THE UNIVERSITY OF TEXAS MEDICAL BRANCH (UTMB) AT GALVESTON

Turning Adversity into Opportunity

Presented to

IDEA Campus Energy 2016

February 11, 2016

Affiliated Engineers

utmb Health

Agenda

- About UTMB Galveston
- Hurricane Ike
- Where We Were - September 12, 2008
- Where We Are Going - A Three Step Solution
- CHP Options Evaluated
- New East Plant
- West Plant Hardening

About UTMB

- Established in 1891 as the University of Texas Medical Department with one building, 23 students and 13 faculty members is the oldest medical school west of the Mississippi River.

- 84 acre campus with seven hospitals, more than 70 major buildings, 13,000 employees, 2,500 students and more than 1,000 faculty.

- Emergency Room at John Sealy Hospital is one of only three Level 1 Trauma Centers in the Greater Houston area.

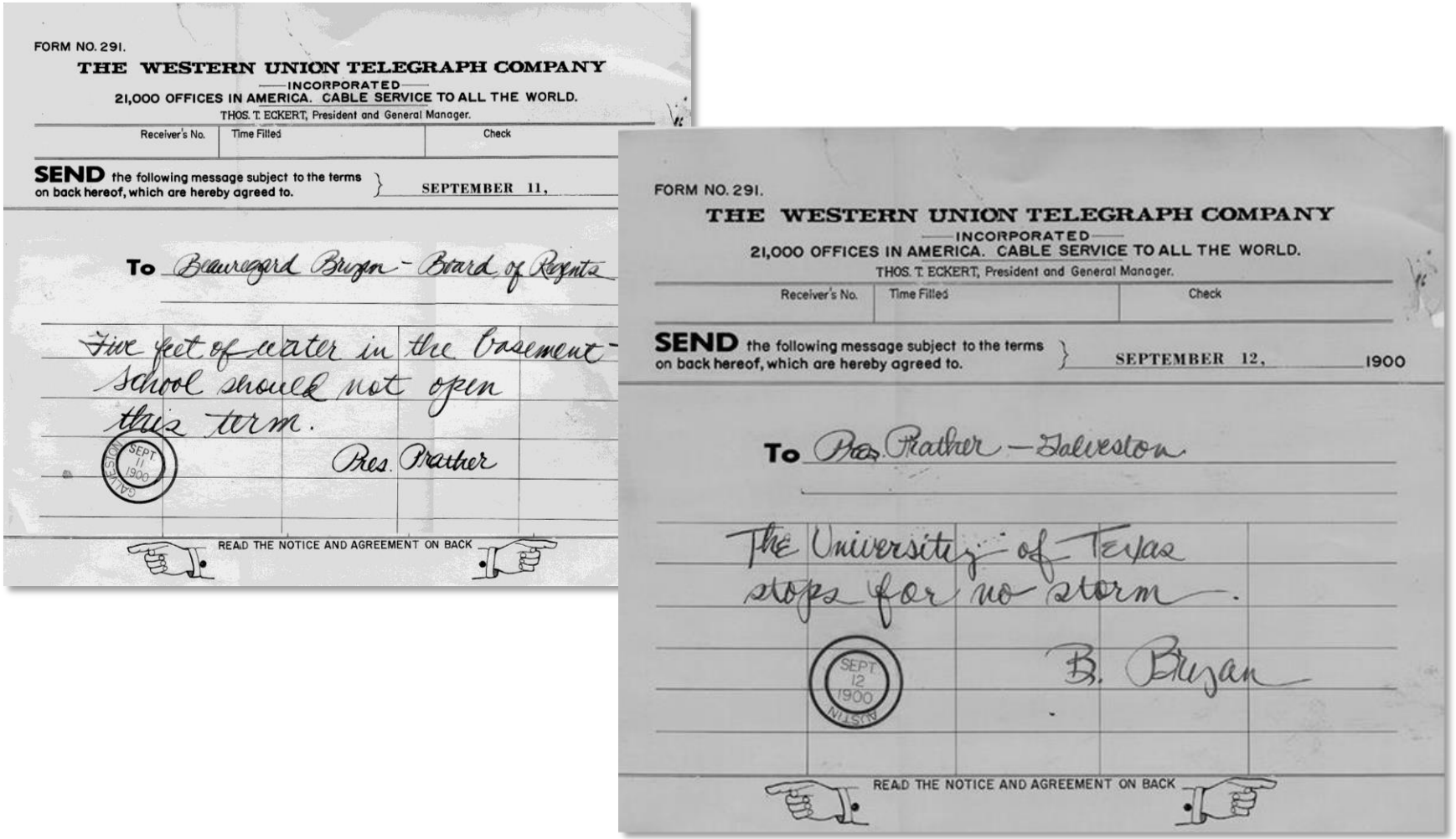
Galveston Island, circa 1890's

UTMB Photos: Old Red/John Sealy

The Great Storm of 1900

UTMB Photos: Old Red/John Sealy

University of Texas Stops for No Storm



FORM NO. 291.

