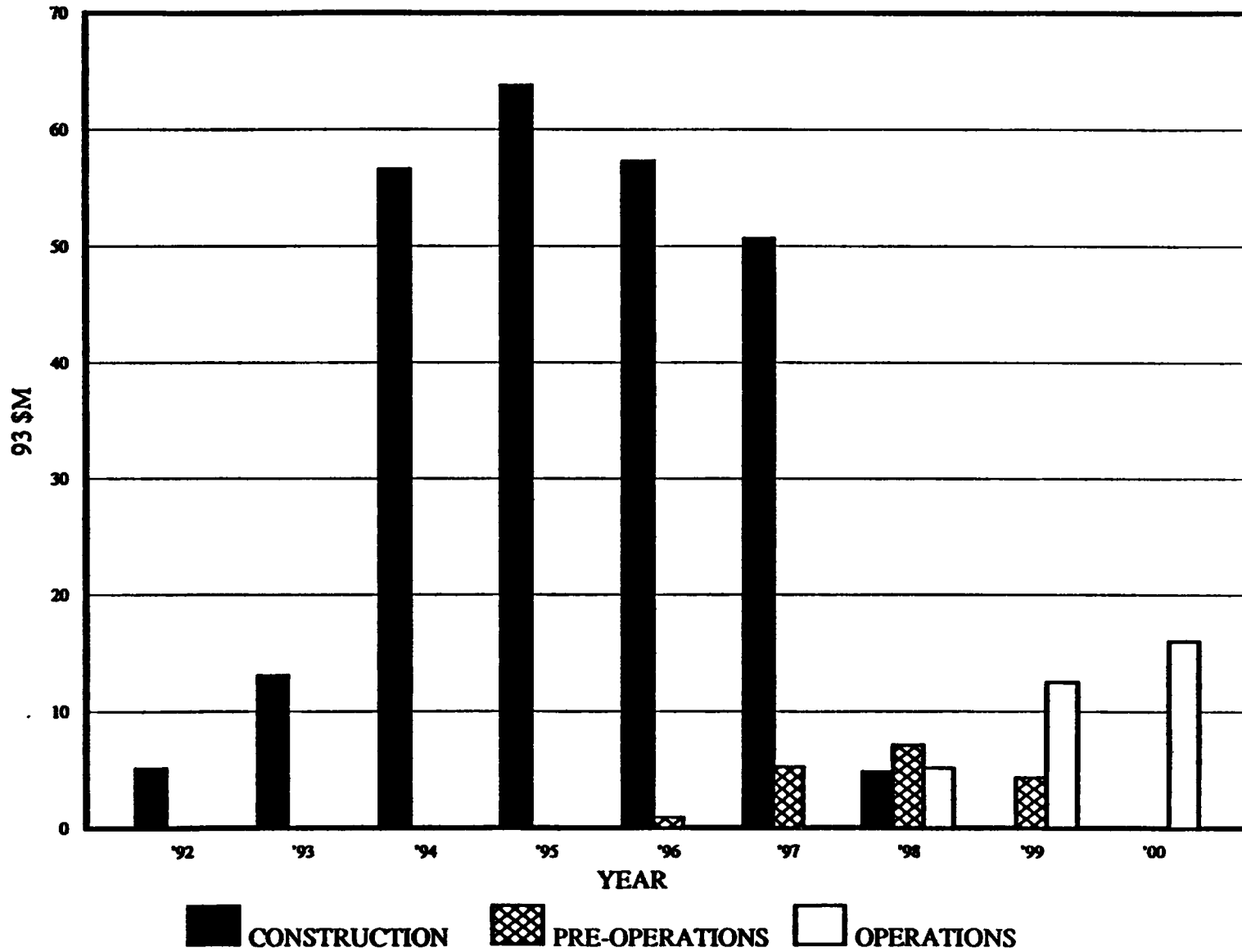
\*EXCLUDING WBS 4.6, REMOTE SITE OPERATIONS (MOVED TO PRE-OPS PHASE)

## TRANSITION FROM CONSTRUCTION TO OPERATIONS

('93 \$M)

