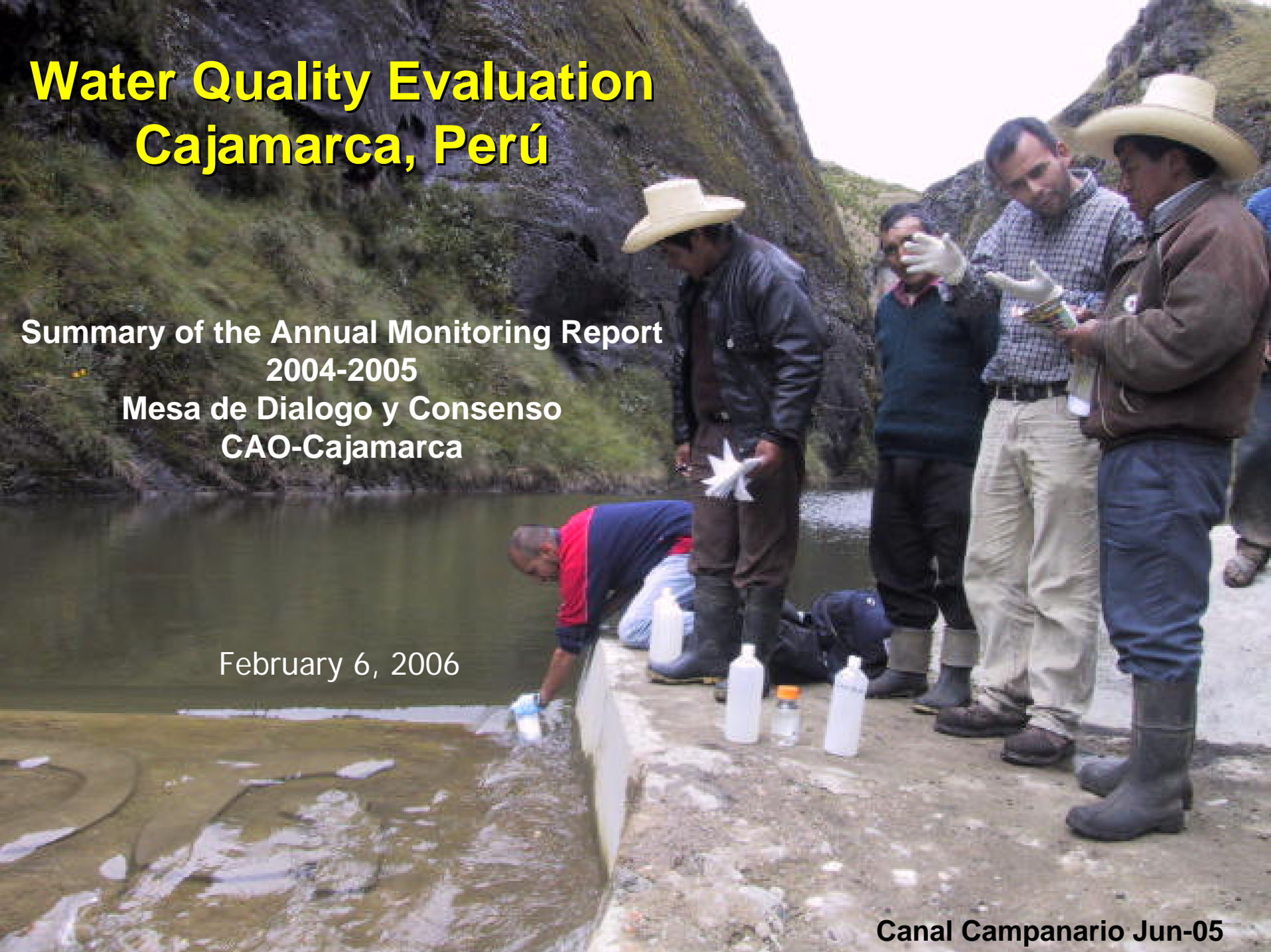


# Water Quality Evaluation Cajamarca, Perú

Summary of the Annual Monitoring Report  
2004-2005  
Mesa de Dialogo y Consenso  
CAO-Cajamarca

February 6, 2006



## Why Participatory Monitoring?

- Recommendation of original Mesa study, November 2003.
  - ✓ Implemented by the Mesa and CAO in 2004-2005.



## Participatory Monitoring

- Other Institutions have implemented participatory programs since 2003.
  - With assistance from Minera Yanacocha

- ✓ Canal Users
  - ✓ COMOCA Sur
  - ✓ COMOCA Este
- ✓ SEDACAJ (municipal water)
- ✓ Communities
  - ✓ Cooperativa Granja Porcón
  - ✓ Centro Poblado Yanacancha
  - ✓ Centro Poblado Llaucán



## Mesa Workshop on Participatory Monitoring - 2004

Approximately 50 institutions participated

- Define technical objectives
  - Participate with other institutions to leverage results.
  - Evaluate data quality.
  - Create a database of all monitoring results.
  - Interpretation.



## Mesa Workshop on Participatory Monitoring

- Define community objectives
  - Encourage participation.
  - Generate confidence in results.
  - Communicate results to urban and rural people.
  - Encourage institutions to take responsibility.



## Participatory Monitoring Program Structure - Staff

- CAO
  - Funding, oversight
- Mesa
  - Coordination with institutions and community
- Technical team
  - Field and laboratory work, database, interpretation



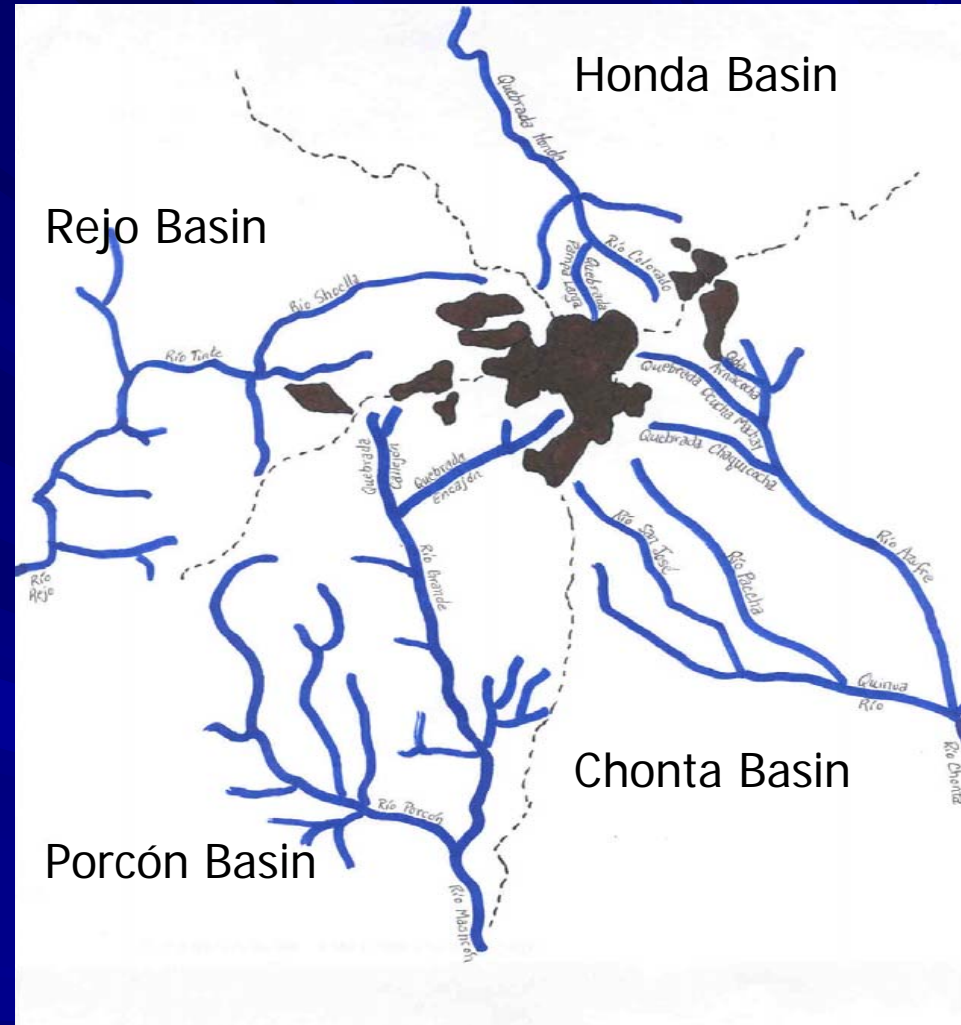
## Participatory Monitoring Program Structure - Volunteers

