

The LIGO Livingston Observatory

Mark Coles

Head - LIGO Livingston Observatory

April 23, 1998
G970259-00-F

PAC Meeting



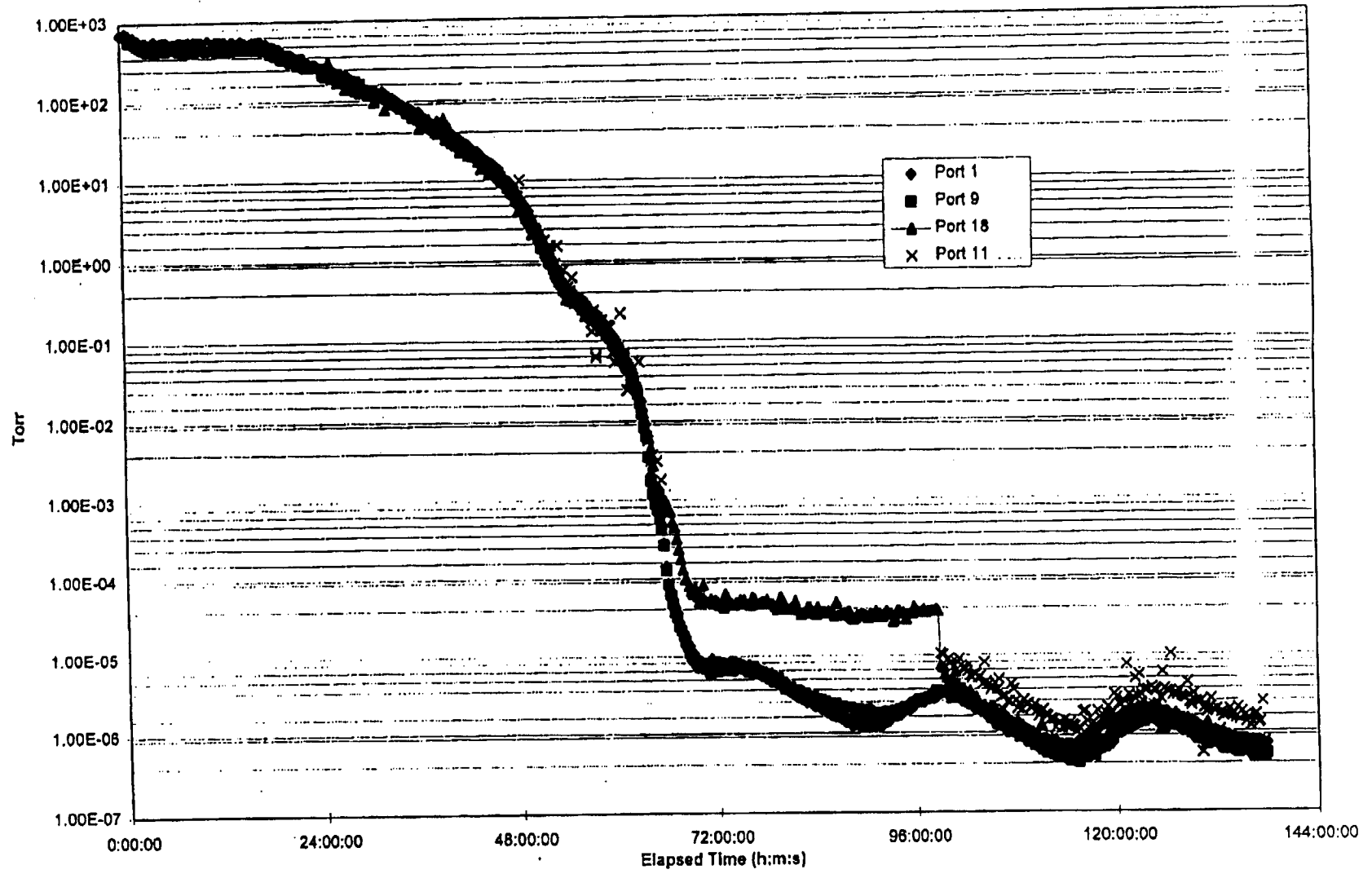
Topics Presented

- Orientation
- Site Status
- Schedule
- Staffing
- Concerns

Site Status

- Beam Tube:
 - ~300 Beam tubes (out of 400) installed and leak tested
 - Forming of beam tubes nearly complete.
 - Pumpdown of right arm underway
 - Preparing RGA's now for first gas accumulations next week
- Delivery of large vacuum chambers, spool pieces, tanks, etc., in progress.

