

# **AURA-OBSERVATORY & NOAO-SOUTH FACILITIES**

## **SITE REPORT**

YEAR-END RESULTS for FISCAL YEAR 2011  
and  
PROJECTED BUDGET for FISCAL YEAR 2012



## **I. Introduction:**

During FY-2011 AURA Administration and NOAO-South Facilities continued to operate as an integrated Administration and Facilities (A&F) department. This report reflects that organizational structure. Steps have recently been taken to establish a centralized AURA Administration which is functionally separate from the NOAO-South Facilities department. Future reporting, starting with FY-2012, will reflect that change. For all A&F activities in Chile, direct accounting is in Chilean Pesos (CLP) so correspondingly all monetary figure in this report are in CLP (unless noted otherwise. In addition to the general financial and infrastructure status information, this report also includes in Section VI an accounting of the network infrastructure progress and plans, as that element of NOAO-South infrastructure is currently in active development.

The FY-2011 A&F budget was based primarily on the previous year's budget as well as other long-term experiential data regarding of costs for goods and services in Chile. An adjustment for inflation was made, along with corrective adjustments to the specific fee schedule. The result was an FY-2011 budget of \$1,712,101,178 CLP, 5.5% higher than that of the previous year. That budget proved to be a slight (2.4%) underestimate of actual costs, as total A&F expenses in 2011 were \$1,753,867,107. This deficit was covered, however, by higher than anticipated revenues from Per-Use fees, largely for meals and hotel rooms on Tololo and Pachón. The total FY-2011 revenues from Per-Use Fees, Share Fees, and Census Fees was \$1,507,636,774 which when applied to the total expenses of \$1,444,009,918 resulted in a surplus of \$63,626,856. Of that total surplus, \$16,306,931 came from Mountain-based (Tololo and Pachón) cost centers and \$47,319,925 came from La Serena-based cost centers.

A significant contributor to the higher than anticipated expenses in FY-2011 was the occurrence of three abnormally severe winter storms. In the sectors serving the higher altitude Cerro Pachón site, this resulted in costs 24% over-budget for road maintenance and 85% over-budget for power-line maintenance and repair. Damage to power lines during the storms also increased costs for power generation to more than twice the anticipated budget.

The A&F budget for FY-2012 is \$1,784,238,951, an increase of 4.2% over the FY-2011 budget. This is essentially an inflationary adjustment consistent with the Chilean inflationary index (IPC) for that period. Within that overall adjustment each of the specific budget line items has been adjusted to better reflect its historical and anticipated cost. Section IV of this report contains additional detail on the FY-2012 budget.

## **II. FY-2011 Milestones and Events:**

In FY-2011 the following milestones were achieved and significant events occurred affecting the NOAO-S facilities.

- Execution of a contract for construction of a new dining facility at the Pachón hotel. By the end of FY-2011 this construction was approximately 90% complete.
- Support of a contract by the LSST Project for initial excavation work at the El Peñón site of the future LSST summit facility. That contract, completed in FY-2011, included leveling the peaks for the main telescope and calibration telescope as well as improving access roads and building platforms.
- Emergency repair of roads, power lines, water lines and buildings following winter storms in June and July. On three occasions it was necessary to evacuate the Mountain premises and halt activities due to impassable roads, interruption of utilities and unsafe conditions.
- Replacement of the main water pump at the well in the Quebrada San Carlos, which provides potable water to Tololo and by truck from there to Pachón
- Initiation of a project to replace the main piping from the well in Quebrada San Carlos to Tololo.
- Construction and remodeling work at the Blanco telescope, including at the main observing room, computer room, and visitor center. By the end of FY-2011 this work was 90% complete.
- Completion of a cooling system upgrade at the Blanco telescope in support of the DECam project.