- Veedores from Mesa institutions
  - Observe field work
  - Coordinate with community
- Technical Commission
  - Review work of technical team
  - Public communication



## Monitoring Locations - 108 total

- PORCON BASIN: 51 points
- REJO BASIN: 12 points
- HONDA BASIN: 16 points
- CHONTA BASIN: 18 points
- POTABLE WATER IN CAJAMARCA:
  - ✓ 2 treatment plant discharge points
  - ✓ 3 points in the network
- POINTS IN THE MINE
  - ✓ 4 groundwater wells
  - ✓ 2 discharge points





# Monitoring Frequency

- Monthly:
  - ✓COMOCA Sur
  - ✓COMOCA Este
  - ✓SEDACAJ
  - ✓Cooperativa Granja Porcón
  - ✓Centro Poblado Yanacancha
  - ✓Centro Poblado Llaucán
- Quarterly:
  - ✓Minera Yanacocha
  - ✓COMOCA Este
  - ✓Centro Poblado Yanacancha



# Monitoring Analyses

- Field Parameters
- Total metals
- Fecal coliform bacteria
- Total Dissolved Solids (TDS)
- Total Suspended Solids (TSS)
- WAD cyanide



## Samples Collected between July 2004 and August 2005

- 1044 samples collected by institutions
- 120 duplicates collected by Mesa



## Duplicate samples used to

- Evaluate integrity and quality of samples collected by participating institutions
  - Credibility and confidence in larger data set
- More rapid results for critical points



## Quality Control

- The Mesa and the participating institutions collect samples at the same location and time.

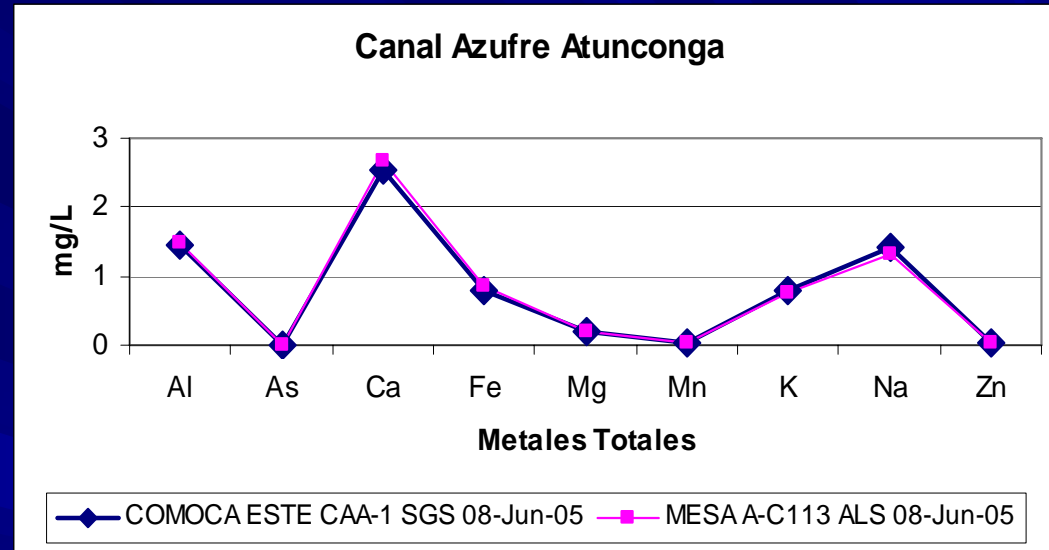


- Allows technical team to check whether:

- The samples are altered during handling and shipping.
- The samples are altered at the laboratory.
- Laboratory performance.

# Quality Control

Institución	COMOCA ESTE		MESA		
Cuenca	Chonta		Chonta		
Nombre	Canal Azufre Atunconga		Canal Azufre Atunconga		
Muestra_ID	CAA-1		A-C113-CE		
Laboratorio	SGS		ALS		
fecha	08-Jun-05		08-Jun-05		PDR
Aluminio	1.46		1.474		1%
Arsénico	0.009		0.009		0%
Cadmio	0.001	U	0.001	U	na
Calcio	2.55		2.66		4%
Cobre	0.001	U	0.003		na
Cromo	0.001	U	0.002	U	na
Hierro	0.78		0.843		8%
Magnesio	0.2		0.21		5%
Manganeso	0.03		0.0291		3%
Mercurio	0.001	U	0.0004	U	na
Níquel	0.001	U	0.004	U	na
Plata	0.001	U	0.001	U	na
Plomo	0.006		0.01	U	na
Potasio	0.78		0.76		3%
Selenio	0.005	U	0.002	U	na
Sodio	1.422		1.33		6%
Talio	0.005	U	0.01	U	na
Zinc	0.028		0.026		7%



The criterion for acceptance of duplicate samples for total metals is relative percent difference less than 35%

Source: USEPA 1994

## Quality Control - Results

- The results are acceptable for the evaluation.
- We have confidence in the monitoring conducted by the participating institutions.