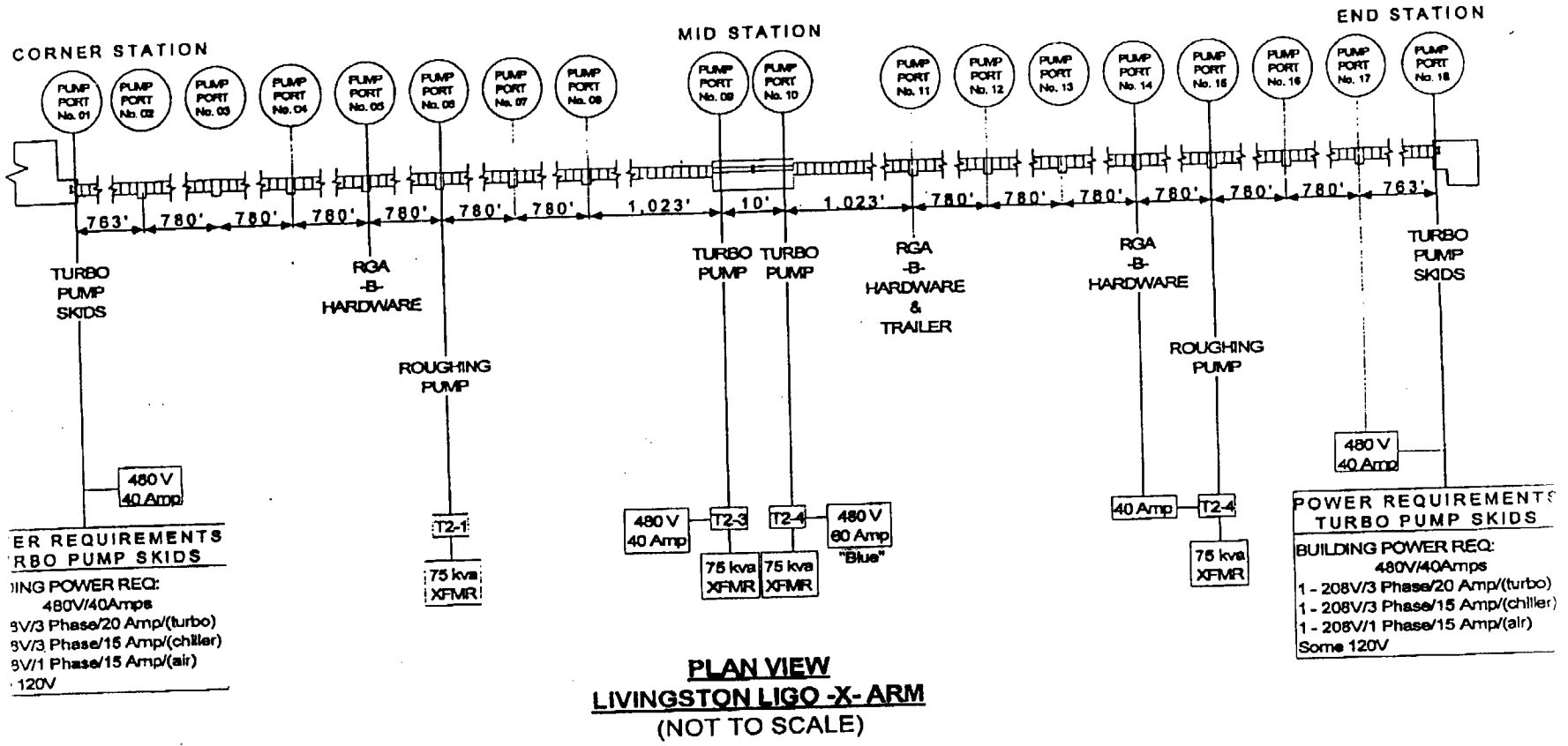
Livingston X arm Pumpdown Curve



Livingston X arm Pumpdown Curve

Key Events and Notes to Pumpdown Curve

<u>Note:</u>	<u>Elapsed Time</u> (hh:mm)	<u>Description</u>
1.	00:50 00:58	Roughing started at port 15. 15:01 p.m. 04/07/98 Roughing started at port 6. 15:08 p.m. 04/07/98
2.	02:45	Roughing systems isolated from the beam tube and shut down for the night, 16:55 to 17:00 04/07/98
3.	16:55 17:01	Roughing started at port 15. 07:06 04/08/98 Roughing started at port 6. 07:12 04/08/98
4.	20:12 to 23:09	Several roughing pump shutdowns due to mechanical issues with the pumps, 10:22 to 13:20 04/08/98
5.	38:50 40:49	Roughing pump at port 6 found shut down but still warm, 05:00 04/09/98. Restarted immediately Roughing pump at port 6 found shut down again. 07:00 04/09/98. Restarted after cooling down.
6.	53:10 to 53:33	Four turbo pump carts brought on line to pump beam tube. 19:21 p.m. to 19:33 p.m. 04/09/98.
7.	53:45	Roughing systems isolated from beam tube after approx. 39 hours of rough pumping time. 19:56 p.m. 04/09/98
8.	98:36	The turbo (foreline to roughing) bypass valve on the port 18 turbo cart was found to be in the open position. This valve should have been in the closed position. The valve was closed and the inlet pressure at this location immediately began to go down. 16:47 P.M. 04/11/98.
9.	98:36	The port 11 cold cathode gauge enable switch was found to be in the open position. This switch was closed, and pressure recording from this gauge was resumed. 16:47 P.M. 04/11/98.



PLAN VIEW
LIVINGSTON LIGO -X- ARM
 (NOT TO SCALE)

NOTES:

- 1) REDRAWN FROM GPB SKETCH, REV 3A Dated 3/3/98.



Site status (ctd)

- >2000 enclosures cast
- 1600 enclosures installed (right arm complete)
- service road base course complete
- high voltage power distribution along both arms complete