- Completion of safety improvements to the Blanco entry area.
- Completion of construction of the telescope enclosures and site infrastructure for the Las Cumbres Observatory Global Telescope Network on Tololo.
- Construction of the telescope enclosures for the PROMPT Project on Tololo.
- Removal of the gas pump in La Serena and upgrade of the tank and pump on Cerro Tololo in compliance with environmental regulations.
- La Serena Recinto LP gas tank improvements /certification and upgrade of gas valves throughout the system.
- Initiation of a remodeling project to convert a section of the existing La Serena library into a staff interaction space and a meeting/dining area.
- Responsive measures necessitated by a six-month closure of the Raul Bitran gate to the La Serena Recinto due to a strike by University of La Serena students. The access road from this gate crosses University property, exposing AURA to unpredictable and increasingly extended periods of restricted access and advocating for the development of a new access point in the near future.

### III. FY-2011 Financial Results:

#### A. Mountain Cost Centers:

Mountain cost centers include all of the expenses for operation and maintenance of the facilities on Tololo and Pachón. These are divided into two different categories for tracking and recovery of costs:

**Share-fee accounts** cover the support services that cannot be directly tracked and billed to the individual programs, and therefore are instead billed as comprehensive fees calculated separately for Pachón and Tololo. This includes safety/security services, road and power line maintenance, power generation and communications networking services. For Share-fee services in FY-2011 there was a total expenditure of \$366,131,238 versus a budgeted amount of \$341,349,342. This overrun was mainly attributable to higher-than-normal costs incurred, particularly in the Pachón sector, to recover from the severe winter storms.

**Per-use accounts** cover the expenses that can be directly tracked and charged based on consumption by the programs. These include dining services (per meal), dormitory use (per room-night), janitorial services (per hour) and water supply (per cubic meter). For Mountain Per-use services in FY-2011 the total expenditure was \$522,131,238 versus a budgeted amount of \$500,782,229. Total revenues from billing for these mountain-based Per-use services was \$573,353,143.

#### B. La Serena Cost Centers:

La Serena cost centers include all of the expenses for operation and maintenance of the base facilities on the AURA Recinto in La Serena. Similar to the Mountain, these are divided into two different categories for tracking and recovery of costs.

**Census-fee accounts**, based proportionately on the number of employees each program has in Chile, cover services that cannot effectively be tracked directly based on use by the programs. This includes safety services, security (Recinto guard) service, warehouse/inventory services, communications maintenance, personnel and payroll. For Census-fee services in FY-2011 there was a total expenditure of \$343,748,963 which was very close to the budgeted amount of \$344,276,215.

**Per-use accounts** cover the base facility expenses that can be tracked directly based on consumption. These include water and sewer (per cubic meter), vehicle and building maintenance (per hour), transportation (per trip) and hotel (per room-night). For La Serena Per-use services in FY-2011 the total expenditure was \$211,998,359 which was very close to the budgeted amount of \$209,565,252. Total revenues from billing for these La Serena-based Per-use services was \$ 231,416,496.

### C. General and Administrative (G&A) Expenses:

This category covers general support, administration and accounting expenses related to facilities maintenance and operation in Chile. For the most part these are payroll expenses for personnel carrying out management, administration, accounting, purchasing, reception and IT support. The total FY-2011 G&A expenditure was \$309,857,189 versus a total budget of \$316,128,140.

Table 1 details the actual FY-2011 expenses in all cost centers and their assigned budgets for FY-2011 & FY-2012.

