



# *Sound* Geothermal



Comfort from the ground up

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## *Clark County School District Case History*

### *Moving Through the Gx Learning Curve*

*Salt Lake City, Utah  
April 30, 2009*



*Sound*

**Geothermal**



Comfort from the ground up



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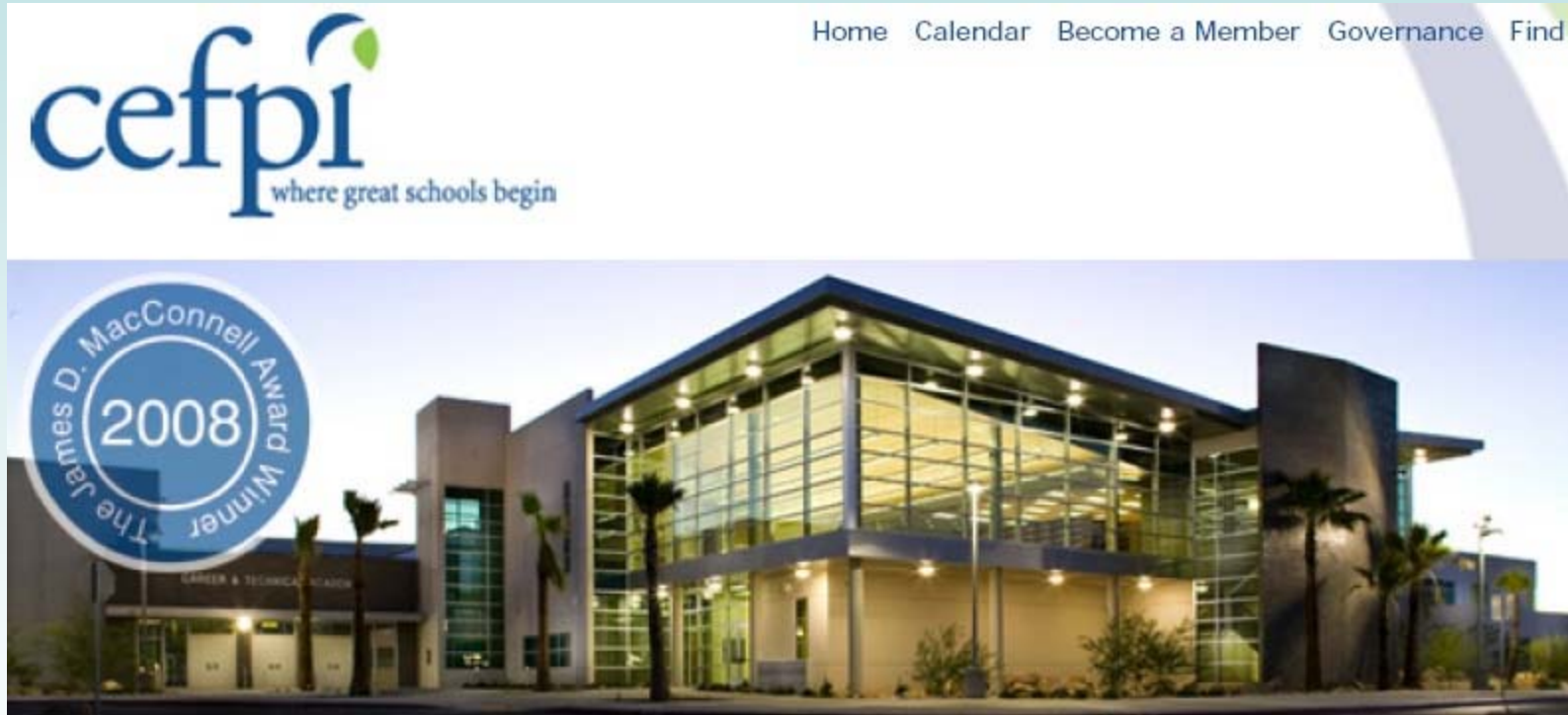
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# My summer vacation

- A slide show of our family trip to Utah



# CCSD's First Gx Project



Northwest Career & Technical  
Academy

# NW CTA

## Implementing a New Technology Planning & Development Process

- Award Winning Architectural Design Planning Process
- Leed Silver
- Gx Consultant
- District Planning & Design Review
- District PM & Inspection
- District hired 3<sup>rd</sup> Party TAB & Cx
- 80/20 Hybrid System
- Energy Usage Goal

# Then what happened???

- Time to call AAA



# Energy Usage Goal

- **39 kBtu/sf/Yr**
- Combined Power & Gas
- Electrical Usage Only
- |          | kBtu/sf | kBtu/sf/Yr |
|----------|---------|------------|
| • Jul-07 | 7.85    | 47.11      |
| • Aug-07 | 6.64    | 57.97      |
| • Sep-07 | 4.28    | 51.35      |
| • Oct-07 | 3.95    | 49.40      |
| • Nov-07 | 3.93    | 48.63      |
| • Dec-07 | 3.36    | 46.54      |