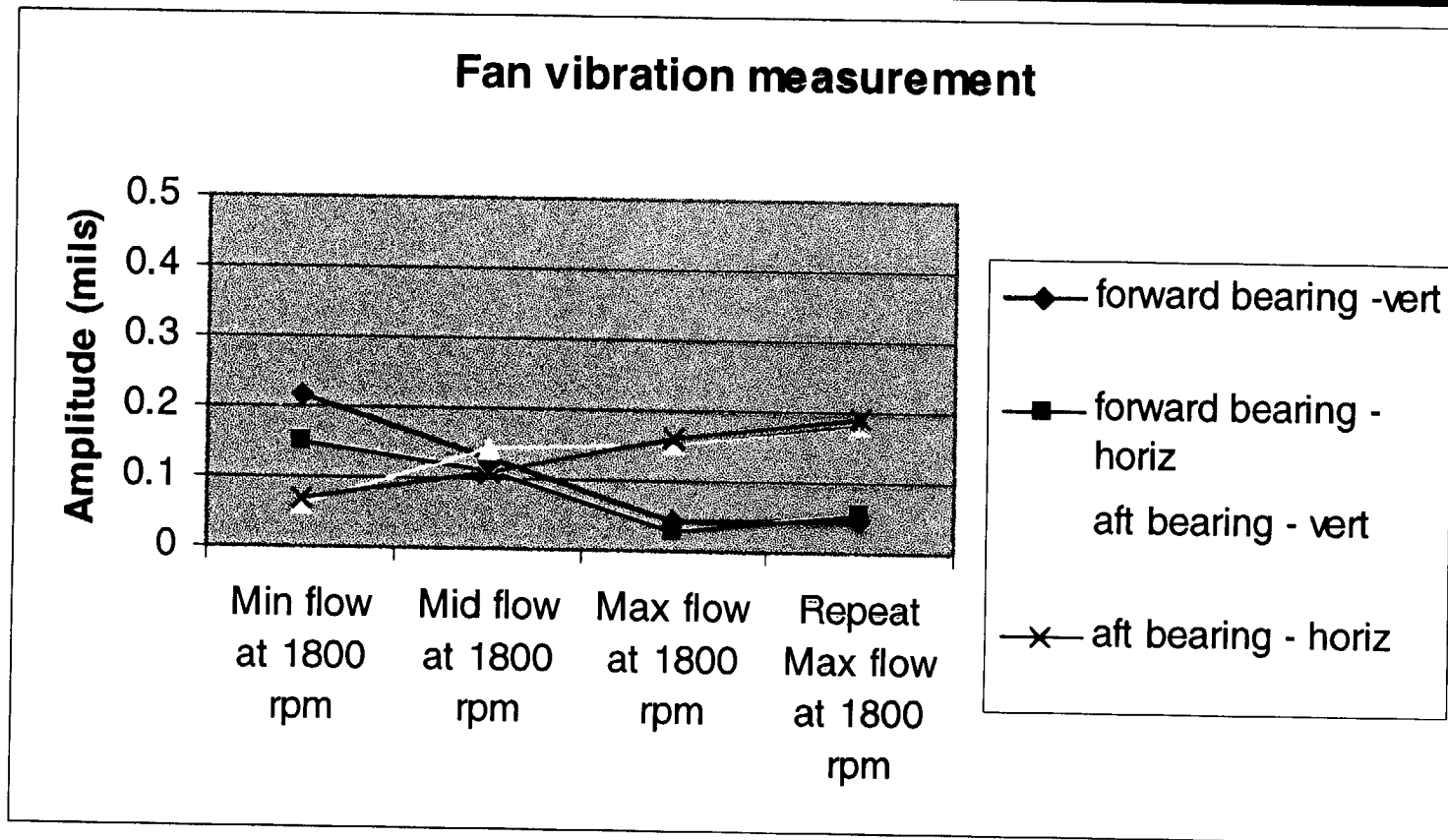
Civil Construction: Remaining work

- Close out punch list (estimate June 1)
- Verify as-built documentation
- Training and final acceptance of installed sub-systems (HVAC, etc.)
 - Most important issue is to insure that building meets structural and acoustic design criteria

Final Acceptance Example: Fan Vibration

- Structural vibration calculations predict maximum budget for sources due rotating equipment
 - example: 0.5 mil max amplitude on vane axial fans
- Develop spec for max vibration amplitude (0.3 mil p-p on fans)

Hanford Fan Vibration Measurements



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Remaining issues

- Access road (provided by state of Louisiana) needs to be completed.
- Experience indicates this should be upgraded (requires Legislature approval)



Agence France-Presse

Livingston Louisiana. Despite typically rainy winter weather, construction activity at the LIGO Livingston Observatory continues on schedule. "It appears that the access road is a little low in some places," reports Gerry Stapfer, LIGO site construction manager.