**Table 1 – A&F Expenses and Budget Comparative Breakdown**

Description of Service	FY2011 Budget (CLP)	FY2011 Actual (CLP)	FY2012 Budget (CLP)
<b>MOUNTAIN SHARE FEE ACCOUNTS</b>			
Security	23,105,759	21.316.002	23.364.188
Road Maint. Gate-Quisco	54,094,526	57.487.362	49.062.618
Emergency Medical Services	144,549,994	143.940.396	153.552.545
Power Line Maint. Gate-San Carlos	47,339,504	46.321.640	37.445.672
Communicat.-Tel. Radio Maint.	24,997,937	27.538.341	28.384.236
Visitor Center	12,592,066	9.928.653	11.616.364
Power Generation	9,812,400	23.644.317	8.215.508
Road Maint. Tololo-Quisco	4,272,419	2.447.213	4.926.568
Power Line Maint.San Carlos-Tololo	3,060,472	3.148.851	9.417.100
Road Maint. Pachon-Quisco	3,372,640	4.173.367	16.943.600
Power Line Maint. San Carlos C. Pachon	14,151,624	26.185.096	25.183.729
<b>TOTAL for MOUNTAIN SHARE FEE ACCOUNTS</b>	<b>341,349,342</b>	<b>366.131.238</b>	<b>368.112.127</b>
<b>MOUNTAIN PER USE ACCOUNTS</b>			
Janitorial Mntn Services per use	31,698,310	35.834.140	40.136.326
Kitchen Operations Tololo	166,378,624	177.489.142	183.266.540
Kitchen Operations Pachon	152,528,328	183.138.257	177.557.500
Dormitory Operations Tololo	74,960,200	64.221.267	71.706.843
Dormitory Operations Pachon	50,922,627	37.063.285	54.608.829
Water Supply	24,294,140	24.385.267	16.563.397
<b>TOTAL for MOUNTAIN PER USE ACCOUNTS</b>	<b>500,782,229</b>	<b>522.131.358</b>	<b>543.839.434</b>
<b>LA SERENA CENSUS FEE ACCOUNTS</b>			
Safety	32,947,383	30.290.466	25.033.625
Warehouse/Shipping & Receiving	82,569,287	78.606.111	85.229.064
Inventory Control	11,376,517	15.120.909	10.608.420
Communication & Telephone Maint.	15,473,899	10.004.535	10.559.632
Security La Serena	55,559,143	55.519.761	59.558.337
Personnel and Payroll	146,349,986	154.207.181	123.583.396
<b>TOTAL for LA SERENA CENSUS FEE ACCOUNTS</b>	<b>344,276,215</b>	<b>343.748.963</b>	<b>314.572.474</b>
<b>LA SERENA PER USE ACCOUNTS</b>			
Water & Sewer Per Use	20,713,360	10.915.070	20.123.683
Garage & Transport	54,995,001	45.259.798	53.658.079
Maintenance Group Per Use	44,232,689	61.910.923	51.707.444
Shuttle Carry All Transportation	27,457,757	33.050.460	32.083.789
Janitorial Services La Serena	35,275,925	29.240.149	31.246.501
Motel	26,890,520	31.621.959	30.708.542
<b>TOTAL for LA SERENA PER USE ACCOUNTS</b>	<b>209,565,252</b>	<b>211.998.359</b>	<b>219.528.038</b>
<b>G&amp;A Expenses</b>			

Gen. Administration	188,336,119	184,541,362	213,040,302
Budget & Accounting	127,792,021	125,315,827	125,146,576
<b>Total G&amp;A Expenses</b>	<b>316,128,140</b>	<b>309,857,189</b>	<b>338,186,878</b>
<b>Grand Total</b>	<b>1,712,101,178</b>	<b>1,753,867,107</b>	<b>1,784,238,951</b>

An important part of the yearly budgeting process is the estimation of the Quantities of Per-use services (Qs) that are expected to be billed to the user programs in the coming year. The estimation of Qs is based on historical usage tracking as well as consumption predictions solicited directly from the programs.

Table 2 shows the budgeted and actual Qs for FY-2011 and the percentage that they were over or under the estimated (budgeted) amount.

**Table 2 - A&F Q's of Consumption per Service Table**

<b>Mountain Per -Use Service</b>	<b>Quantity (Q)</b>	<b>FY-2011 Budget Qs</b>	<b>FY-2011 Actual Qs</b>	<b>% Over/Under Budget</b>
Janitorial Mntn Services	hours	3,015	3,133	4%
Kitchen Operations Tololo	meals	17,013	18,435	8%
Kitchen Operations Pachon	meals	15,587	18,264	17%
Dormitory Operations Tololo	room-nights	5,965	7,364	23%
Dormitory Operations Pachon	room-nights	2,096	2,857	36%
Water Supply	cubic meters	2,942	2,990	2%
Water Transportation	cubic meters	1,242	738	-41%
<b>La Serena Per-Use Service</b>	<b>Quantity (Q)</b>	<b>FY-2011 Budget Qs</b>	<b>FY-2011 Actual Qs</b>	<b>% Over/Under Budget</b>
Water & Sewer Per Use	cubic meters	4,421	4,513	2%
Garage & Transport	hours	1,180	1,764	49%
Maintenance Group Per Use	hours	3,895	3,266	-16%
Shuttle Carry All Transportation	one-way trips	774	912	18%
Janitorial Services La Serena	hours	2,899	2,789	-4%
La Serena Recinto Hotel	room-nights	1,000	1,250	25%

A summary of the FY-2011 financial results by category of expense is shown in the Table 3, indicating that an overall surplus of \$63,626,856 was generated. That surplus will be utilized for infrastructure improvements that benefit all the served programs, at the discretion of the AURA-O and NOAO-South Director.