# Gx in Las Vegas

## How did CCSD get here?



- Over 340 facilities using \$60M expenditure for energy - all fossil fuels
- Growing interest in sustainable/green design
- LEED Certification Points



# The Learning Curve

## for the Gx Application Process

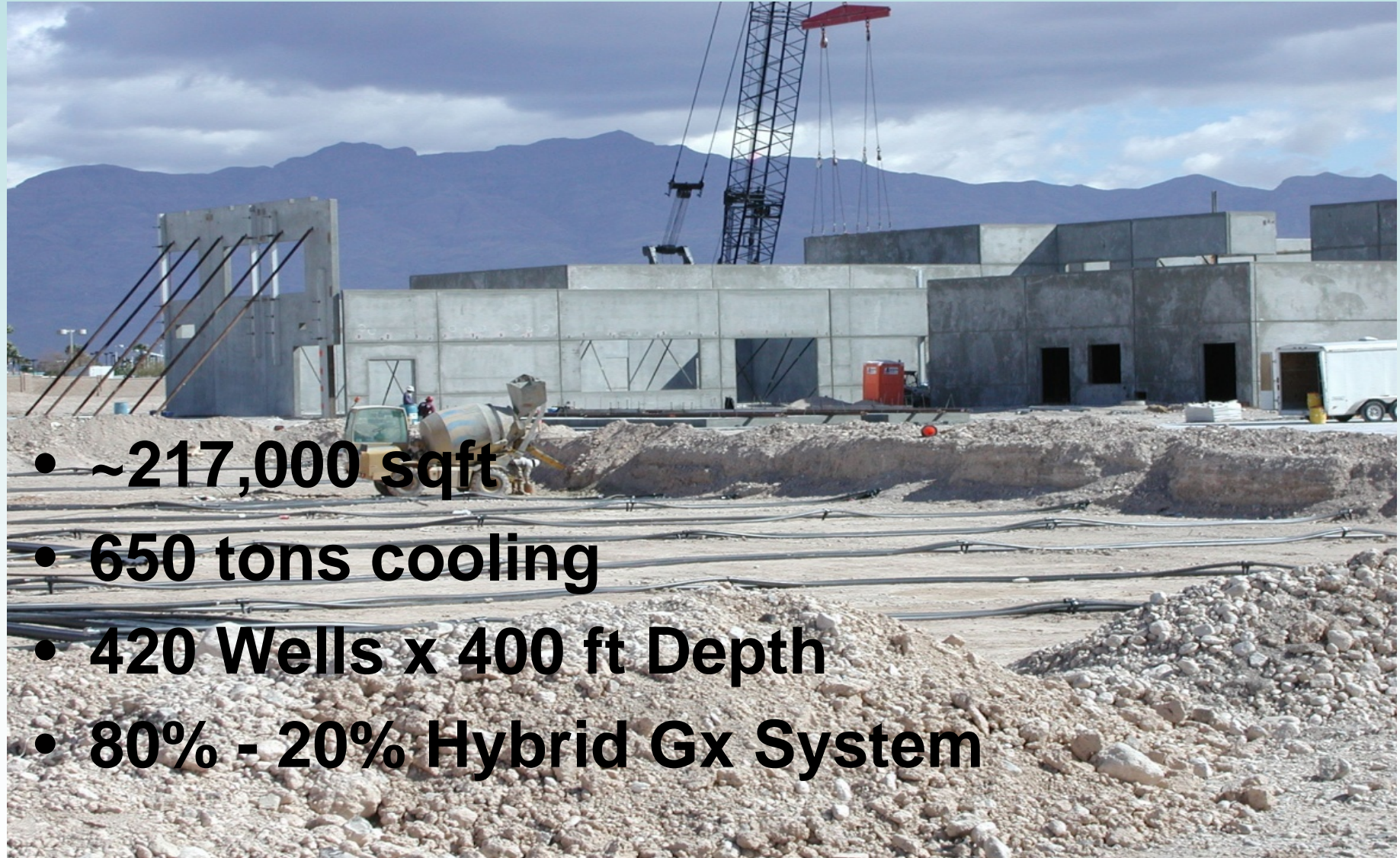
### What it's not

- Not just a Pre-construction Planning Process
- Not an “apply it & forget it” technology
- Not conventional or common

### What it is

- An Ongoing Process – through the life of the building
- Never stop learning & improving
- Show & Tell