## Data Evaluation

- The technical team evaluates data on a monthly basis in comparison to:
  - National standards
  - International guidelines
- The technical commission meets several times per month to review the data interpretation and communicate results

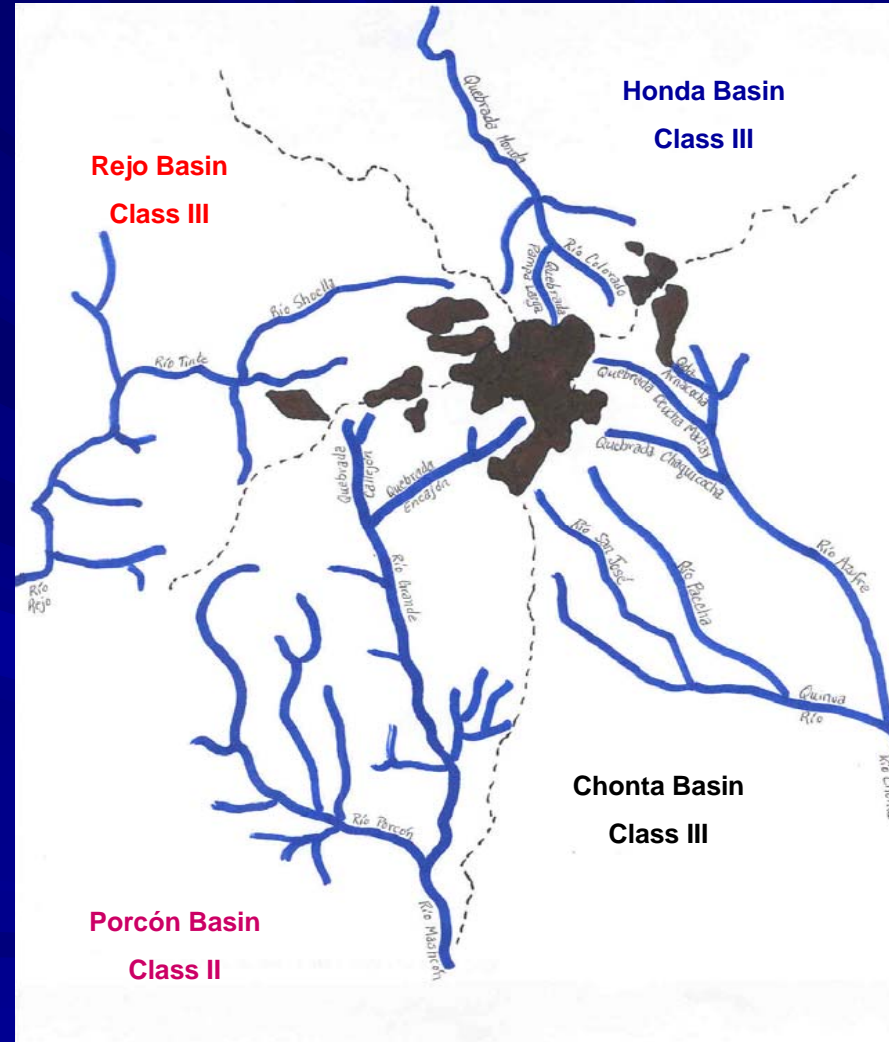




# Data Evaluation - National Standards

Evaluation according to the Ley General de Aguas D.L. 17752

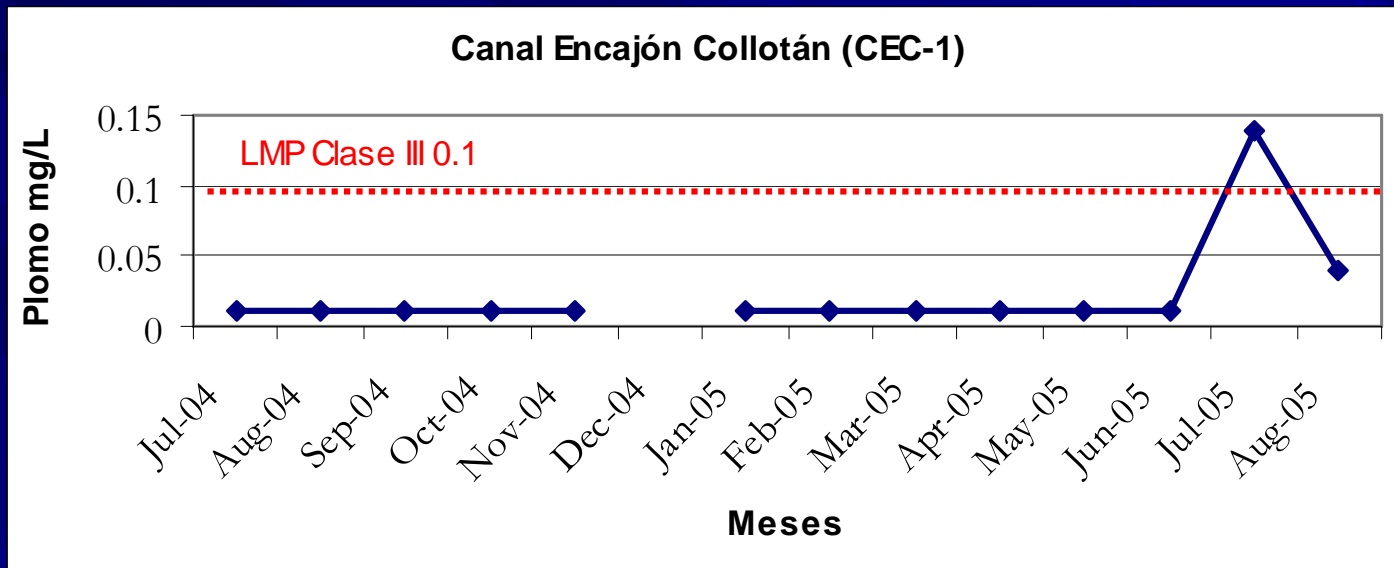
- **CLASS II:**
  - ✓ Porcón Basin (rivers and streams)
  
- **CLASS III:**
  - ✓ Rejo, Chonta, Honda Basins (rivers and streams)
  
  - ✓ Porcón, Rejo, Chonta, Honda Basins (canals)
  
- **SUNASS:**
  - ✓ Potable water in the city of Cajamarca



# Results

## Porcón Basin

- In general, all the rivers and streams comply with Class II standards
- One of the 15 canals does not comply with Class III standards.

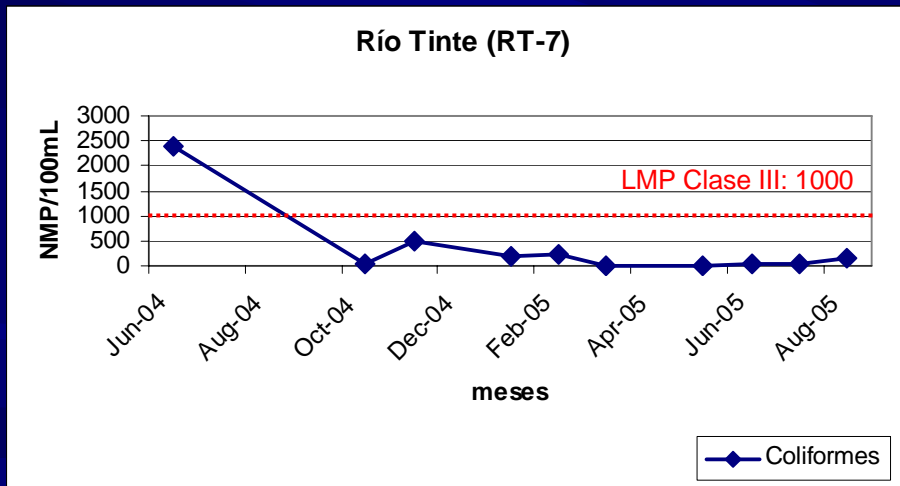
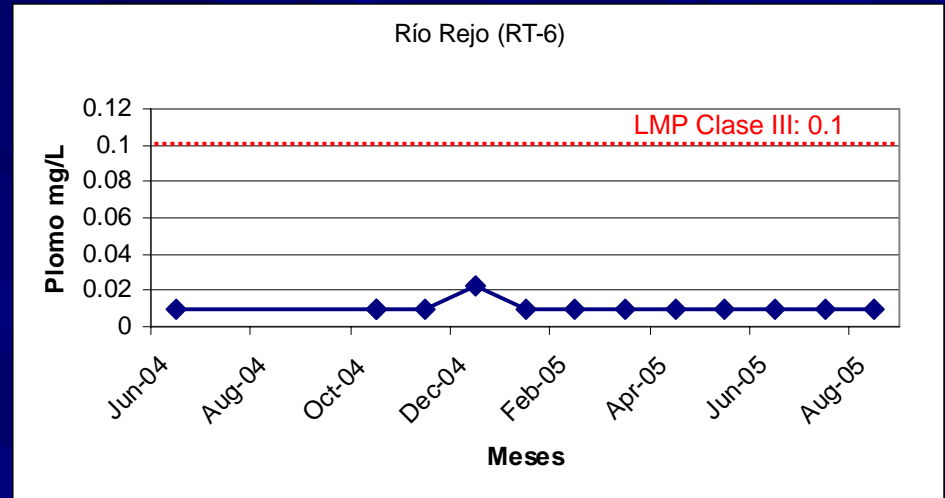


- Potable water for the City of Cajamarca complies with the standards of SUNASS.

