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# Honduras Progress Presentation

*Improved Wastewater Treatment for the City of Las Vegas*



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# Agenda

- Background
- Client Needs
- Existing WWT
- Project Responsibilities
- Methodology
- Field Investigation
- Recent Developments
- System Expansion
- Conclusions



Figure by MIT OpenCourseWare.

# Background

- City of Las Vegas: 17,400 population
- Wastewater Treatment Facility Built in 1992
- Approximately 30% of Population Connected to Treatment
- No Facility Maintenance in 15 Years
- Las Vegas Interested in Expansion

# Client Needs

- Documentation of Existing Conditions
- Sludge Maintenance Plan
- Options for Expansion
- Applicability of CEPT in Expansion
- Effect of Increased Loading

# Existing WWT Treatment

Parameters	National Discharge Regulations			Imhoff Tanks	
	Units	Method*	Requirements	Influent	Effluent
pH		4500-HB	6.00 – 9.00	7.36	7.29
Conductivity	µs/cm	2510-B		474	479
Settleable Solids	mL/L/hr	2540-F	1	3.5	2.5
Total Suspended Solids	mg/L	2540-D	100	205	110
Ammonia Nitrogen	mg/L	4500-NH <sub>3</sub> -D	20	8.96	10.64
Total Kjeldahl Nitrogen	mg/L	4500-N	30	10.64	11.76
Nitrites	mg/L	4500-NO <sub>2</sub> -B		<0.01	<0.01
Nitrates	mg/L	4500-NO <sub>3</sub> -B		0.01	0.07
Total Phosphorus	mg/L	4500-C	5	3.50	3.70
Fecal Coliforms	UFC/100 mL	9222-D	5E+03	4E+07	5E+07
Fats and Oils	mg/L	5520-D	10	29.56	27.43
Chemical Oxygen Demand	mg/L of O <sub>2</sub>	5520-D	200	220	227
Biochemical Oxygen Demand	mg/L of O <sub>2</sub>	5210-B	50	123	138

\* All samples were preserved following the norms established by "Standard Methods"

# Project Responsibilities

## Matthew

- Current System Removal Efficiencies
- Sludge Handling
- Local Impacts to Lake Yojoa
- Tank's Role in System Expansion

## Anne

- Tank Improvement from CEPT
- Prevalence and State of Repair of Tanks in Honduras
- CEPT's Role in System Expansion

# Methodology

## Environmental Impact

- **Assess Existing Removal Rates of Treatment**
  - Water Quality Sampling and Testing of Influent and Effluent Quality
  - TSS, COD/BOD, Microbial
- **Sludge Handling**
  - Mass Balance of Tank
  - Investigate Appropriate Digestion Rates
  - Sludge Removal Volume
  - On-Site Disposal Options
- **Downstream Loading**
  - Water Quality Sampling Downstream
  - Evaluate Impact of Regular Maintenance
  - Evaluate Impact of Increased Flow Maintenance
- **Results**
  - Baseline for Evaluating Impact of CEPT
  - Recommendations for Future System Expansion