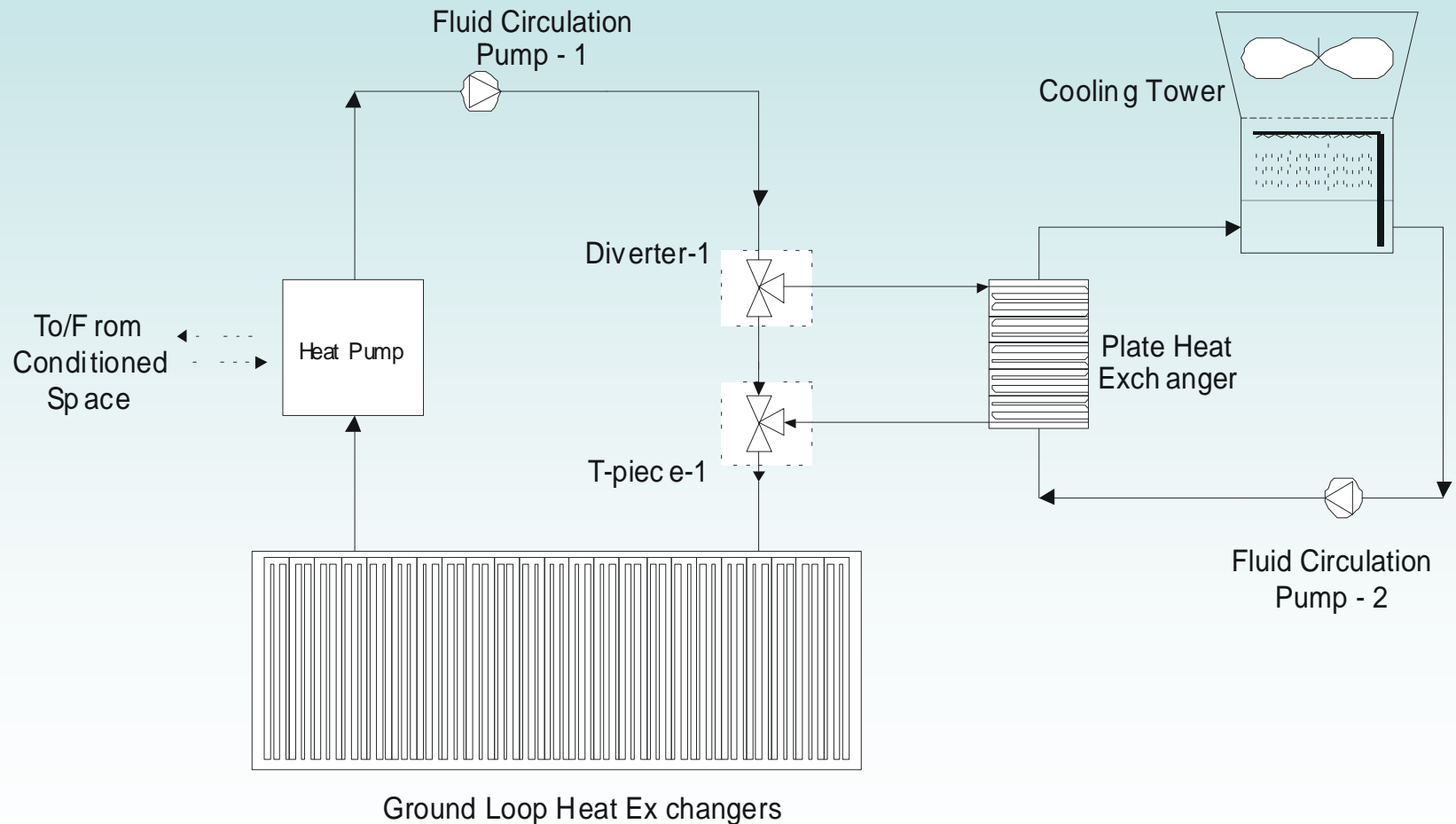
# NW CTA



- **~217,000 sqft**
- **650 tons cooling**
- **420 Wells x 400 ft Depth**
- **80% - 20% Hybrid Gx System**

# TYPICAL HYBRID SYSTEM

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# Other CCSD Gx Projects

- NW CTA
- Burkholder MS Replacement
- East CTA
- Vegas PBS – Ch 10
- SW CTA
- Central CTA
- West CTA
- Total – over 1.3 Million sf