# Results

## Rejo Basin

- In general, all the rivers, streams and canals comply with Class III standards.

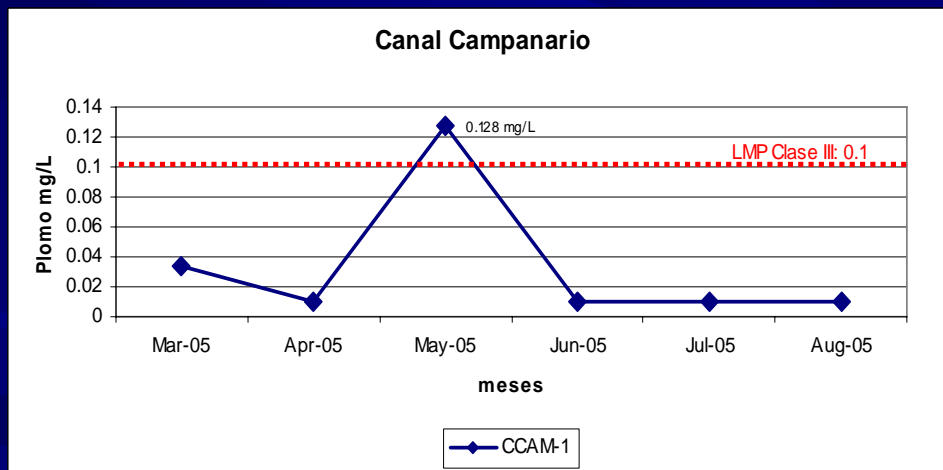
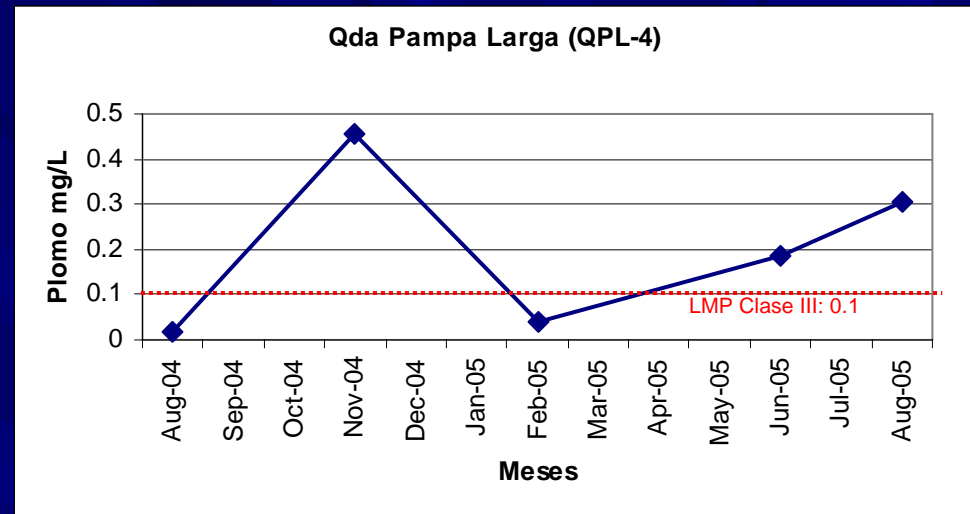


- Fecal coliform bacteria from humans and animals at some locations and times did not comply with Class III standards.

# Results

## Honda Basin

- In general, all the rivers and streams comply with Class III standards with the exception of Quebrada Pampa Larga.

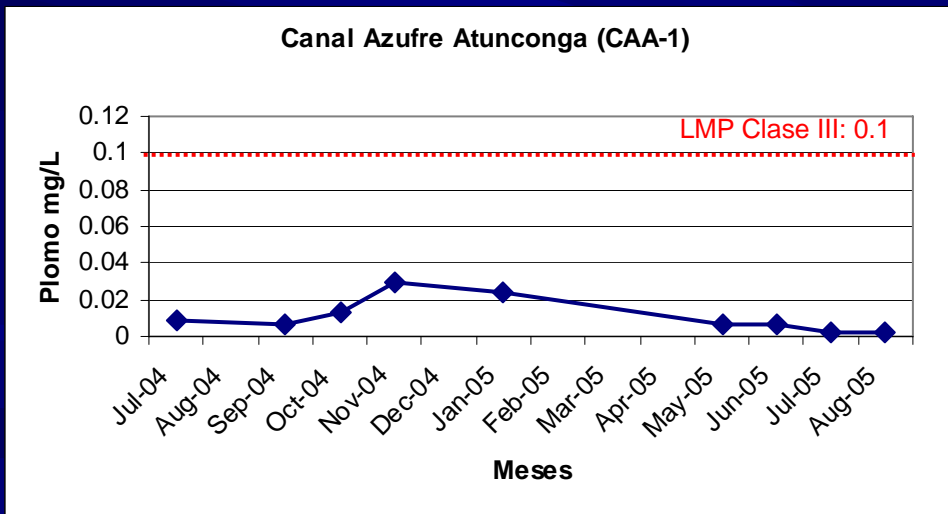
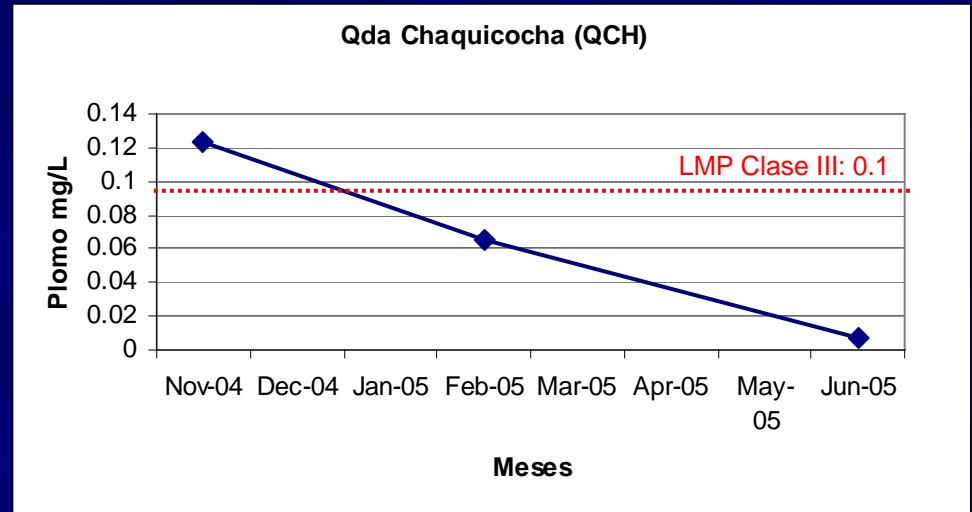


- Water quality in one of three canals does not comply with Class III standards.