	'92	'93	'94	'95	'96	'97	'98	'99	'00
<b>AUGMENTED PLAN:</b>									
<b>WBS 1.</b>	<b>0.3</b>	<b>4.4</b>	<b>9.7</b>	<b>2.6</b>	<b>1.4</b>	<b>1.8</b>			
<b>WBS 2.</b>		<b>3.1</b>	<b>25.9</b>	<b>17.3</b>	<b>14.1</b>	<b>39.1</b>			
<b>WBS 3.</b>			<b>12.6</b>	<b>32.4</b>	<b>29.8</b>				
<b>WBS 4.</b>	<u><b>4.8</b></u>	<u><b>5.6</b></u>	<u><b>8.4</b></u>	<u><b>11.5</b></u>	<u><b>12.0</b></u>	<u><b>9.8</b></u>	<u><b>4.8</b></u>		
<b>CONSTRUCTION PHASE</b>	<b>5.1</b>	<b>13.1</b>	<b>56.6</b>	<b>63.8</b>	<b>57.3</b>	<b>50.7</b>	<b>4.8</b>		
			<b>TOTAL, CONSTRUCTION PHASE = 251.4</b>						
 <b>PRE-OPERATIONS PHASE</b>					<b>0.9</b>	<b>5.2</b>	<b>7.1</b>	<b>4.3</b>	
					<b>TOTAL, PRE-OPERATIONS PHASE = 17.5</b>				
 <b>OPERATIONS PHASE</b>							<b>5.1</b>	<b>12.5</b>	<b>16.0</b>
							<b>ANNUAL OPERATIONS PHASE COST = 16.0</b>		

# TRANSITION FROM CONSTRUCTION TO OPERATIONS





**PRE-OPS / OPERATIONS PHASE  
COSTS BREAKDOWN**

('93 \$M)

	'96	'97	'98	'99	'00
<b>PRE-OPERATIONS PHASE:</b>					
<b>SALARIES &amp; BENEFITS</b>	<b>0.3</b>	<b>2.6</b>	<b>3.4</b>	<b>2.4</b>	
<b>TRAVEL</b>	<b>0.1</b>	<b>0.4</b>	<b>0.8</b>	<b>0.4</b>	
<b>R&amp;D EQUIPMENT</b>			<b>0.5</b>	<b>0.2</b>	
<b>SUPPLIES &amp; EXPENSES</b>	<b>0.1</b>	<b>0.4</b>	<b>0.6</b>	<b>0.4</b>	
<b>REMOTE SITE POWER</b>	<b>0.4</b>	<b>0.8</b>	<b>0.4</b>	<b>0.3</b>	
<b>REMOTE SITE MAINTENANCE</b>		<b>1.0</b>	<b>1.4</b>	<b>0.6</b>	
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	<b>0.9</b>	<b>5.2</b>	<b>7.1</b>	<b>4.3</b>	
 <b>OPERATION PHASE:</b>					
<b>SALARIES &amp; BENEFITS</b>			<b>2.9</b>	<b>7.3</b>	<b>9.3</b>
<b>TRAVEL</b>				<b>0.4</b>	<b>0.5</b>
<b>R&amp;D EQUIPMENT</b>			<b>0.4</b>	<b>1.0</b>	<b>1.2</b>
<b>SUPPLIES &amp; EXPENSES</b>			<b>0.5</b>	<b>1.2</b>	<b>1.5</b>
<b>REMOTE SITE POWER</b>			<b>0.5</b>	<b>0.8</b>	<b>1.1</b>
<b>REMOTE SITE MAINTENANCE</b>			<b>0.8</b>	<b>1.8</b>	<b>2.4</b>
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			<b>5.1</b>	<b>12.5</b>	<b>16.0</b>

**PRE-OPS / OPERATIONS PHASE  
COST BREAKDOWN BY SITE**

('93 \$M)