**Table 3 Summary Financial Report by Type of Account**

<b>NOAO-S A&amp;F Financial Report – FY-2011</b>				
<b>TYPE OF ACCOUNT (FEE)</b>	<b>REVENUES</b>	<b>EXPENSES</b>	<b>(SURPLUS)/DEFICIT BY TYPE OF FEE</b>	<b>% contribution to the total surplus</b>
SHARE FEE ACCOUNTS	(331.216.385)	366.131.238	34.914.853	-55%
CENSUS FEE ACCOUNTS	(371.650.751)	343.748.964	(27.901.787)	44%
MOUNTAIN PER USE ACCOUNTS	(573.353.143)	522.131.358	(51.221.784)	81%
LA SERENA PER USE ACCOUNTS	(231.416.496)	211.998.358	(19.418.138)	31%
<b>Totals for the FY-2011</b>	<b>(1.507.636.774)</b>	<b>1.444.009.918</b>	<b>(63.626.856)</b>	<b>100%</b>

#### IV. FY-2012 Budget:

The FY-2012 budget, following the precedent of previous years, has been developed with a zero-sum approach, wherein the established fee structure for each cost center is adjusted so as to generate revenues as close as possible to the expenses that are anticipated to be incurred for the given support activities during the coming fiscal year. Services are assumed to be provided under normal circumstances, however, the fees are set at level to cover a limited amount of additional unpredictable expenses such as emergencies and extreme weather. Any major unforeseen expenses will necessarily be billed separately and proportionately to the programs utilizing the affected services.

As in prior years, the development of this budget involved a detailed analysis of expenses by cost center and object code using: data from historical accounting records, input from the programs regarding their anticipated service requirements, and other relevant statistical information. An inflation of 4.2 % was assumed, consistent with the Chilean IPC for the period. For incorporation of the NOAO-South budget into the comprehensive NOAO budget (USD-based) a peso/dollar conversion rate of 475 CLP/USD was utilized. It was assumed that operational activities will be resourced and performed in a similar manner to FY-2011 and previous years.

Based on the FY-2012 budget projections presented previously in Table 1, fees and rates for services were developed as described in Table 4 below. These rates are developed following the criteria of Full Cost Recovery as mandated by the United States Office of Management and Budget.

**Table 4 – FY-2012 A&F Fees and Rates for Services:**

Type of Fee	FY-2011	FY-2012	Variation
<b>2-m Share Fees:</b>			
Tololo	77,208,938	80,297,296	4%
Pachón	78,211,644	83,686,459	7%
<b>Census Fees:</b>			
La Serena Based employee/year	579,850	579,850	0%
All Places All staff Census employee/year	1,692,311	1,692,311	0%
PPC Census (non AURA Sites)	656,334	656,334	0%
<b>Per-use Rates (Mountain):</b>			
Water – Tololo	6,791	6,791	0%
Water - Delivered to Pachon	11,437	11,437	0%
Tololo Meals	9,821	10,312	5%
Tololo Lodging	13,260	13,260	0%
Pachón Meals	9,821	10,312	5%
Pachón Lodging	39,377	39,377	0%
Janitorial Services	10,209	10,209	0%
<b>Per-use Rates (La Serena):</b>			
Shuttle Transportation Carry All	30,000	33,000	10%
Garage	11,941	5,971	-50%

Maintenance Group	13,851	8,311	-60%
Janitorial Services	12,280	12,280	0%
Motel	28,000	28,840	3%
Water and Sewage	890	926	4%

Other primary considerations reflected in this budget and schedule of fees and rates are:

- A 4.2% increase in total expenses over the FY-2011 budget, which is commensurate with the IPC inflation index for that period. This increase includes:
  - An increase of 3.8% in payroll expenses, which comprise 64% of the total budget.
  - The payroll expenses include \$40,000,000 in anticipated severance payments (*finiquitos*) due to employment terminations.
  - An increase of 4.0% in non-payroll expenses, which comprise 36% of the budget
  - An increment of \$7,400,000 in investments for warehouse and garage equipment which are capitalized separately and not included in the general non-payroll expenses.
- The Pachón Share Fee was increased by 7% and the Tololo Share Fee was increased 4%. The difference in these adjustments is to correct for the historically higher costs of providing vehicular access and utility services to the higher-altitude Pachón site.
- Census Fees for La Serena facilities was held flat with no increase. This lack of an inflationary adjustment, effectively a net budget reduction, is to correct for the relatively high surplus experienced in La Serena centers in FY-2010
- Mountain Per-use Fees, except meals, were held flat with no increase to adjust for the surplus experienced in these centers in FY-2010.
- Cost for meals is driven strongly by inflation, and as such a 5% increase was applied to those rates.
- Garage and maintenance Per-use fees were reduced by 50% and 60% respectively. The majority of the cost for those services has been transferred to the Census-fee account as they are considered to be more effectively tracked and assessed comprehensively.

**V. Facility and Infrastructure Projects to be developed in FY-2012:**

A number of NOAO-South Facilities projects will be completed, initiated or studied for feasibility and cost during FY-2012. These projects are described below in Table 5. The funding source for each project is also identified.

The top section of Table 5 is a status accounting for all projects which were funded through the American Recovery and Reinvestment Act (ARRA) along with the amount in U.S. dollars (USD) allocated for each project. The second section of Table 5 lists the projects that will be funded or potentially funded by NOAO-South Operations accounts. The financial feasibility of these projects is largely dependent on the potential surplus generated from revenues that is not fully expended on regular maintenance and operations activities or otherwise required for response to emergencies or other unanticipated urgent repairs.

The third section of Table 5 describes projects involving NOAO Facilities & Operations support that are in development or planning but are funded by other sources. These include support of projects for tenant telescopes – funded by other institutions, and projects that are capitalized by the users of specific services – such as maintenance projects for the rented housing in the La Serena Recinto.

Project	Funding Source	Status
<b>American Recovery and Reinvestment Act</b>		

Tololo/Pachón Water System Renovation	ARRA (\$400K USD)	Work in progress, Completion estimated June 2012
Dormitories Repair and Renovation	ARRA (\$480K USD)	Bids Received, Final evaluation pending Project completion estimated Dec. 2012
New Pachón Dining Facility – Construction	ARRA (\$450K USD)	Complete
Cerro Tololo UPS Upgrade	ARRA (\$67K USD)	Complete
Pachón Dorm Emergency Generator	ARRA (\$60K USD)	Complete
Mountain Meeting Rooms Renovation	ARRA (\$60K USD)	Refurbishment complete, installation of presentation equipment pending
Mountain Road Guardrail Installation (approved use of funds instead to replace Motor /Generator Frequency Converter)	ARRA (\$150K USD)	Complete
La Serena Machine Shop Modification & Refurbishment	ARRA (\$46K USD)	Project being evaluated and re-scoped
La Serena OTDR Unit Replacement	ARRA (\$25.5K USD)	Complete
La Serena Compound Water System Renovation	ARRA (\$100K USD)	In Progress
La Serena Meeting Rooms Renovation	ARRA (\$40K USD)	In progress
La Serena Compound Security Fencing Repair	ARRA (\$40K USD)	In progress
Vehicle Fleet Renewal	ARRA (\$188K USD)	Complete
<b>NOAO South Operations Accounts</b>		
New Pachón dining facility – Outfitting and start-up	NOAO-S Operations	Minor work items being completed. First use anticipated in April 2012
New Pachón dining facility – Outfitting and start-up	NOAO-S Operations	Minor work items being completed. First use anticipated in April 2012
Conversion of old Pachón dining facility to Mountain paramedics/nurses office	NOAO-S Operations	Evaluation/scoping in progress, requires purchase of building from Gemini
Interior finishes and outfitting of multi-purpose area in Pachón dining facility	NOAO-S Operations	Evaluation/scoping in progress
Complete construction and outfitting of a networking facility on Pachón	NOAO-S Operations	Building construction complete, final outfitting to be coordinated
Extend landfill on Tololo	NOAO-S Operations	In progress
Replace Tololo water chlorination system	NOAO-S Operations	Preparatory maintenance in progress – replacement project pending
Repair of La Serena office facility roofs	NOAO-S Operations	Bids received, evaluation of available funding in progress