LIGO DETECTOR INSTALLATION -- TOP LEVEL

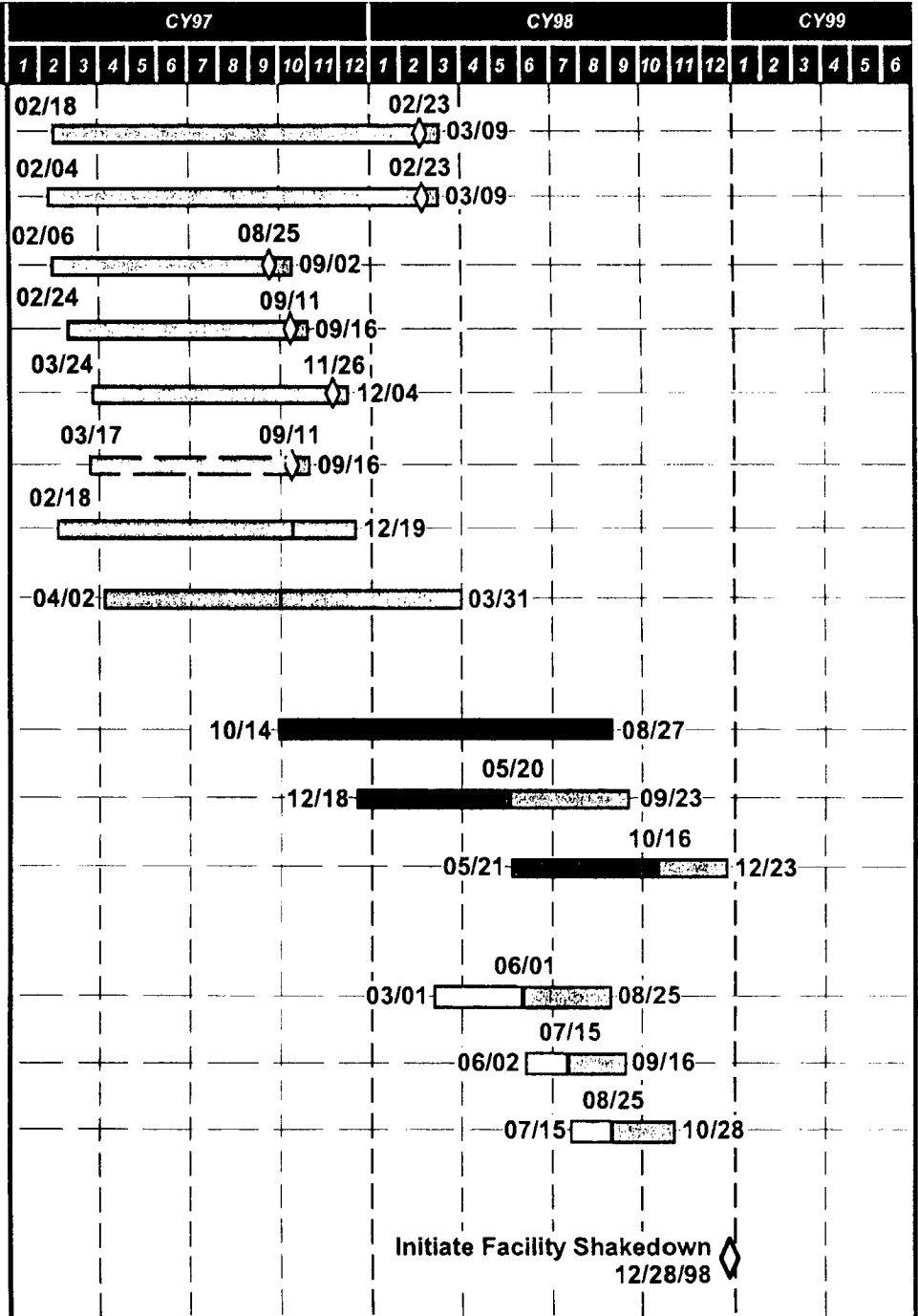
ID	Task Name	Duration	Start	Finish	1998			1999				2000				2001				
					Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
1	VE Completion	194d	3/11/98	12/8/98																
11	BT Bake Out	374d	9/15/98	2/21/00																
21	LHO Detector Infrastructure	80w	7/27/98	2/4/00																
22	LHO 2km IFO	525d	7/27/98	7/28/00																
23	Install SEI, SUS, COS, ISC	51w	7/27/98	7/16/99																
24	PSL	10w	7/27/98	10/2/98																
25	Input Optics	30w	7/27/98	2/19/99																
26	PR Near Michelson	30w	2/22/99	9/17/99																
27	PR Michelson w/ FP Arms	45w	9/20/99	7/28/00																
28	LHO 4km IFO	593d	7/1/98	10/6/00																
29	Start Detector Integration	0d	7/1/98	7/1/98																
30	Install SEI, SUS, COS, ISC	60w	7/1/98	8/24/99																
31	PSL	8w	5/10/99	7/2/99																
32	Input Optics	15w	8/16/99	11/26/99																
33	PR Near Michelson	15w	11/29/99	3/10/00																
34	PR Michelson w/ FP Arms	30w	3/13/00	10/6/00																
35	LLO Detector Infrastructure	80w	12/8/98	6/19/00																
36	LLO 4km IFO	443d	1/6/99	9/15/00																
37	Install SEI, SUS, COS, ISC	39w	1/6/99	10/5/99																
38	PSL	8w	3/15/99	5/7/99																
39	Input Optics	25w	2/22/99	8/13/99																
40	PR Near Michelson	19w	8/16/99	12/24/99																
41	PR Michelson w/ FP Arms	38w	12/27/99	9/15/00																
42	Detector Commissioned (h<10^-20)	0d	10/6/00	10/6/00																
43	Observatory Operations & improve	56w	10/9/00	11/2/01																
44	Design Sensitivity (h<10^-21)	0d	11/2/01	11/2/01																

Livingston - Remaining work ctd

- Complete casting and installation of remaining beam tube enclosures
- Install chip and seal course on all service roads
- Install final asphalt course around corner station