	'96	'97	'98	'99	'00
<b>PRE-OPERATIONS PHASE:</b>					
<b>ON-CAMPUS</b>	<b>0.5</b>	<b>2.8</b>	<b>4.6</b>	<b>2.9</b>	
<b>LOUISIANA SITE</b>	<b>0.3</b>	<b>1.8</b>	<b>0.7</b>		
<b>WASHINGTON SITE</b>	<b>0.1</b>	<b>0.6</b>	<b>1.8</b>	<b>1.4</b>	
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	<b>0.9</b>	<b>5.2</b>	<b>7.1</b>	<b>4.3</b>	
 <b>OPERATION PHASE:</b>					
<b>ON-CAMPUS</b>			<b>3.1</b>	<b>8.4</b>	<b>10.5</b>
<b>LOUISIANA SITE</b>			<b>2.0</b>	<b>2.8</b>	<b>2.8</b>
<b>WASHINGTON SITE</b>				<b>1.3</b>	<b>2.7</b>
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			<b>5.1</b>	<b>12.5</b>	<b>16.0</b>

## LIGO COMMUNITY PROGRAM

('93 \$)

	'94	'95	'96	'97	'98	'99	'94-'98 TOTAL
<b>CURRENT LIGO ASSOCIATES</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>5.0</b>
<b>VISITORS PROGRAM</b>	<b>0.2</b>	<b>0.3</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>	<b>0.5</b>	<b>1.7</b>
<b>SUPPORT FOR THEORY COMMUNITY</b>	<b>0.3</b>	<b>0.5</b>	<b>0.8</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>3.6</b>
<b>EXPANDED LIGO ASSOCIATES/USERS</b>		<b>0.5</b>	<b>1.0</b>	<b>2.0</b>	<b>3.0</b>	<b>4.0</b>	<b>6.5</b>
<b>TOTAL:</b>	<b>1.5</b>	<b>2.3</b>	<b>3.2</b>	<b>4.4</b>	<b>5.4</b>	<b>6.5</b>	<b>16.8*</b>

\* '94 -'98 TOTAL: \$16.8M VS. \$5.0M CURRENT

# OPERATIONS PHASE ANNUAL COST

('93 \$M)

**COMMUNITY PROGRAM/USERS 6.5**

**ON-CAMPUS**

**RESEARCH PROGRAM 5.0**

**FACILITY/COMMUNITY SUPPORT 5.5**

**REMOTE SITE OPERATIONS 5.5**

## COST IMPACTS

	COST	TOTAL COST	TOTAL COST RUNOUT
	93 \$M	93 \$M	\$M
COOPERATIVE AGREEMENT	222.8	222.8	232.2
SALES TAX	8.1	230.9	241.0
5 YR → 6 YR STRETCHOUT	7.6	238.5	
UNIMPLEMENTED SCOPE REDUCTIONS	8.4	246.9	
SITE-RELATED CHANGES	2.4	249.3	
WBS 4 ADJUSTMENTS	0.7	250.0	
CONTINGENCY RE-ALLOCATION	-2.7	247.3	
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PROJECT MANAGEMENT PLAN	239.2		
+ SALES TAXES	8.1	247.3	266.6
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<b><u>REVISED PROJECT PLANS:</u></b>			
REMOTE SITE COSTS TO PRE-OPS	-2.1	245.2	
AUGMENTED STAFFING	14.2	259.4	
<b>SCHEDULE SLIPS FORCED BY FUNDING CAP:</b>			
• AUGUMENTED STAFFING	3.4		
• FY 94 FUNDING = \$39M	1.9	264.7	291.1
<b>POTENTIAL COST INCREASES:</b>			
• LA SITE DEVELOPMENT	2.6		
• SCHEDULE SLIP TO ACCOMMODATE FUNDING FOR COMMUNITY PROGRAM	2.9	270.2	296.9