Repainting of La Serena office, shop and warehouse buildings	NOAO-S Operations	Cost estimates received, evaluation of available funding in progress
<b>Projects with Other Funding Sources</b>		
Support of installation of PROMPT telescope on Tololo	PROMPT Project	Buildings constructed, pending installation of telescopes in 2012
Support of installation of LCOGTN Telescopes on Tololo	LCOGTN Project	Buildings constructed, pending installation of telescopes in 2012
Support of facility construction for KMTN Telescope on Tololo	KASI (Korean Astronomical Agency)	Bidding in progress, construction of facility complete by Dec 2012
Various, repairs, improvements and refurbishments to La Serena houses	Housing rent account	Scheduled throughout the year based on maintenance needs and housing turnover
Improvements to swimming pool facility	Pool user fee account	Work scope in study
Repair to La Serena athletic court	TBD – contributions/fees from potential users	Work scope in study
Construction and implementation of a new gate into the La Serena Recinto	TBD	Potential locations being studied for feasibility. Communications with the University of La Serena and the Municipal authorities in progress

Status and performance of networking infrastructure for AURA Observatory and NOAO South as well as improvement projects related to networking connectivity are described in Section VI.

## VI. AURA/NOAO-S NETWORKING REPORT

### Introduction

The AURA network in Chile comprises of the following sections that are maintained by NOAO-South Computer Infrastructure Services South (CISS):

- Connectivity from La Serena to Cerro Tololo and Cerro Pachon which is served by a common backbone utilizing Microwave radios to produce two STM-1s or 310 Megabits per second (Mbs)
- Connectivity from La Serena to Santiago which is operated by REUNA, the Chilean Education and Research Network that provides 50Mbs. This is sub-divided into 40Mbs for research traffic and 10Mbs for commodity.
- Connectivity from Santiago to Miami which is operated by LAUREN and AMLIGHT who are partially funded by NSF grants and provide 50Mbs
- From Miami onwards is provided by research networks in the U.S. such as I-2, NLR, ESNET, Atlantic Wave, Pacific Wave, CENIC and others

### Status at End of FY-2011

FY-2011 was expected to be the year when our last mile and international bandwidth increased from 50 Mbs per to 1000 Mbs (1 Gigabit per second), but unexpected events have caused this to be delayed. The Chilean national segment which is provided by REUNA did in fact provide the increased expected bandwidth on account of their partnership with ESO, and the provision of a 10 Gigabit Lambda from Santiago to Antofagasta. AURA contributed

to this link by providing DWDM ADM equipment in La Serena and Copiapo that was a front-end payment for REUNA to build up their infrastructure. This provided AURA a dramatic increase to the GigE level between La Serena and Santiago with no increase in our annual payments. AURA changed the gateway router to a switch that would allow us to configure V-lan circuits and take advantage of a protected ring from the La Serena Recinto to Santiago.

The root cause of the above mentioned delay was the CLARA circuit from Santiago to Sao Paolo. There have been serious delays interning networking equipment into Chile, Argentina and Brazil, which to date have not been resolved. To mitigate the impact of this setback on our users, AMPATH agreed to increase our international bandwidth to 155 Mbs at no additional charge.

During FY-2011 the AURA backbone from La Serena to the summits of Cerro Tololo and Cerro Pachon have undergone some maintenance and minor problems on one of the radio links that has been resolved with spares. None of this caused downtime on the circuit but only a decrease in capacity that did not adversely affect user traffic.