FACILITIES CONSTRUCTION & EQUIPMENT INSTALLATION SUMMARY SCHEDULE

LIGO - LIVINGSTON SITE



LIGO Livingston Staff

- **Present Staff on-site:**

	<i>Construction Responsibility</i>	<i>Operations Position</i>
- Gerry Stapfer	Construction Mgr	Site Manager
- Cecil Franklin	Beam Tube/Vac. Ept. Install.	Vac. Specialist
- Jonathan Kern	Core Optics Support	Operations Spec.
- Rich Riesen	Beam Tube Installation	Operations Ldr.
- Allen Sibley	Vac. Eqpt./Civil	Vac. Engr.
- Kerry Stiff	BT Bake out	Operations Spec.
- Juilien Svoboda	Electr. Engr	Operations Spec.
- Bonnie Wascomb	Site Admin.	Site Admin.

- **Planned additions this year:**

- Mark Coles	Observatory Head
- TBD	Senior Scientist
- TBD	Scientist

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Commissioning and Operations Staff

Position:

- Observatory Head
- Site Manager
- Site Administrator
- 5 scientific staff
- Vacuum Engineer
- Electrical Engineer
- Software Engineer
- Vacuum Specialist
- 10 Operations Specialists

22 Total Staff + Visitors

Staff Growth Profile

Staff Headcount on Operations Budget			
	1998	1999	2000
Scientist	0.75	3	4
Engineering/Technical	0.25	10	16
Site Admin	0.25	0.5	1
Total Operations FTE's	1.25	13.5	21
Total Construction FTE's	6	2	0

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Staff Issues

- Carefully hire a technical staff with the right expertise for installation that can then be part of the operating staff.
- Scientific staff appointments:
 - 3 term appointments of 3 years each
 - 2 Senior Scientists - open ended appointments
 - Seek opportunities for joint appointments with collaborating institutions to leverage budget, so that 1 FTE could be 2 people
- Encourage long term visitors:
 - for example, Peter Saulson will spend 2000 assisting with commissioning and initial operation.

Goals

- Strengthen infrastructure at site and effectively utilize local resources:
 - Example: Networking, T1 line installed with from LSU.
 - Shop support to supplement capabilities at site.
 - Shared expertise, for example with LSU storage ring support staff.
- Create an intellectual community at LIGO Livingston rather than an outpost:
 - Interaction with local universities via collaborative work, joint and adjunct appointments, student research on-site, joint seminars, etc.
 - Opportunities to conduct research at the site (FNAL model of 50% service time, 50% research time)

Educational Outreach

- Livingston Parish (pop. ~82,000) is among the poorest regions within Louisiana
 - 52% of all families identified low income
 - 33% high school drop out rate, vs 22% statewide
 - <9% of the adult population are college graduates
- Opportunity for LIGO to create interest in science and have a positive impact on education in the community and region (population > 1 million)