# Results

## Chonta Basin

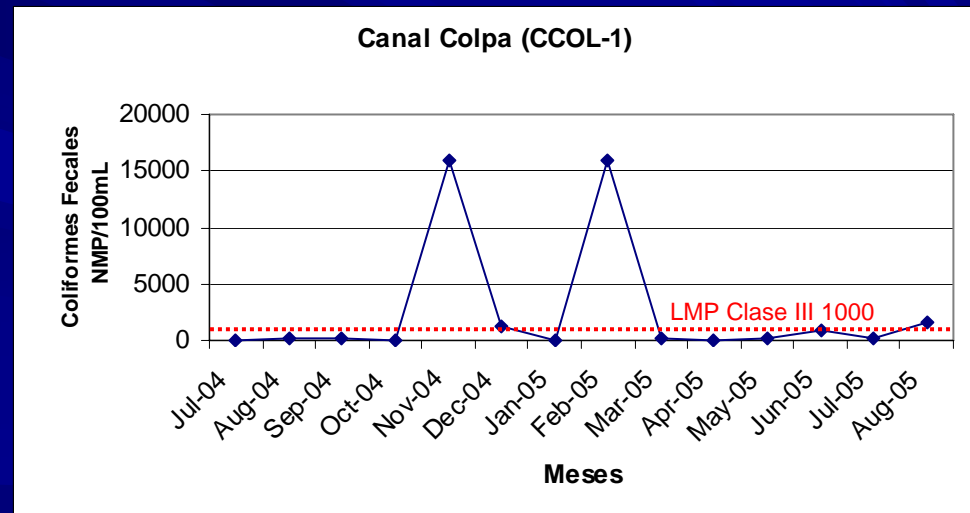
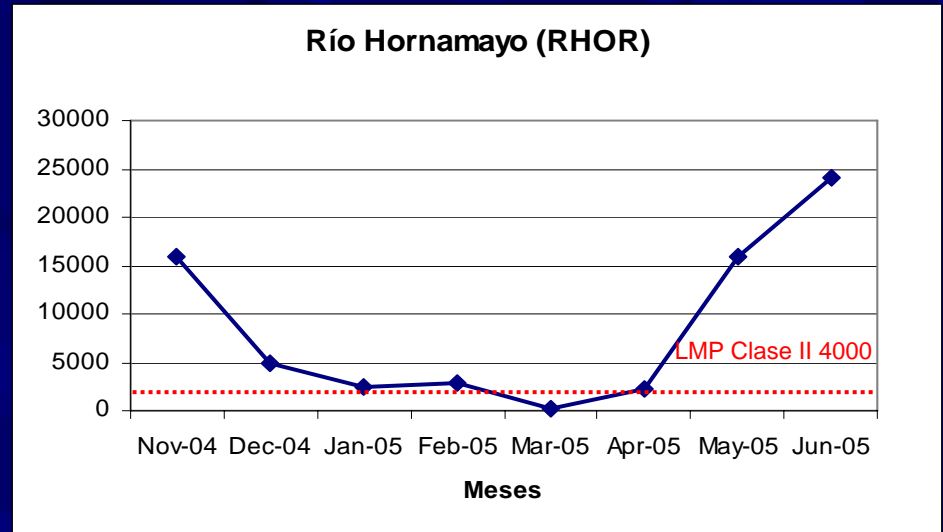
- In general, all the rivers and streams comply with Class III standards.



- All canals evaluated comply with Class III standards.

# Results

- Fecal coliform bacteria resulting from human and animal waste frequently exceed Class II and III standards and are a concern in all four basins.



## Comparison to International guidelines

- Human consumption (WHO, USEPA)
- Livestock (State of Nevada - USA, Environment Canada)
- Irrigation (FAO, State of Nevada - USA, Environment Canada)

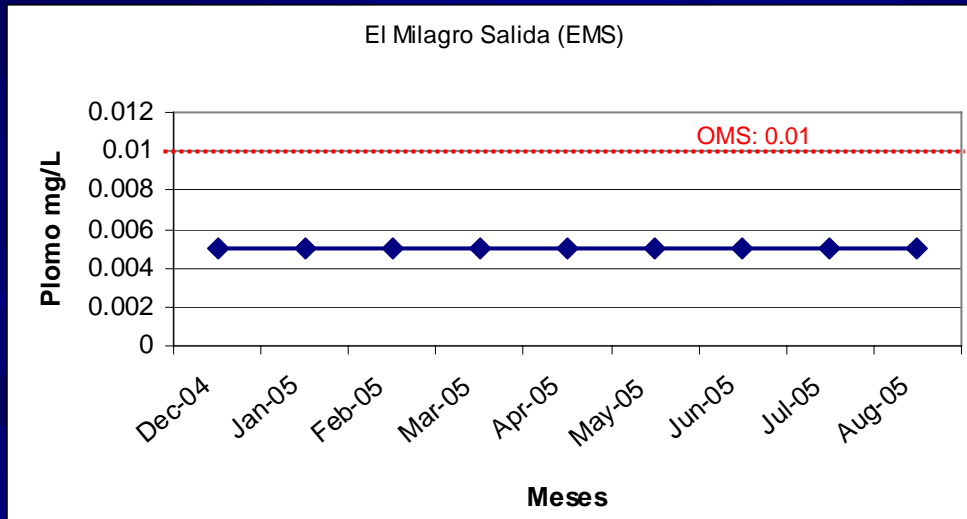
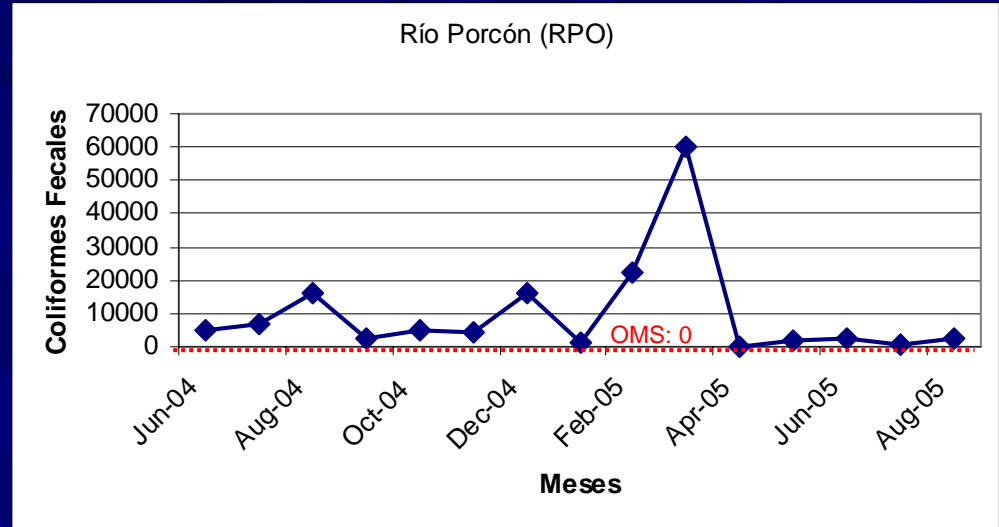


# Comparison to International guidelines

## Porcón Basin

### Human Consumption

- In general, rivers, streams and canals comply with international guidelines (except for fecal coliform bacteria).