## Water Quality Sampling Plan

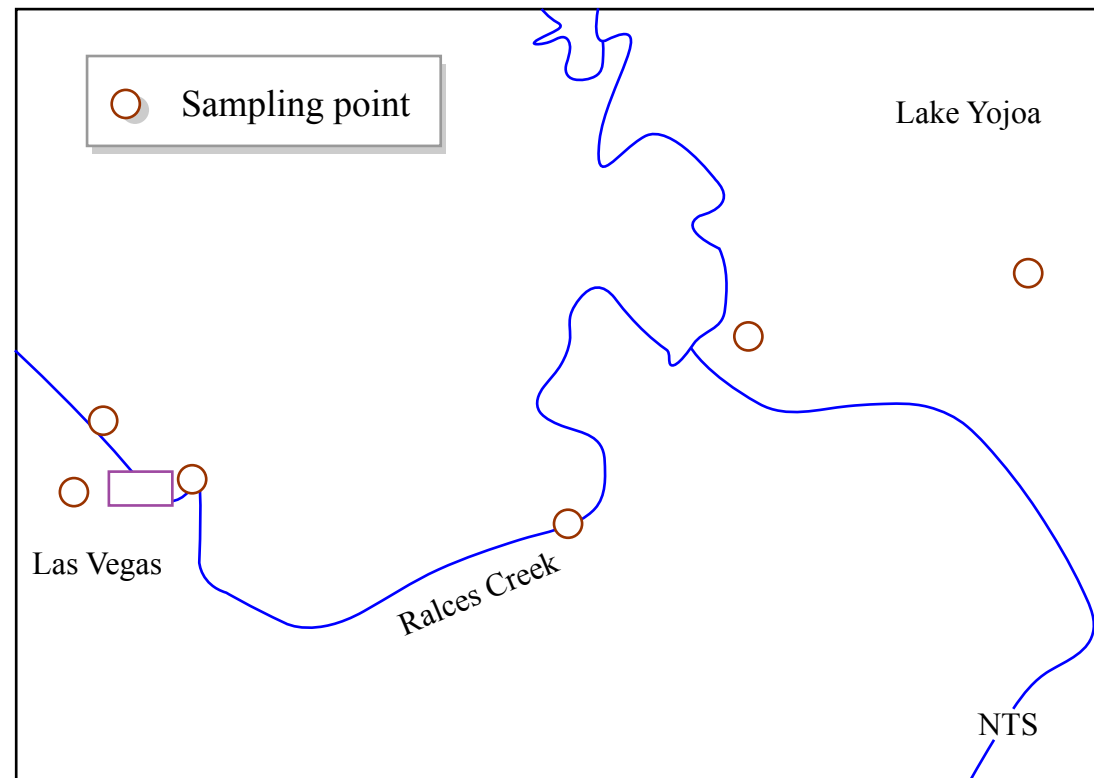


Figure by MIT OpenCourseWare.



# Methodology

- **Goal:**  
Assess Applicability of CEPT for Wastewater Treatment by Imhoff Tanks

- **Approach**

- Jar Tests
- Measure TSS, COD, pH, turbidity
- Hydraulic Profiles
- Interviews and Site Visits
- Vendor Investigation

- **Results**

- Determination of Coagulant Dosage
- Determination of Increase in Sludge
- Proposal for Staging of Mixing and Flocculation
- Proposal for Appropriate Feed System



# Field Investigation

Start Date	Finish Date	Activity
January 7	January 11	Meet Local Contacts in Las Vegas
January 8	February 1	Interview Stakeholders and Information Sources
January 10	January 10	Workshop I: Tank Maintenance
January 12	January 25	Water Quality Sampling
January 12	January 25	Jar Tests, Mixing & Flocculation Tests
January 21	February 1	Imhoff Tank Field Visits
January 21	February 1	Site Investigation -- Mapping

# Recent Developments

- Expected Completion of Sewer Expansion Completed January 2008
- Taiwanese Government Grant for Sewer Expansion
- No Funding for Wastewater Treatment Facility

# System Expansion

- Short Term
  - CEPT's ability to improve treatment without new infrastructure
- Long Term
  - Appropriate Treatment Scheme
  - Continued Viability of CEPT in Expanded Treatment Scheme

# Conclusion

## Respond To

- Removal efficiency of the existing tanks
- Options for sludge handling CEPT testing (bench and/or pilot scale)
- Conception design of a full scale system
- Identification of local sources of coagulants (e.g.,  $\text{FeCl}_3$ )
- Downstream water quality analysis

## Final Submittal

- Report on Recommendations for Expansion of WWT to Las Vegas
  - Delivered to Key Contacts
  - Full Report (English)
  - Executive Summary (Spanish and English)
- 2 Theses
  - Anne: Focused on Application of CEPT to Imhoff Tanks
  - Matt: Focused on Environmental Impact of Current and Future WWT Options for Las Vegas