**IMPACT OF  
REVISED PROJECT PLANS**

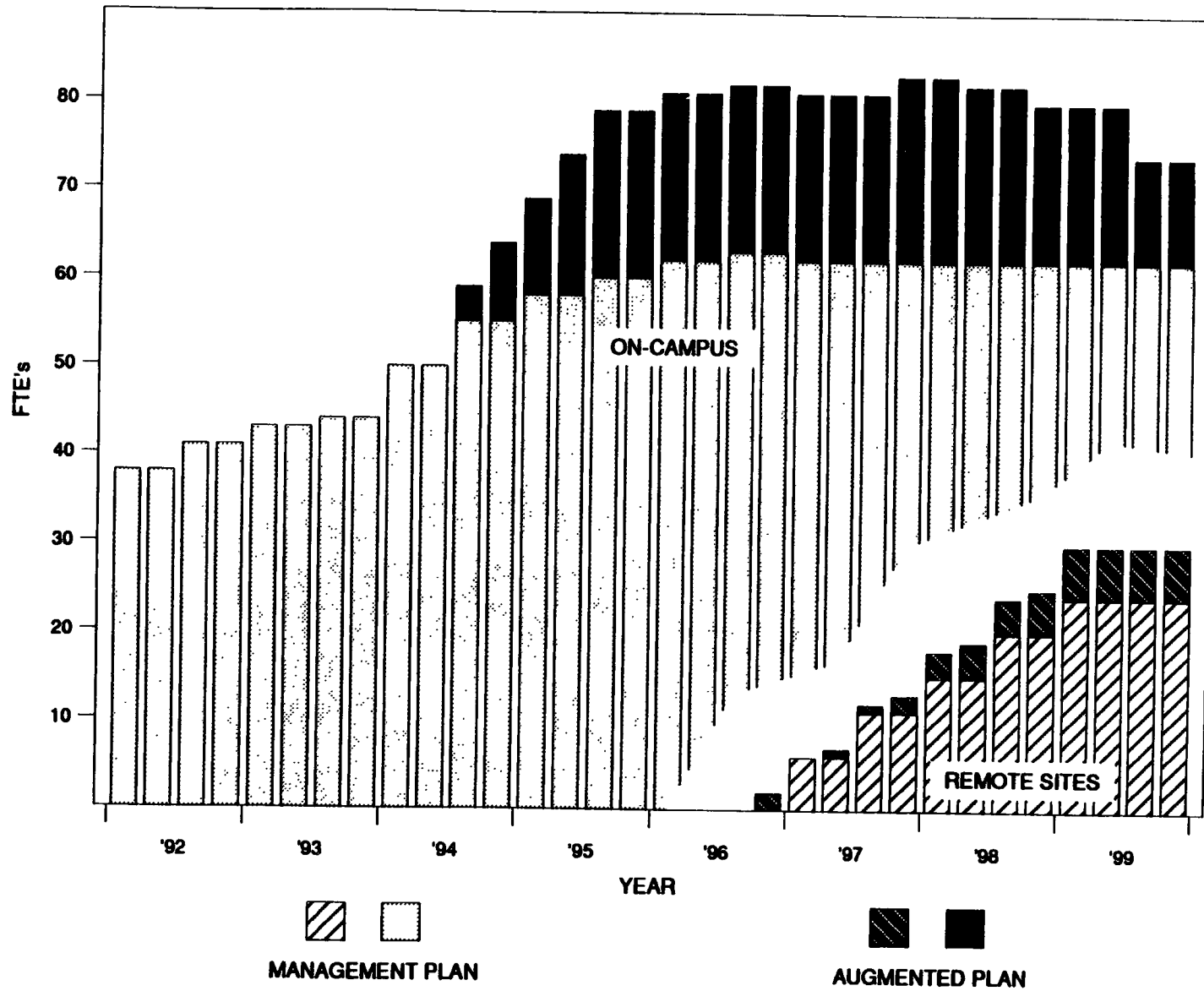
**B. BARISH  
6 APRIL 1994**

## CONSTRUCTION PHASE STAFFING

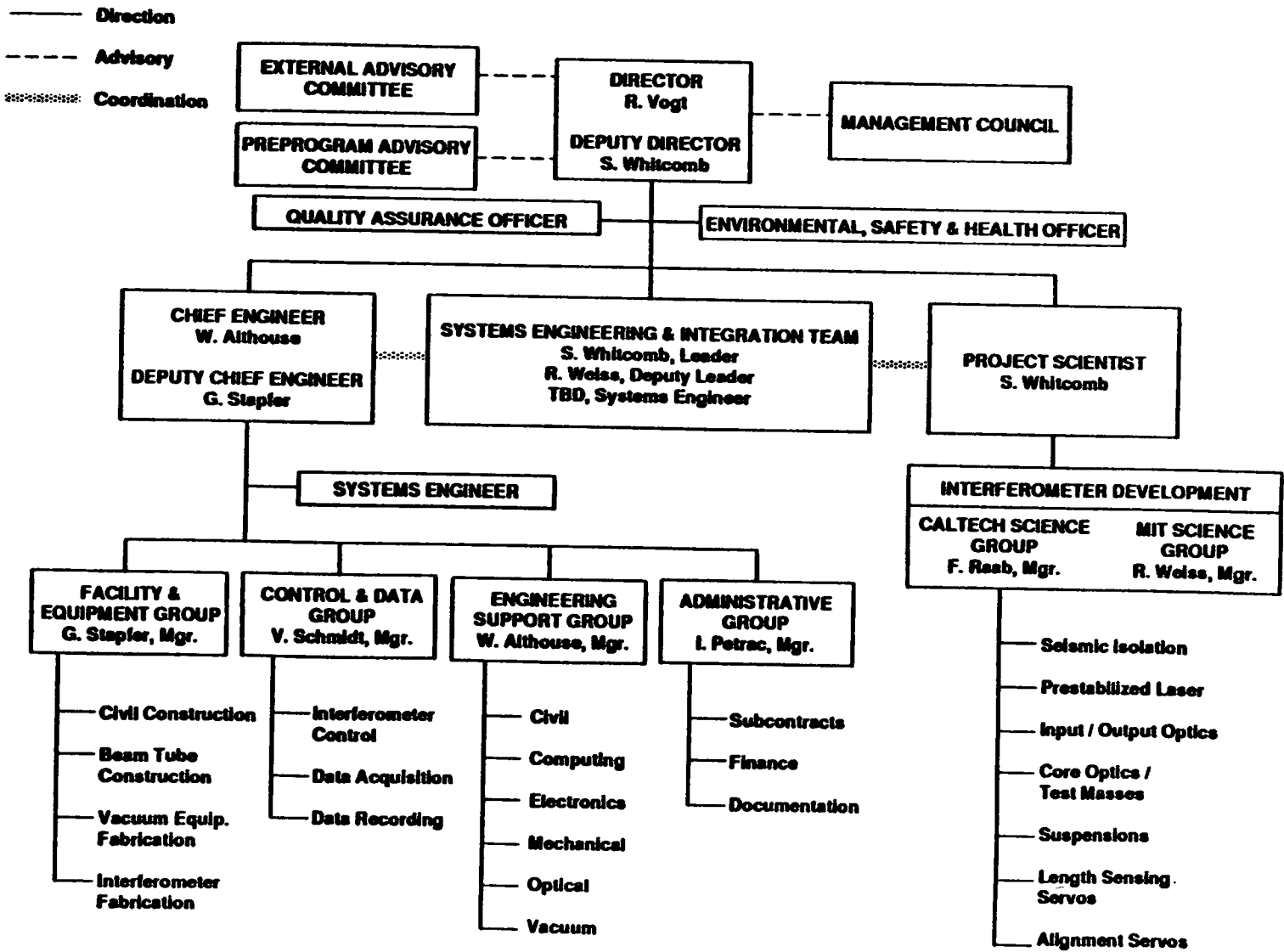
	PROJECT MANAGEMENT PLAN (PEAK) (FTE's)	AUGMENTED PLAN (PEAK) (FTE's)
MANAGEMENT	4	7
ADMINISTRATION	6	9
TECHNICAL STAFF	41	54
GRADUATE STUDENTS	12	12

- **STAFFING ADJUSTMENTS ACCOMMODATE SIGNIFICANT OUTSIDE DEMANDS AND LOWER IMPLEMENTATION RISK**
- **POLICY-MAKING MANAGEMENT SIGNIFICANTLY STRENGTHENED**
- **FINANCE / PLANNING ADMINISTRATION STRENGTHENED**
- **7 OF 13 NEW TECHNICAL STAFF POSITIONS ARE LINE MANAGEMENT — ELIMINATED DUAL ROLES OF POLICY-MAKING MANAGEMENT AND STRENGTHENS EXISTING ROLES**
- **ADDITIONAL TECHNICAL STAFF STRENGTHENS OPERATIONS**

# LIGO STAFFING PLANS







12

Figure 2-3 LIGO organization.