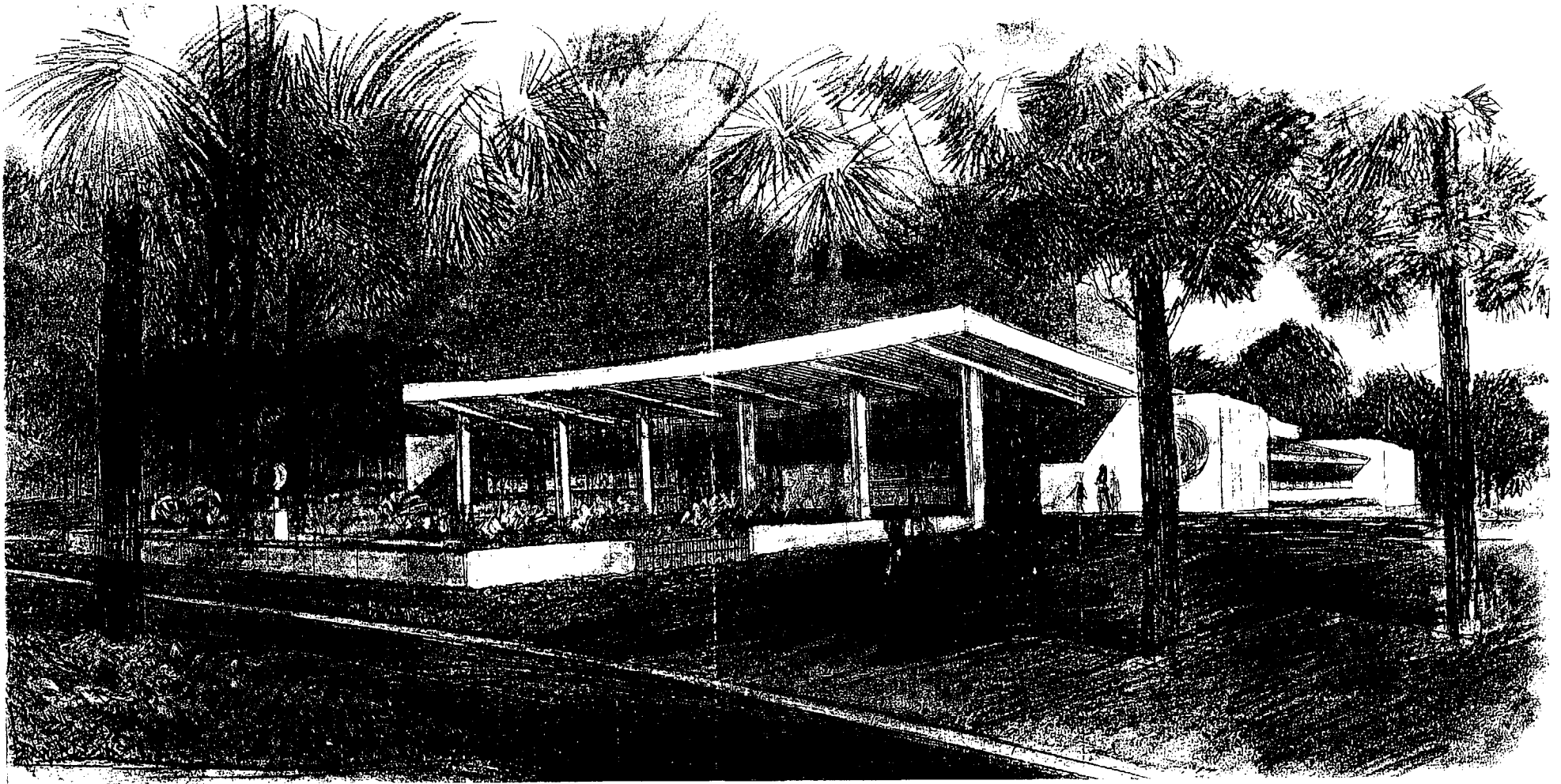
Opportunities

- We are pursuing opportunities to partner with local organizations to promote educational outreach.
- Possibility to build an educational outreach center adjacent to the LIGO site.
 - Promising discussions with Southeastern Louisiana University (Hammond) regarding establishment of a center using state funds:
 - Host student and public visits - provide hands-on exhibits to teach basic science using LIGO as the drawing card
 - Provide opportunities for teacher in-service through summer internships and partnerships with LIGO staff to create curricula that can be taken back to the home classroom
 - Participate in school-to-work programs that allow students in post HS vocational training programs to develop job skills (vacuum technology, network administration, etc.)
 - Congressman Baker wants to locate a small optical observatory near the site as part of an outreach program (extension of LSU/BREC Highland Rd. Observatory program)

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LIGO OUTREACH CENTER

Livingston, Louisiana

Summary

- **Main concerns:**
 - Staffing
 - Develop an outstanding staff
 - Staffing is very lean, so every position counts
 - Schedule:
 - Many installation activities sequential: Hanford 2K, Livingston 4K, Hanford 4K
 - Need to be mindful of accumulating schedule slip
 - Want to develop LIGO Livingston as a strong participant in LIGO, not a weak effort.
 - Need to evaluate appropriate level of infrastructure necessary at the Livingston site: shops, computational facilities, lab space, etc.

Summary (ctd)

- **Unique Opportunities:**
 - Develop working relationships with the universities in the region, pursue joint appointments, collaborative work, outreach partnerships.
 - Unique physics - stochastic background measurement via correlations with LSU bar detector.
 - Capitalize on receptive community and a strong interest in partnering to have a positive impact on the public school system.