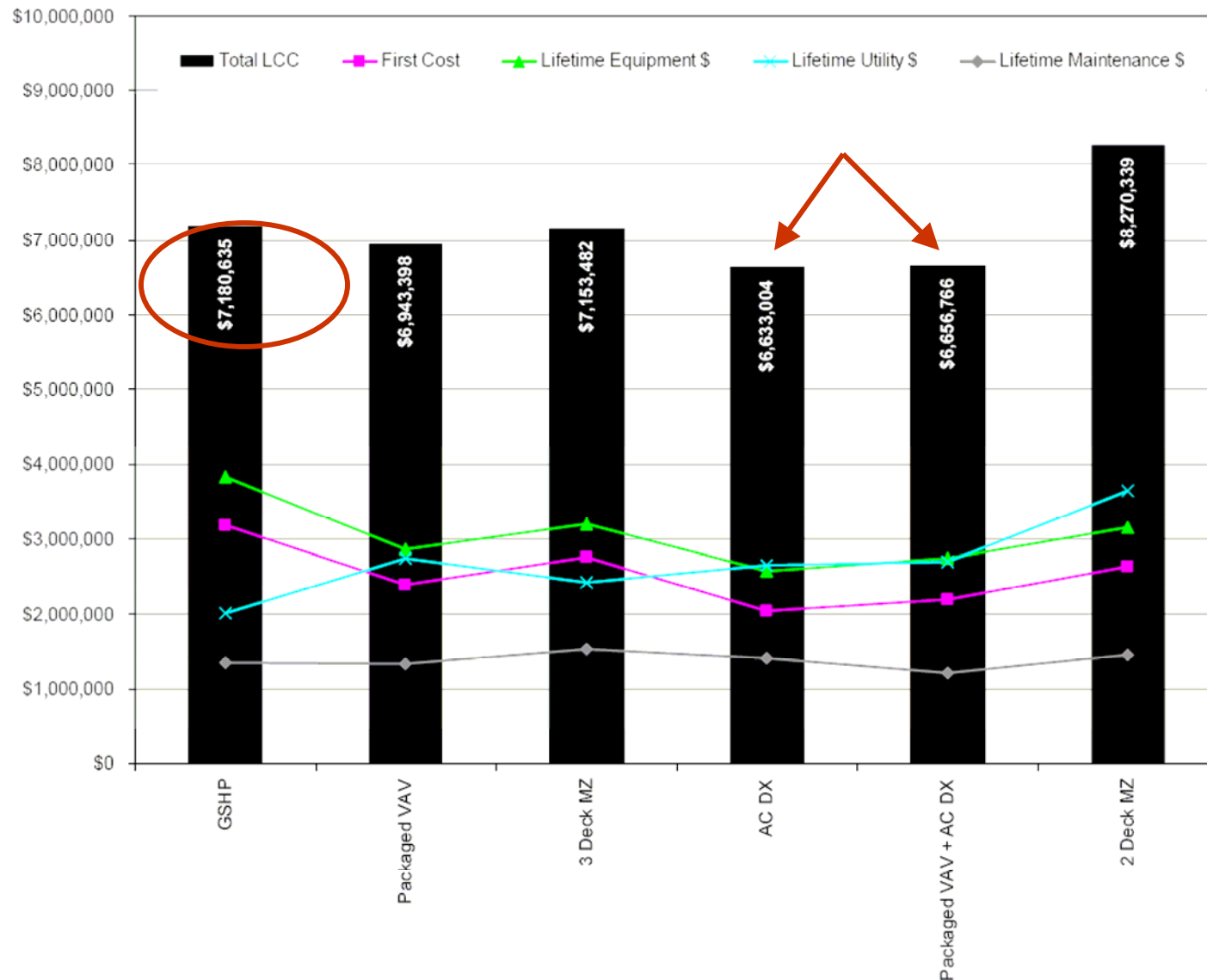


# The Planning....

	Design Base	Bundle 1	Bundle 2	Bundle 3
Envelope				
		Code level roof insulation	Code level roof insulation	Code level roof insulation
	Aggressive roof insulation			
Daylighting				
		Solatube Skylights	Solatube Skylights	Solatube Skylights
		Dimming daylighting controls	Dimming daylighting controls	Dimming daylighting controls
Lighting Controls				
	Occupancy sensors	Occupancy sensors	Occupancy sensors	Occupancy sensors
		Dual level control	Dual level control	Dual level control
Lighting Design				
	Direct system at 50 fc minimum			
		Direct system at 50 fc min w/ super T8 lamps		
			Indir/Dir system at 50 fc min w/ super T8 lamps	Indir/Dir system at 50 fc min w/ super T8 lamps
HVAC System				
	2-Deck Multizone			
		Packaged rooftop units		
			3-Deck Multizone	
				Ground Source Heat Pump
HVAC Controls & other strategies				
	Outside Air Controls	Outside Air Controls	Outside Air Controls	Outside Air Controls
		Efficient DHW	Efficient DHW	DHW with heat pump

# HVAC Systems- Lifecycle Cost Analysis Results

The  
Planning  
Results....