# LIGO PROJECT PHASES

## DESIGN / CONSTRUCTION PHASE:

- **BEGINS 12/1/91 (DEFINED IN COOPERATION AGREEMENT)**
- **ENDS WITH ACCEPTANCE OF VACUUM SYSTEMS (BOTH SITES) AND COMPLETION OF THIRD "INITIAL" INTERFEROMETER FABRICATION**
- **INCLUDES FACILITY DESIGN AND CONSTRUCTION, SUPPORT EQUIPMENT ACQUISITION, INITIAL INTERFEROMETER FABRICATION AND TEST, AND INTERFEROMETER R&D**

## PRE-OPERATION PHASE:

- **BEGINS WITH ACCEPTANCE OF FIRST BUILDINGS**
- **ENDS WITH DECLARATION OF THREE OPERATIONAL INTERFEROMETERS (ONE DETECTOR)**
- **INCLUDES FACILITY SUPPORT EQUIPMENT AND INTERFEROMETER INTEGRATION AND SHAKEDOWN**

## OPERATIONS PHASE:

- **BEGINS WHEN FIRST REMOTE SITE IS OPERATIONAL**
- **FULL OPERATION WHEN BOTH SITES ARE OPERATIONAL**

## DESIGN / CONSTRUCTION PHASE COST

('93 \$M)

	'92	'93	'94	'95	'96	'97	'98	TOTAL	
<b>PROJECT MANAGEMENT PLAN:</b>									
WBS 1.	0.3	4.4	9.7	2.6	1.4	1.8		20.2	
WBS 2.		3.1	25.9	17.3	14.1	39.1		99.5	
WBS 3.			12.6	32.4	29.8			74.8	
WBS 4.*	4.8	5.6	7.7	7.9	8.4	8.3		42.7	
<b>TOTAL</b>	<u>5.1</u>	<u>13.1</u>	<u>55.9</u>	<u>60.2</u>	<u>53.7</u>	<u>49.2</u>		<u>237.2</u>	
<b>AUGMENTED PLAN:</b>									
WBS 1-3.	————— SAME —————								194.5
WBS 4.	<u>4.8</u>	<u>5.6</u>	<u>8.4</u>	<u>11.5</u>	<u>12.0</u>	<u>9.8</u>	<u>4.8</u>	<u>56.9</u>	
<b>TOTAL</b>	<u>5.1</u>	<u>13.1</u>	<u>56.6</u>	<u>63.8</u>	<u>57.3</u>	<u>50.7</u>	<u>4.8</u>	<u>251.4</u>	
							<b>DIFFERENCE:</b>	<b>14.2</b>	