- Water that exits the treatment plant for the City of Cajamarca complies with international guidelines.

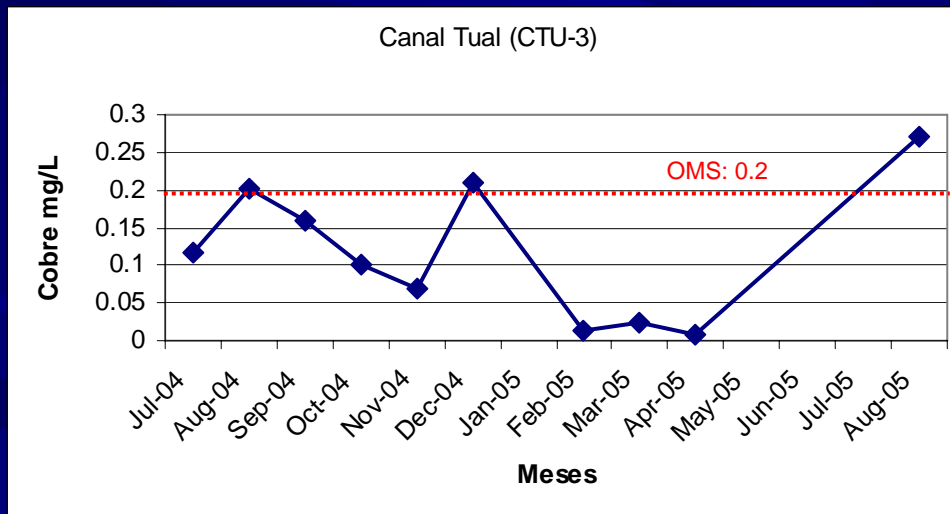
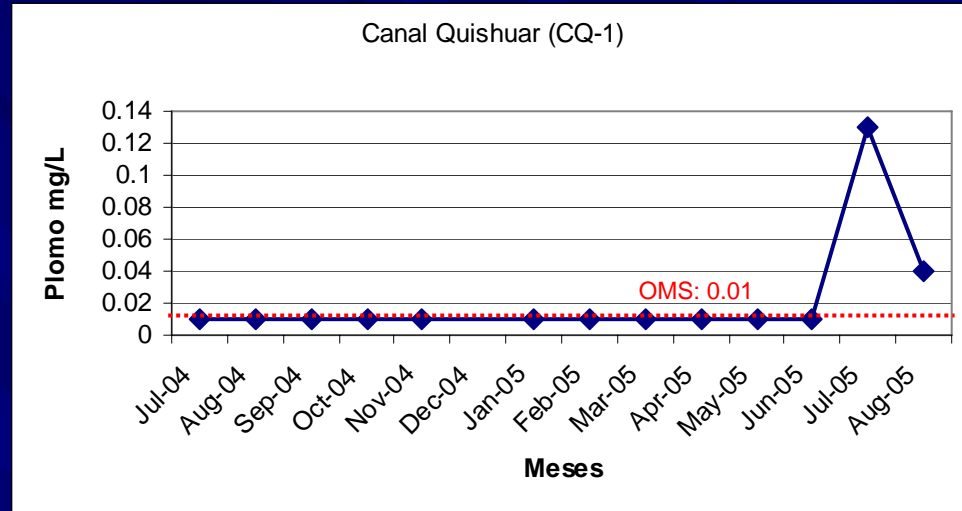


# Comparison to International guidelines

## Porcón Basin

### Livestock

- In general, rivers and streams comply with international guidelines
- Two of 15 canals do not comply with international guidelines for arsenic and lead (Encajón Collotán and Quishuar)



### Irrigation

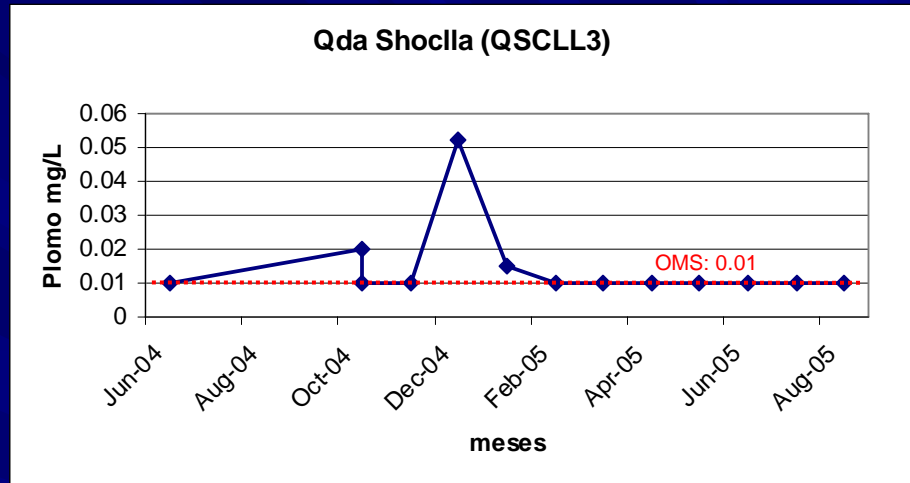
- In general, rivers and streams comply with international guidelines
- Four of 15 canals do not comply with international guidelines for copper and manganese (Tual, Encajón Collotán, Quishuar and Llagamarca)

# Comparison to International guidelines

## Rejo Basin

### *Human Consumption*

- In general, rivers and streams comply with international guidelines, except for lead (Qda Shoclla) and fecal coliform bacteria.



### *Livestock*

- In general, rivers, streams and canals comply with international guidelines.