# Best Lit School at Night





# Automotive Shop

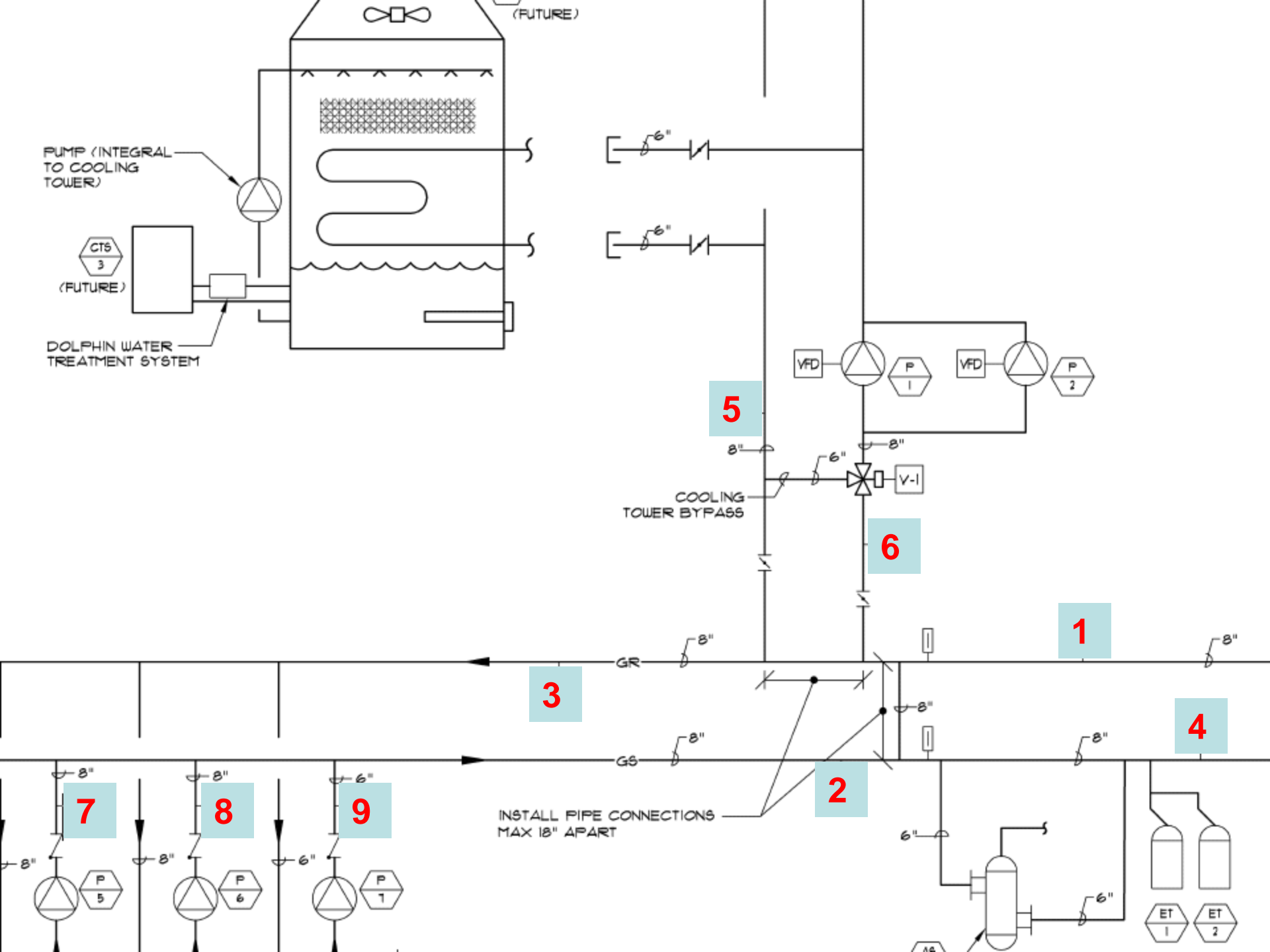
## Egress lighting



# Security Camera Monitor

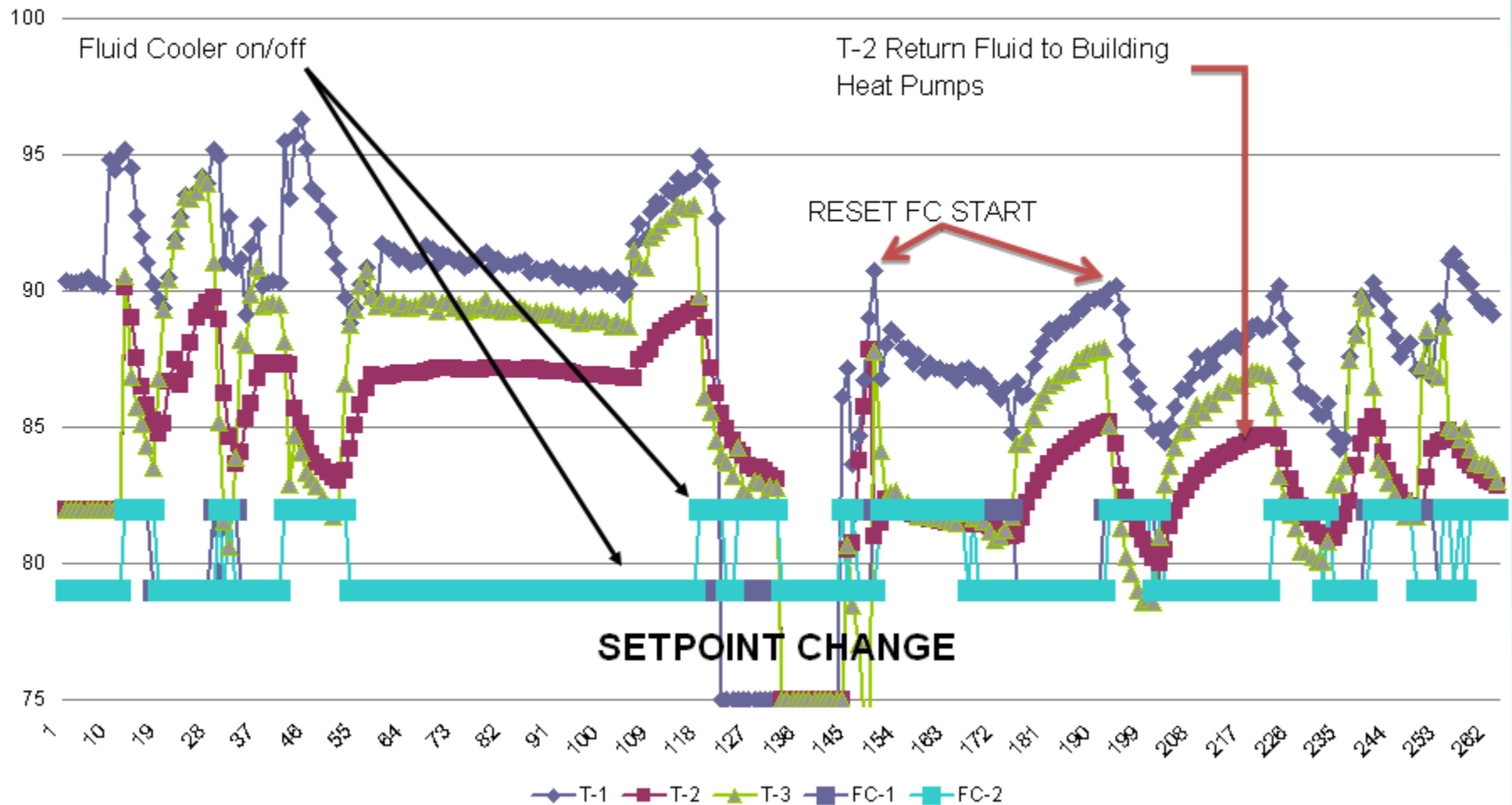
It's Midnight....16 nicely lit spaces



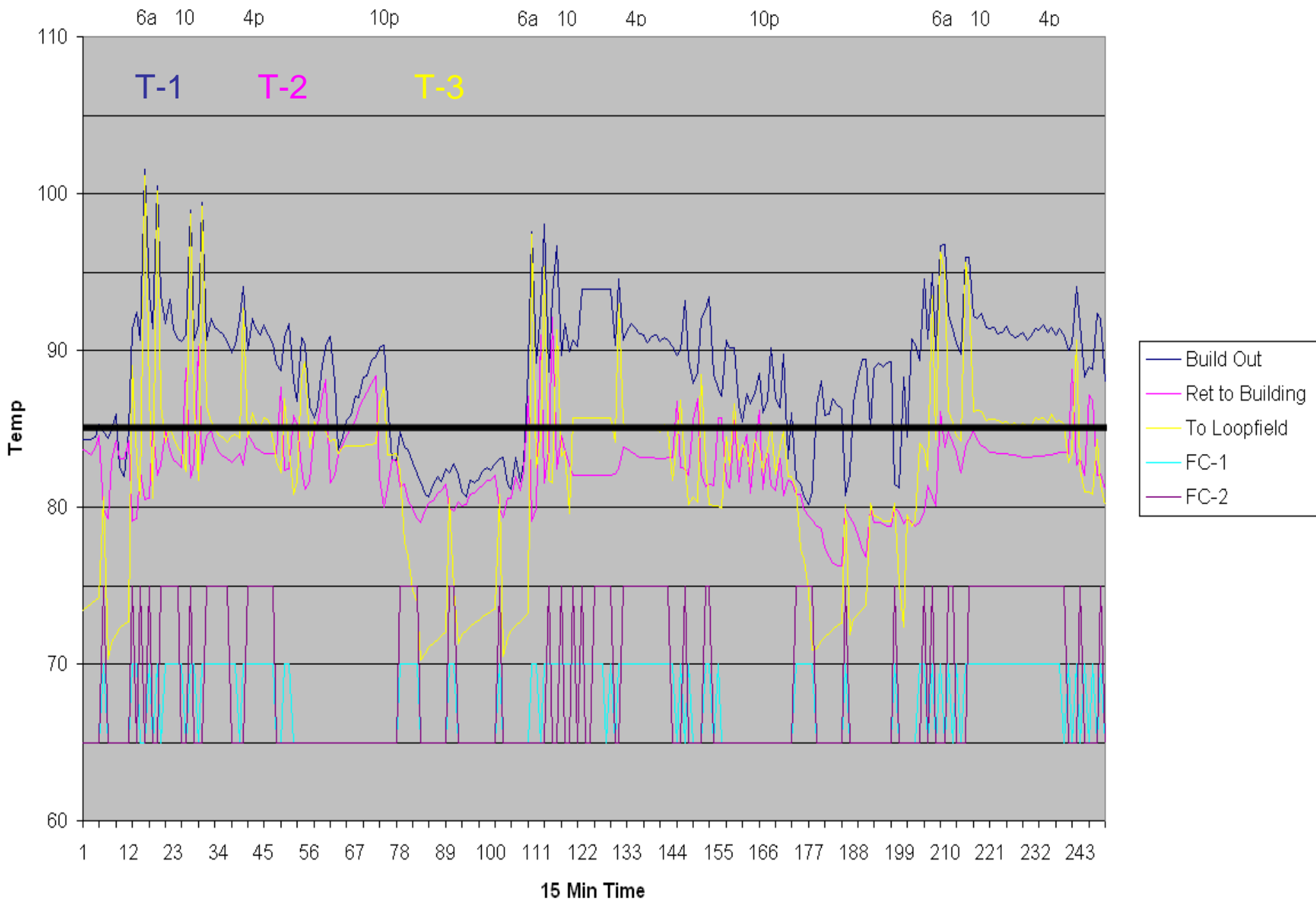


# BURKHOLDER FLUID TEMPERATURE

June 15 - 28



August 21 - 23, 2007



# Planning Lessons Learned:

Need to get your engineering community to overcome the doubt:

- Study the technology.

- Study Gx applications in your area or similar climates.

- Retain a qualified Gx consultant.

Present your findings to your peers:

- Evaluate your upcoming projects to select a prime candidate for Gx.

- Conduct TC testing – evaluate drilling conditions at various sites.



# Design Lessons Learned:

Pre-plan to avoid common pitfalls

GX Consultant – KLVX, clustering Hp's – small mech pods vs. overhead heat pumps