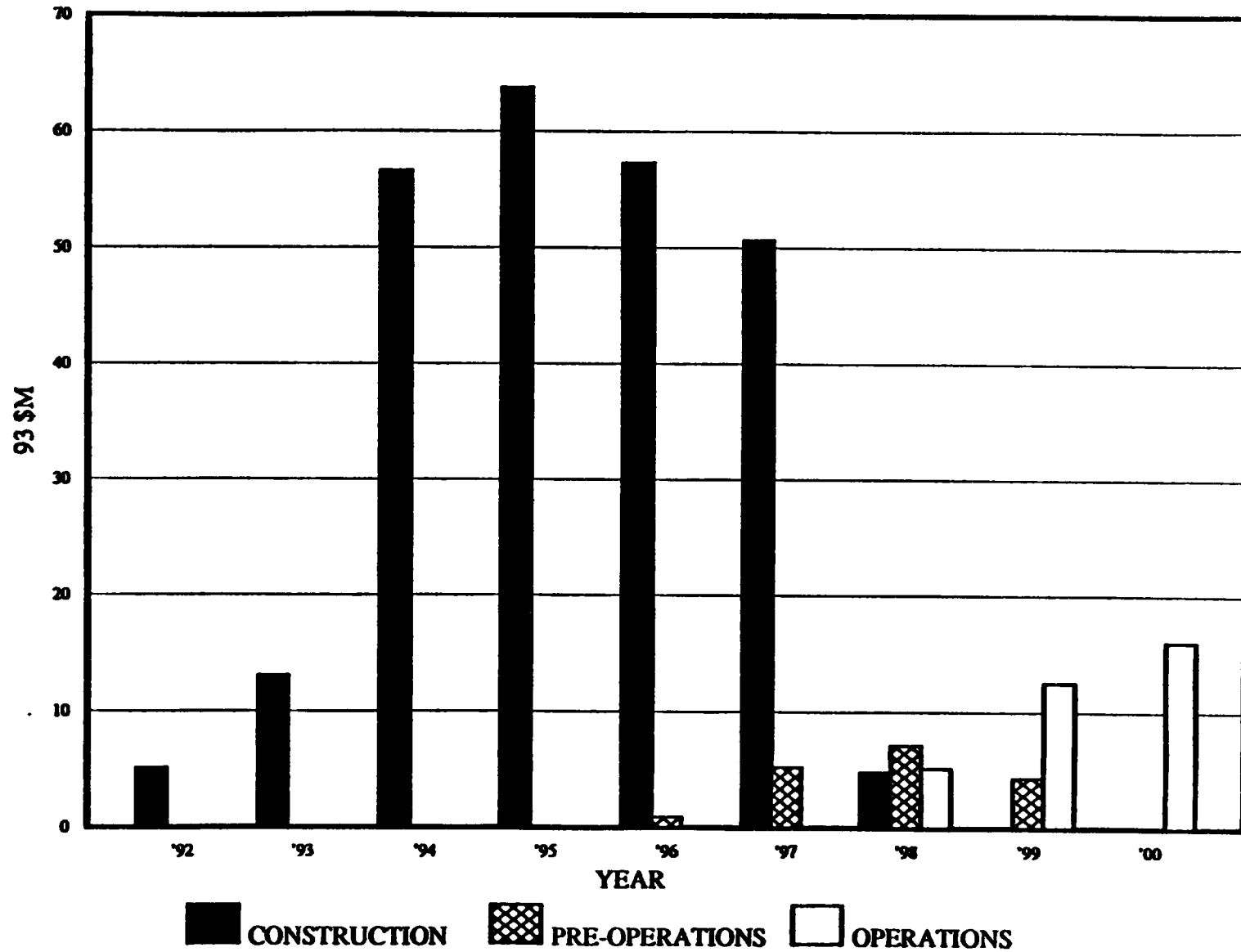
\*EXCLUDING WBS 4.6, REMOTE SITE OPERATIONS (MOVED TO PRE-OPS PHASE)

## TRANSITION FROM CONSTRUCTION TO OPERATIONS

('93 \$M)

	'92	'93	'94	'95	'96	'97	'98	'99	'00
<b>AUGMENTED PLAN:</b>									
<b>WBS 1.</b>	<b>0.3</b>	<b>4.4</b>	<b>9.7</b>	<b>2.6</b>	<b>1.4</b>	<b>1.8</b>			
<b>WBS 2.</b>		<b>3.1</b>	<b>25.9</b>	<b>17.3</b>	<b>14.1</b>	<b>39.1</b>			
<b>WBS 3.</b>			<b>12.6</b>	<b>32.4</b>	<b>29.8</b>				
<b>WBS 4.</b>	<b>4.8</b>	<b>5.6</b>	<b>8.4</b>	<b>11.5</b>	<b>12.0</b>	<b>9.8</b>	<b>4.8</b>		
<b>CONSTRUCTION PHASE</b>	<u><b>5.1</b></u>	<u><b>13.1</b></u>	<u><b>56.6</b></u>	<u><b>63.8</b></u>	<u><b>57.3</b></u>	<u><b>50.7</b></u>	<u><b>4.8</b></u>		
			<b>TOTAL, CONSTRUCTION PHASE = 251.4</b>						
 <b>PRE-OPERATIONS PHASE</b>					<b>0.9</b>	<b>5.2</b>	<b>7.1</b>	<b>4.3</b>	
					<b>TOTAL, PRE-OPERATIONS PHASE = 17.5</b>				
 <b>OPERATIONS PHASE</b>							<b>5.1</b>	<b>12.5</b>	<b>16.0</b>
							<b>ANNUAL OPERATIONS PHASE COST = 16.0</b>		

## TRANSITION FROM CONSTRUCTION TO OPERATIONS



**PRE-OPS / OPERATIONS PHASE  
COSTS BREAKDOWN**

('93 \$M)