### *Irrigation*

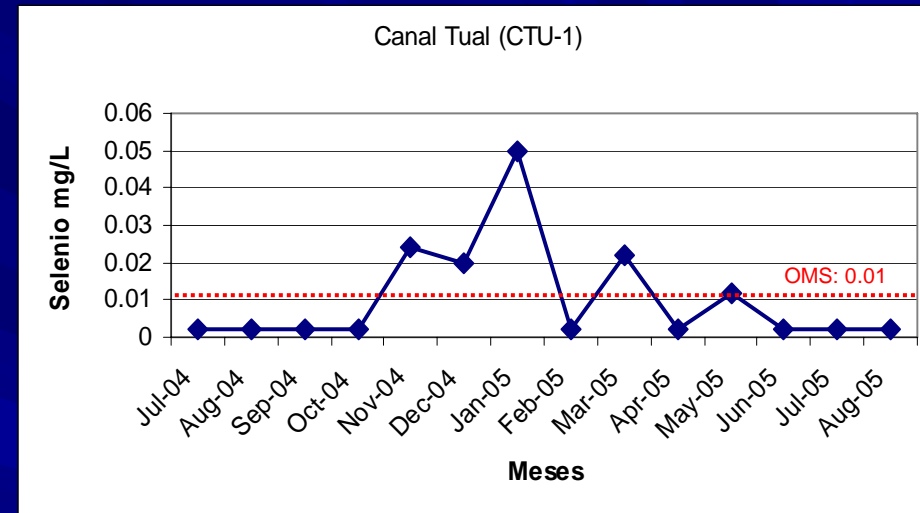
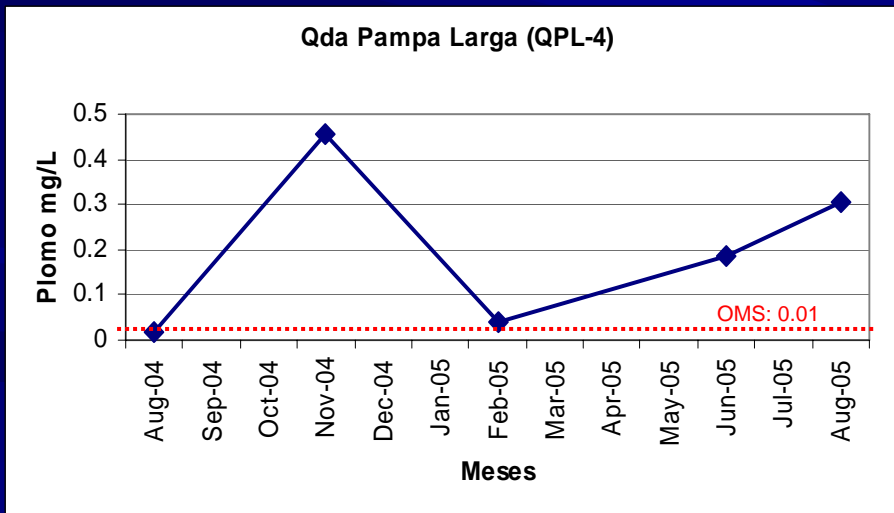
- In general, rivers, streams and canals comply with international guidelines.

# Comparison to International guidelines

## Honda Basin

### Human Consumption

- In general, rivers, streams and canals comply with international guidelines, except for lead (Qda Pampa Larga) and selenium (Canal Tual)

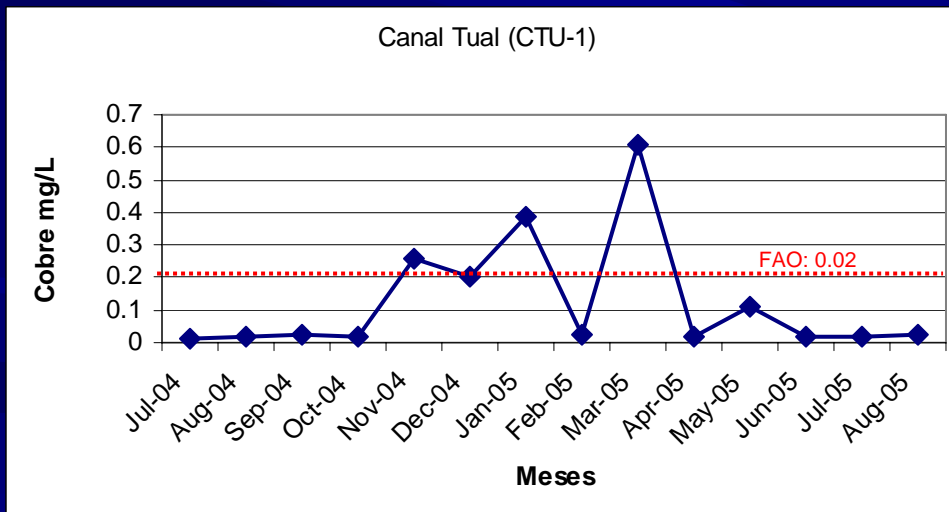
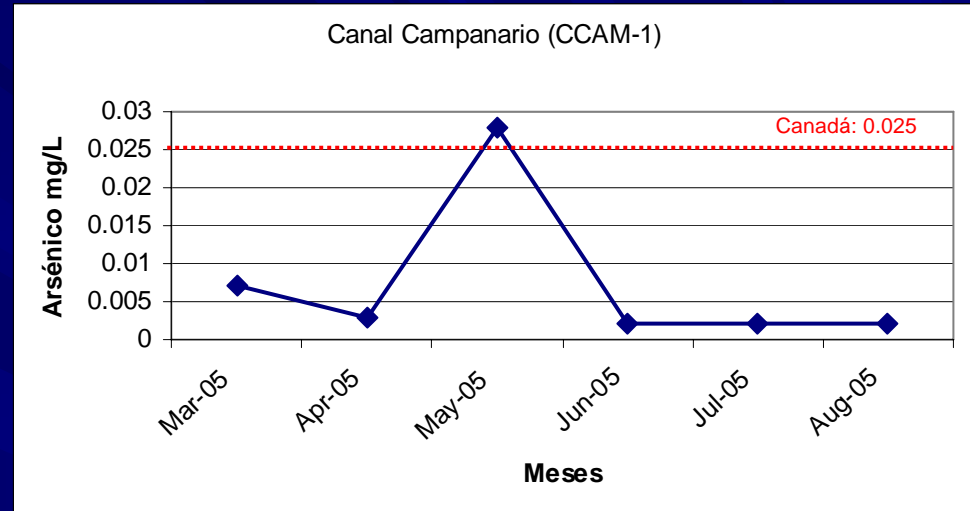


# Comparison to International guidelines

## Honda Basin

### Livestock

- In general, rivers, streams and canals comply with international guidelines.
- One of three canals does not comply with international guidelines for arsenic and lead (Campanario).