Peer review of design from an Architectural, Mechanical & Gx standpoint

Plan for Maintenance -

Filter access; RA filter grills

HP Access; Suspended Ceiling Access door, avoid interferences from plumbing and conduit

HP location Consider HP Pods – small mechanical rooms

Address OA & Energy Recovery

# Contracting Lessons Learned:

## Cost reduction measures

Break-out bore field contracts from General Contracting

Need to pursue Gx drilling Contractors – consider issuing an RFQ

Package multiple loop field projects into a single contract

Fast track your project by starting loop field & civil work prior to design completion



# Construction Lessons Learned:

This may be new to some folks – Education is the key:

GC – education Coordination – loop damage/heavy equip.

Inspector Education

Mechanical & Control contractors, Comx Agents

Craft coordination-interferences, bore field protection

# Operating Lessons Learned:

## Optimization

Look at it – Troubleshoot it & make adjustments

Find Piping errors, control system errors, etc.

Controls – SOC – Is the SOC correct? Is it programmed as designed?

Cooling Tower operation

Crossover piping location

Training for O&M personnel

Feedback to owner, designer, maintenance –

Conduct Pow Wows –

within organization,  
between organization,  
contractor debriefing,  
tours

# M&V Lessons Learned:

Perform a detailed M&V program

- Retain GX or Energy consultant,  
Continue to work with you're A/E's & contractors as applicable

Study operational sequence variables

- Conduct data evaluations and make your system better,  
Trend your variables and plot them against related variables  
Give yourself enough data storage that you can see long term trends