### Detailed Performance

The graph in Figure 1 shows the uptime for the circuit from the La Serena gateway router to AMPATH in Miami. It is indicative of the performance of our two main providers: REUNA in Chile and LAUREN/AMPATH from Santiago to Miami, Florida. The main cause of downtime was work carried out in Brazil, however, our uptime was in fact better than indicated in the graph as we were switched to the CLARA South American network during those outages.

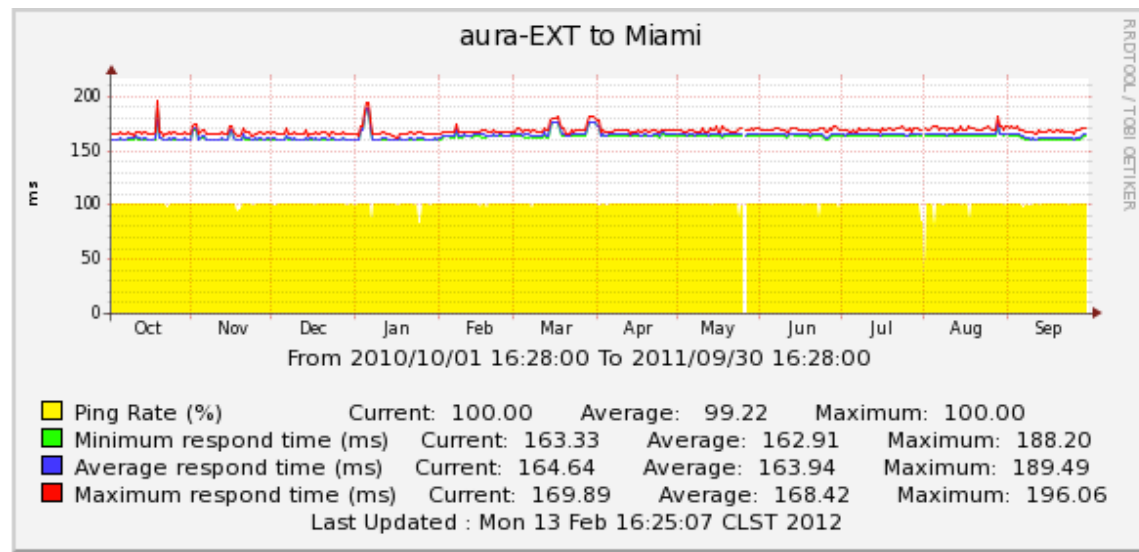
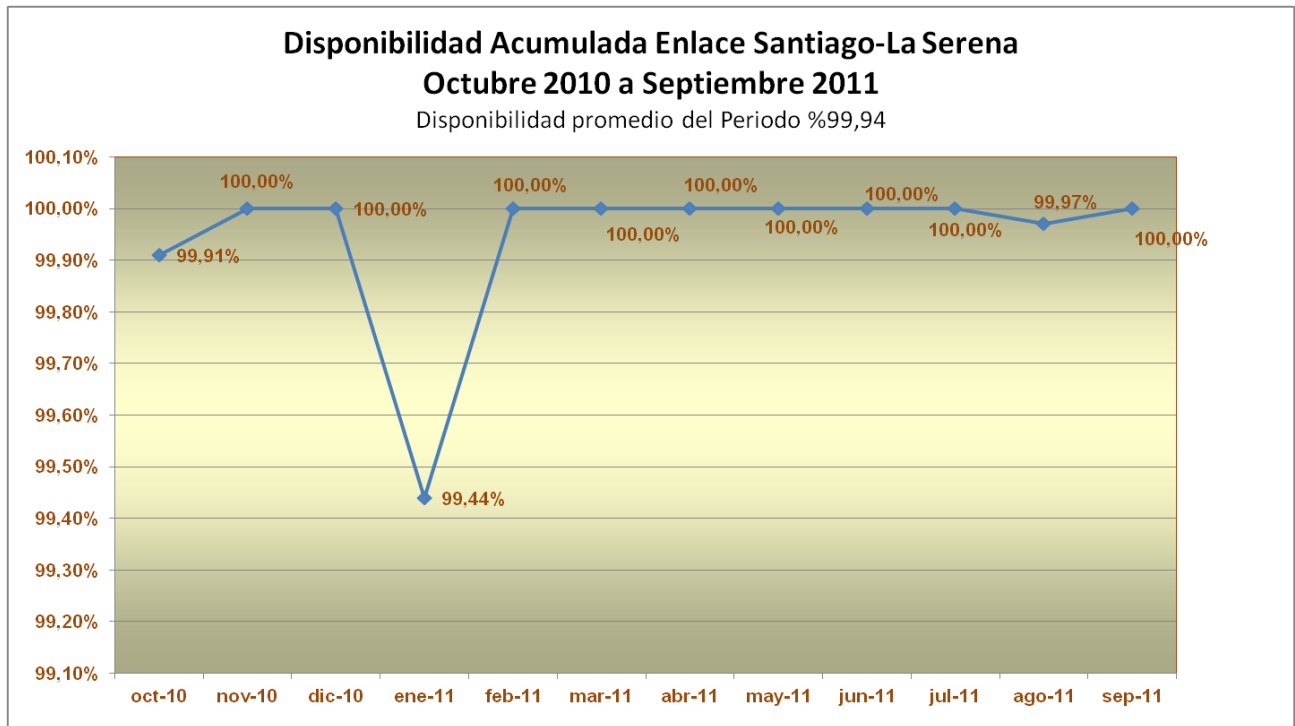