# Questions

CATEGORIES	Company	Catalog #	Quantity	Unit Price	TOTAL
<b>TRAVEL</b>					
Airfare	American	-	2	\$642.70	\$1,285.40
Lodging	Agua Azul	-	26 nights		
Car Rental		-	2	\$700	\$1400
<b>TOTAL TRAVEL</b>					<b>\$</b>
<b>TESTING SUPPLIES</b>					
<b>Microbial</b>					
3M Petrifilm E. Coli/Coliform Count Plates	MIT	-	1 pkg (25)		
Petrifilm Interpretation Guide	MIT	-	1	-	-
3M plastic slider	MIT	-	1	-	-
Incubator	MIT	-	1	-	-
Wide, Lighted Magnifying Glass	HACH	25854-00	1	12.30	
Whirl-Pack Bags	MIT	-	1pkg (100)	-	-
Tweezers	MIT	-	1	-	-
<b>Jar Tests</b>					
Coagulants: solid Alum & Fe <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub>	MIT	-	1 bottle each	-	-
Jar Test Apparatus		-	1	-	-
Balance	MIT	-	1	-	-
Aluminum Dish	MIT	21 640-00	1 pkg	-	-
Stopwatch	Matt	-	-	-	-
Flask (with stopper!)	MIT	-	1	-	-
Turbidmeter	MIT	-	1	-	-
<b>COD</b>					
Reactants	MIT	-	1 case	-	-
COD Incubator	MIT	-	1	-	-
Spectrophotometer	MIT	-	1	-	-
<b>BOD</b>					
BOD Flask	Parsons	-	5	-	-
DO: AccuVac Colorimeter 11	HACH	25150-25	1pkg (25)	20.50	-
<b>TSS</b>					
<i>Photometric Method:</i>					
Blender	MIT	-	1	-	-
<i>Gravimetric Method</i>					
Erlenmeyer Flask	MIT	-	1	-	-
Analytic Balance	Honduras	-	1	-	-
Vacuum	MIT	-	1	-	-
Oven	Honduras	-	1	-	-
TSS Filter Paper	MIT	-	1pkg	-	-
<b>General</b>					

Gloves	MIT	-	1 pkg	-	-
Cases: Spectrophotometer Jar Apparatus COD Reactor	MIT				
Syringe, 10 mL	MIT	-	5	-	-
Scooper for Alum	MIT	-	1	-	-
Lab Labeling Tape	MIT	-	1 roll	-	-
Lab Marking Pen	Anne	-	2	-	-
Duct Tape	Anne	-	1 roll	-	-
Antibacterial Hand gel	Anne	-	1	-	-
Tongs	MIT	-	1	-	-
Squirt Bottles	MIT		2		
Forceps	MIT	-	1	-	-
Funnel	MIT	-	1	-	-
Graduated Cylinders	MIT	-	4	-	-
Lab Notebooks			2		
Pipettes	VWR	53502-251	2	\$16.75	
Thermometer	MIT		1		
Cooler	?				
pH Meter	VWR	-	1	-	-
GPS Unit	Rotch	-	1	1	1
Batteries			-	-	-
<b>TOTAL TESTING</b>					<b>\$</b>
<b>BUY/FIND IN HONDURAS</b>					
Trash Bags					
Alcohol					
Candle					
Matches					
Refrigerator					
Phone					
<b>TOTAL PROJECT COSTS</b>					<b>\$</b>

# References

Experco International, Ltee. And Diana Betancourt, “Estudio de Factibilidad Para la Gestion Integrada de las Aguas Residuales y Desechos Solidos en la Cuenca del Lago de Yojoa – AMUPROLAGO” Honduras, C.A. Abril, 2003.

Herrera A. (2006) Rehabilitation of the Imhoff Tank Treatment in Las Vegas, Santa Barbara, Honduras, Central America, MS Thesis, Dept. of Civil, Architectural and Environmental Engineering, U. Texas, Austin.

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