	'96	'97	'98	'99	'00
<b>PRE-OPERATIONS PHASE:</b>					
<b>SALARIES &amp; BENEFITS</b>	0.3	2.6	3.4	2.4	
<b>TRAVEL</b>	0.1	0.4	0.8	0.4	
<b>R&amp;D EQUIPMENT</b>			0.5	0.2	
<b>SUPPLIES &amp; EXPENSES</b>	0.1	0.4	0.6	0.4	
<b>REMOTE SITE POWER</b>	0.4	0.8	0.4	0.3	
<b>REMOTE SITE MAINTENANCE</b>		1.0	1.4	0.6	
	<u>0.9</u>	<u>5.2</u>	<u>7.1</u>	<u>4.3</u>	
 <b>OPERATION PHASE:</b>					
<b>SALARIES &amp; BENEFITS</b>			2.9	7.3	9.3
<b>TRAVEL</b>				0.4	0.5
<b>R&amp;D EQUIPMENT</b>			0.4	1.0	1.2
<b>SUPPLIES &amp; EXPENSES</b>			0.5	1.2	1.5
<b>REMOTE SITE POWER</b>			0.5	0.8	1.1
<b>REMOTE SITE MAINTENANCE</b>			0.8	1.8	2.4
			<u>5.1</u>	<u>12.5</u>	<u>16.0</u>

**PRE-OPS / OPERATIONS PHASE  
COST BREAKDOWN BY SITE**

('93 \$M)

	'96	'97	'98	'99	'00
<b>PRE-OPERATIONS PHASE:</b>					
<b>ON-CAMPUS</b>	0.5	2.8	4.6	2.9	
<b>LOUISIANA SITE</b>	0.3	1.8	0.7		
<b>WASHINGTON SITE</b>	0.1	0.6	1.8	1.4	
	<u>0.9</u>	<u>5.2</u>	<u>7.1</u>	<u>4.3</u>	
 <b>OPERATION PHASE:</b>					
<b>ON-CAMPUS</b>			3.1	8.4	10.5
<b>LOUISIANA SITE</b>			2.0	2.8	2.8
<b>WASHINGTON SITE</b>				1.3	2.7
			<u>5.1</u>	<u>12.5</u>	<u>16.0</u>

## LIGO COMMUNITY PROGRAM

('93 \$)

	'94	'95	'96	'97	'98	'99	'94-'98 TOTAL
<b>CURRENT LIGO ASSOCIATES</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>5.0</b>
<b>VISITORS PROGRAM</b>	<b>0.2</b>	<b>0.3</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>	<b>0.5</b>	<b>1.7</b>
<b>SUPPORT FOR THEORY COMMUNITY</b>	<b>0.3</b>	<b>0.5</b>	<b>0.8</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>3.6</b>
<b>EXPANDED LIGO ASSOCIATES/USERS</b>		<b>0.5</b>	<b>1.0</b>	<b>2.0</b>	<b>3.0</b>	<b>4.0</b>	<b>6.5</b>
<b>TOTAL:</b>	<b>1.5</b>	<b>2.3</b>	<b>3.2</b>	<b>4.4</b>	<b>5.4</b>	<b>6.5</b>	<b>16.8*</b>

**\* '94 -'98 TOTAL: \$16.8M VS. \$5.0M CURRENT**



# OPERATIONS PHASE ANNUAL COST

('93 \$M)

<b>COMMUNITY PROGRAM/USERS</b>	<b>6.5</b>
<b>ON-CAMPUS</b>	
<b>RESEARCH PROGRAM</b>	<b>5.0</b>
<b>FACILITY/COMMUNITY SUPPORT</b>	<b>5.5</b>
<b>REMOTE SITE OPERATIONS</b>	<b>5.5</b>

## COST IMPACTS

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	93 \$M	93 \$M	\$M
COOPERATIVE AGREEMENT	222.8	222.8	232.2
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AUGMENTED STAFFING	14.2	259.4	
<b>SCHEDULE SLIPS FORCED BY FUNDING CAP:</b>			
• AUGUMENTED STAFFING	3.4		
• FY 94 FUNDING = \$39M	1.9	264.7	291.1
<b>POTENTIAL COST INCREASES:</b>			
• LA SITE DEVELOPMENT	2.6		
• SCHEDULE SLIP TO ACCOMMODATE FUNDING FOR COMMUNITY PROGRAM	2.9	270.2	296.9