Figure 1

The graphic and chart in Figure 2, provided by REUNA, show the connection performance from La Serena to Santiago during FY-2011.

Date	Start Time	End Time	Duration (hh:mm:ss)	Motive
22/10 /2010	05:46	06:29	00:43:30	Power cut in Univ. Of La Serena
24/01/2011	12:25	16:35	04:10:00	Fiber cut of Movistar between Los Vilos y La Ligua.
30/08/2011	11:44	11:58	00:14:24	Fiber Optic problems in La Serena



**Figure 2**

Figure 3 below essentially shows the uptime for the AURA backbone to the summits. Once again our uptime was better than shown as the downtimes indicated here are for one individual machine and not the entire network.

### Host State Breakdowns:

State	Type / Reason	Time	% Total Time	% Known Time
UP	Unscheduled	364d 1h 20m 32s	99.741%	99.741%
	Scheduled	0d 0h 0m 0s	0.000%	0.000%
	<b>Total</b>	<b>364d 1h 20m 32s</b>	<b>99.741%</b>	<b>99.741%</b>
DOWN	Unscheduled	0d 0h 19m 10s	0.004%	0.004%
	Scheduled	0d 0h 0m 0s	0.000%	0.000%
	<b>Total</b>	<b>0d 0h 19m 10s</b>	<b>0.004%</b>	<b>0.004%</b>
UNREACHABLE	Unscheduled	0d 22h 20m 18s	0.255%	0.255%
	Scheduled	0d 0h 0m 0s	0.000%	0.000%
	<b>Total</b>	<b>0d 22h 20m 18s</b>	<b>0.255%</b>	<b>0.255%</b>
Undetermined	Nagios Not Running	0d 0h 0m 0s	0.000%	
	Insufficient Data	0d 0h 0m 0s	0.000%	
	<b>Total</b>	<b>0d 0h 0m 0s</b>	<b>0.000%</b>	
All	<b>Total</b>	<b>365d 0h 0m 0s</b>	<b>100.000%</b>	<b>100.000%</b>

**Figure 3**

## **Networking Milestones for FY-2012**

- In the event that the GigE circuit does not become available we expect to be provided with an interim 622Mbs circuit transiting the west coast of South America via Panama to Miami.
- Participate in establishing the GigE circuit with AMPATH.
- Formalize MOU agreements with several institutions that will help to fund the increase in cost from Santiago to Miami.
- Complete the construction and outfitting of a building to enclose all the shared equipment, microwaves, routers, switches, currently on Cerro Pachón. This is also where the fiber end node for the connectivity to LSST will be installed.
- Investigate upgrade of our current microwave equipment to 624Mbs.
- Work with SOAR partners in Brazil to provide a direct end-to-end circuit to Sao Paolo on the order of 45Mbs.
- Install a switch upgrade in at the SOAR summit facility to prepare for the upcoming fiber link between base and summits.