### Irrigation

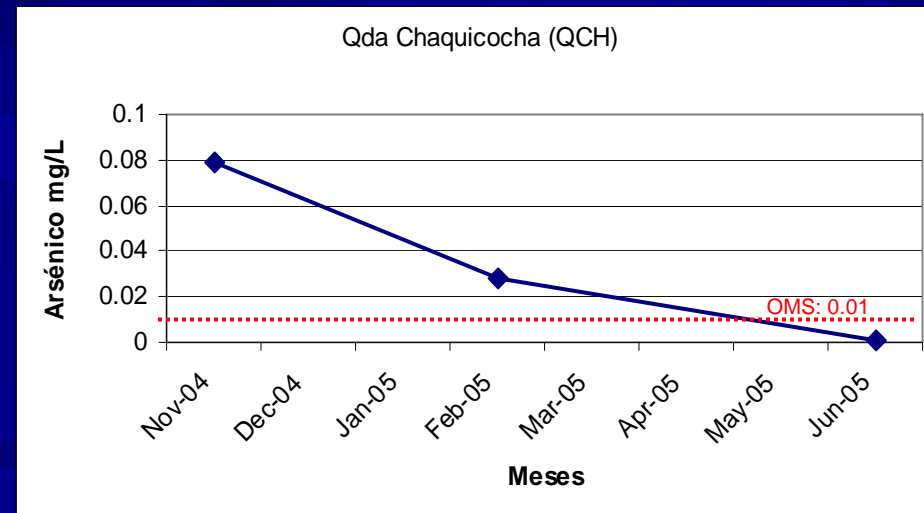
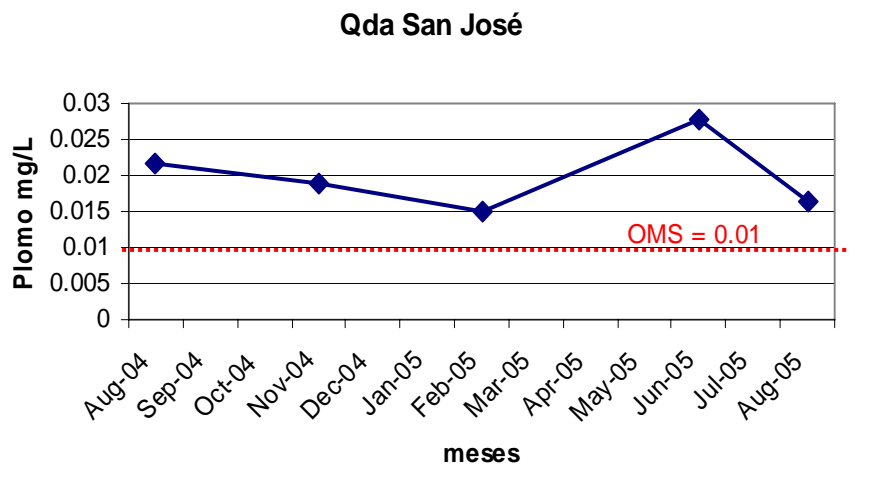
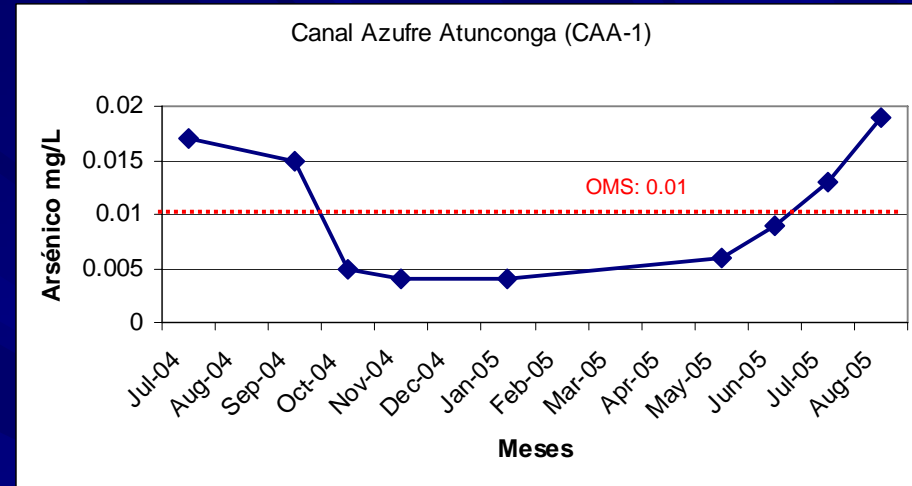
- In general, rivers, streams and canals comply with international guidelines, except for total dissolved solids.
- Two of three canals do not comply with international guidelines for Copper and Selenium (Tual), and Arsenic and Manganese (Campanario).

# Comparison to International guidelines

## Chonta Basin

### Human Consumption

- In general, rivers, streams and canals comply with international guidelines, except for lead and arsenic (Canal Azufre Atunconga), lead (Qda San José) and arsenic and lead (Qda Chaquicocha).

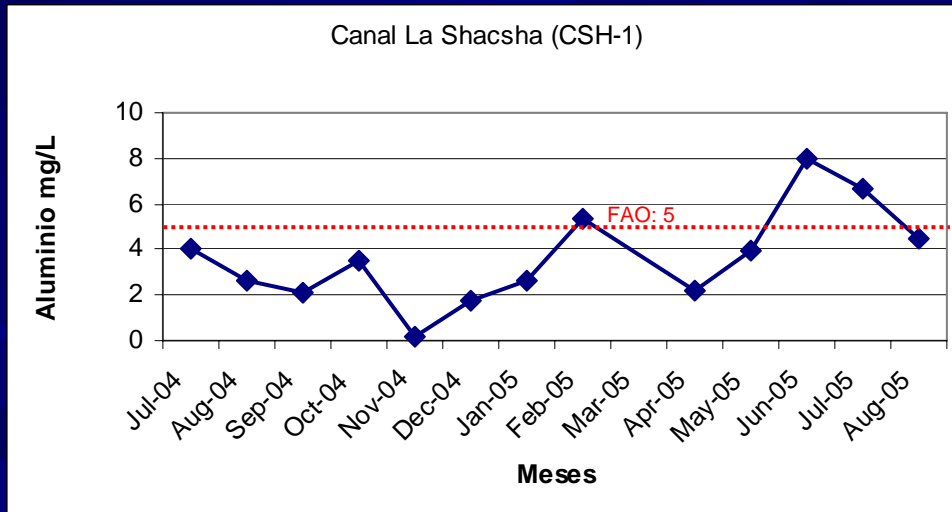


# Comparison to International guidelines

## Chonta Basin

### *Livestock*

- In general, rivers, streams and canals comply with international guidelines.



### *Irrigation*

- In general, rivers, streams and canals comply with international guidelines.
- One of ten canals does not comply with international guidelines for aluminum and manganese (La Shacsha)

# Recommendations

## *Human Consumption*

- Determine the source of drinking water for rural people.
- For those that do not have access to a potable water source, evaluate the quality of the source.
- Locate alternative sources if necessary.



## Recommendations

### *Agriculture (Livestock and Irrigation)*

- Continue to evaluate water quality in:
  - ✓ The upper part of Oda Honda, Honda Basin.
  - ✓ The upper part of Río Grande, Porcon Basin.
  - ✓ The upper part of Río San José and Canal La Shacsha, Chonta Basin.
- Determine whether manganese is a concern for irrigation.





## Recommendations

### *For Future Water Monitoring*

- Develop better procedures for measuring flow rates.
- Standardize procedures for data quality control.
- Encourage the active participation of veedores.
- Improve coordination and cooperation between institutions that monitor water.
- Evaluate trends in the data month by month.
- Improve the communication of information to the public.



## Communication and Outreach for this Report

- General Forums
  - Rural officials
  - Canal users
  - Urban institutions
- Government institutions
  - Cajamarca Regional Government
  - INIA/Agriculture Ministry
  - DESA (regional health ministry)
  - DREM (regional Ministry of Energy and Mines)
  - CAR (environment commission of regional government)
  - Mesa de Dialogo of the Municipality of Cajamarca
  - CONAM (Environment)



# Communication and Outreach for this Report

- Water user/canal associations
  - Tual
  - Shacsha Uñigán
  - Tomacucho
  - Cocán
  - Jequetepeque
- Villages (Centros Poblados)
  - Tumbaden
  - Huacataz
  - Yanacancha Baja



# Communication and Outreach for this Report

- NGOs
  - Defensoria del Pueblo
  - International aid organizations
    - ITDG
    - Solidaridad Internaciónál
    - CEDEPAS
  - CARE Perú
- Educational institutions
  - UPAGU (private university)
  - Engineering college
- Press



## Acknowledgements

- CAO
- Participating institutions
- Mesa staff in Cajamarca
- Technical team
  - Elizabeth Morales
  - Carlo Calderon
  - Eduardo Montoya
- Technical Commission
  - Marietta Cervantes (INIA)
  - Cesar Torres (COMOCA Sur)
  - Alejandro DeBary (Minera Yanacocha)
  - Carlos Diez (Solidaridad Internaciónál)