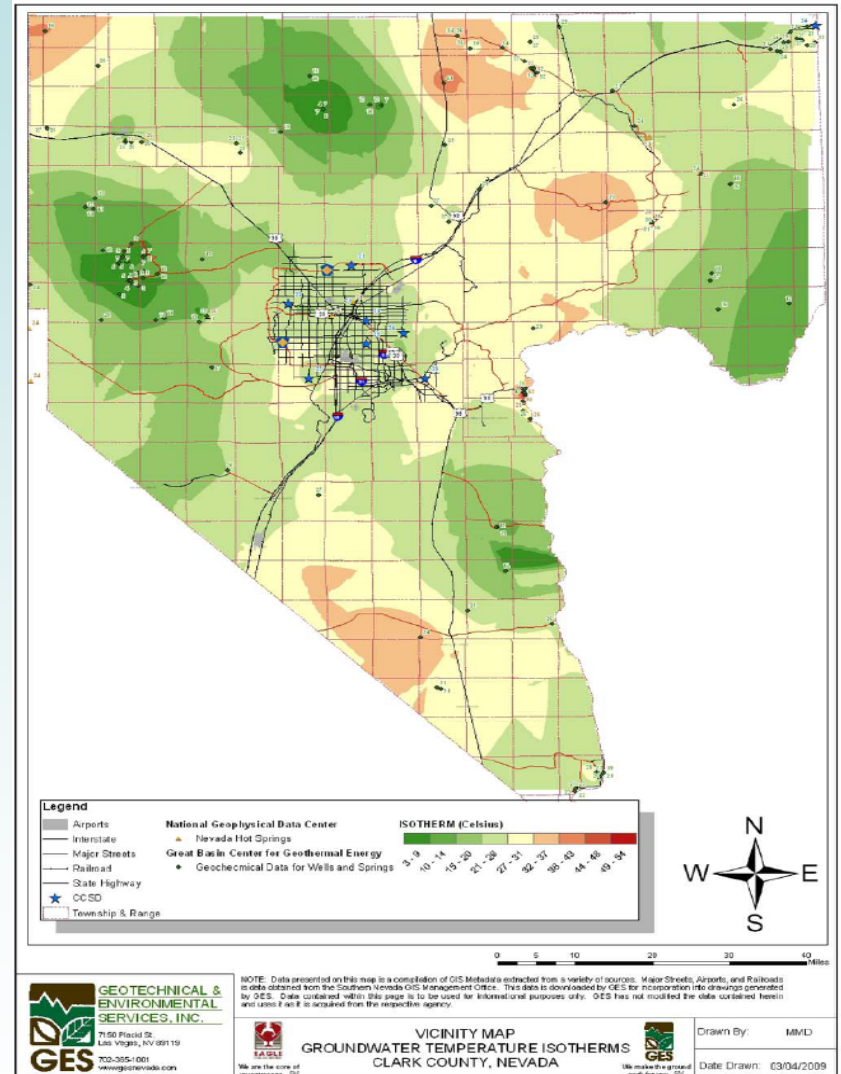
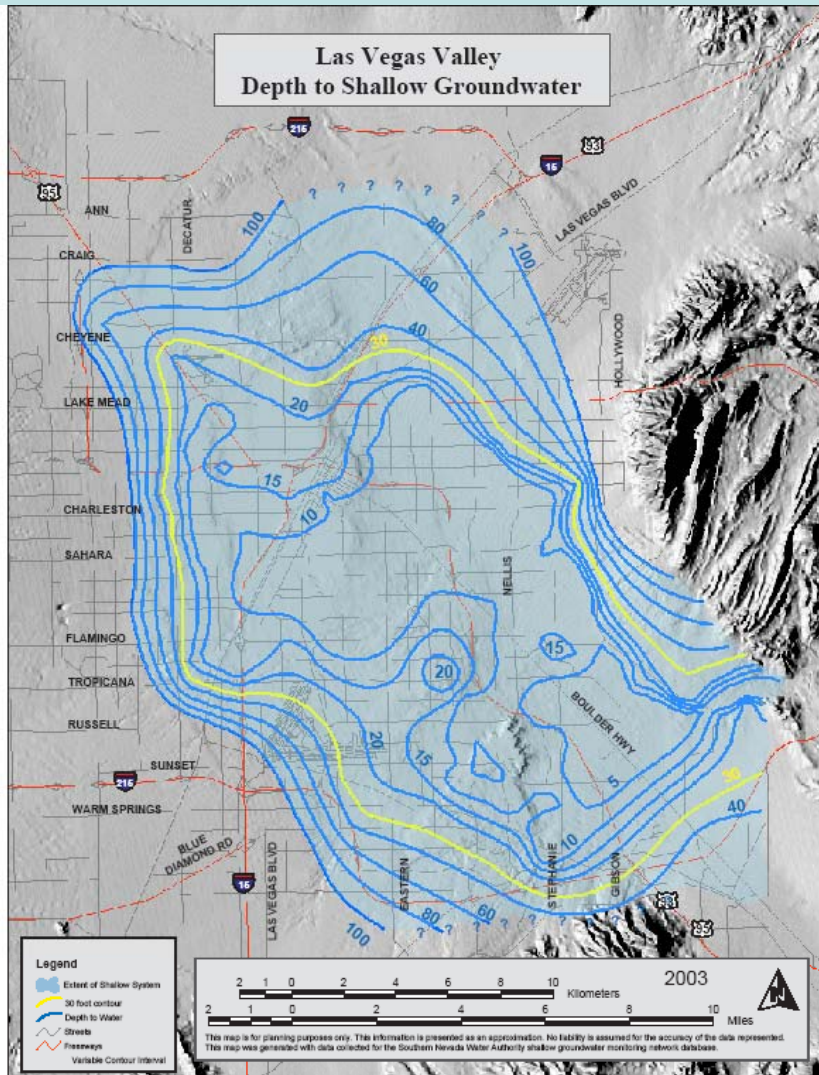
Finally:

- Optimize the system for additional energy savings.  
Use the data to improve future project designs.

# Find Partners

- NV Energy SureBet Program
- Consultants, Design Community
- In-house personnel
- Contractors
- Outside funding sources
- Information resources

# LV Valley Ground Temps & Water Depths





# Educate and Partner with Contractors



# Some closing clichés

Things are not always as they may first appear

Gotta have a sense of humor

Roll with the punches



A New Partner to help us find the watermelons



# Until Next Year