THE WESTERN UNION TELEGRAPH COMPANY

INCORPORATED

21,000 OFFICES IN AMERICA. CABLE SERVICE TO ALL THE WORLD.

THOS. T. ECKERT, President and General Manager.

Receiver's No.	Time Filed	Check

SEND the following message subject to the terms on back hereof, which are hereby agreed to. } SEPTEMBER 11,

To Beauregard Bryan - Board of Regents

Five feet of water in the basement - School should not open this term.

Pres. Prather

SEPT 11 1900 GALVESTON

READ THE NOTICE AND AGREEMENT ON BACK

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To Pres. Prather - Galveston

The University of Texas stops for no storm.

B. Bryan

SEPT 12 1900 AUSTIN

READ THE NOTICE AND AGREEMENT ON BACK

UTMB Photos: UT System and Prather Telegrams, 1900

Hurricane Ike, September 13, 2008

Water/Storm Surge –

Approximately 17 ft to 18 ft based on the information gathered to date. NOAA

Timing at High Tide –

Landfall at approximately 2:10 AM, 2 hours and 4 minutes before the scheduled morning high tide on September 13, 2008 at 4:14am.

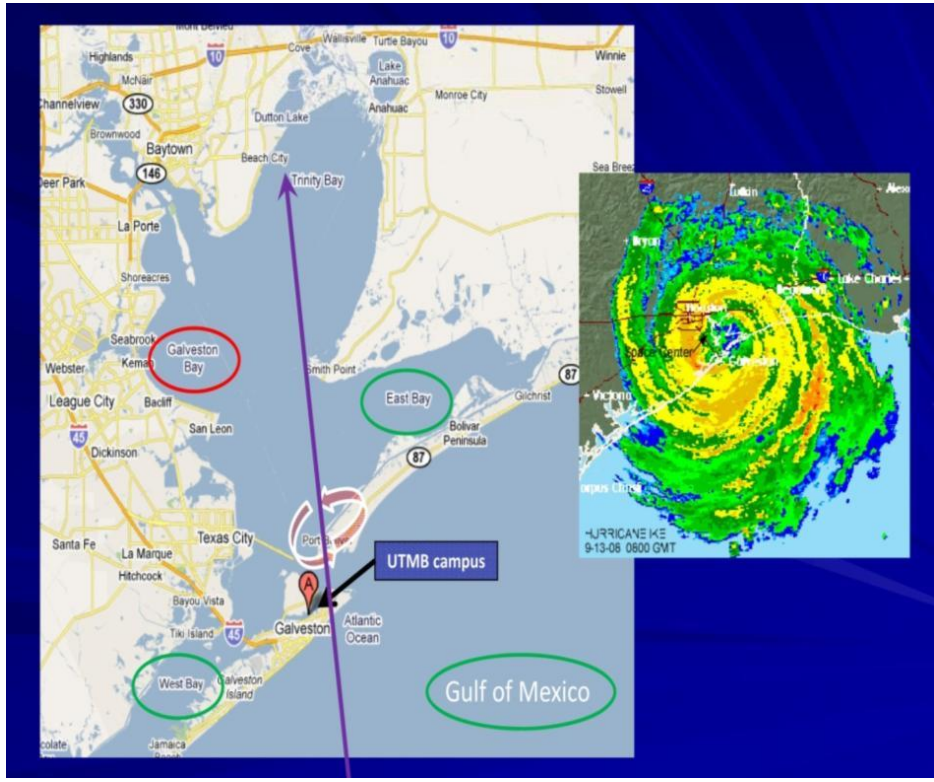
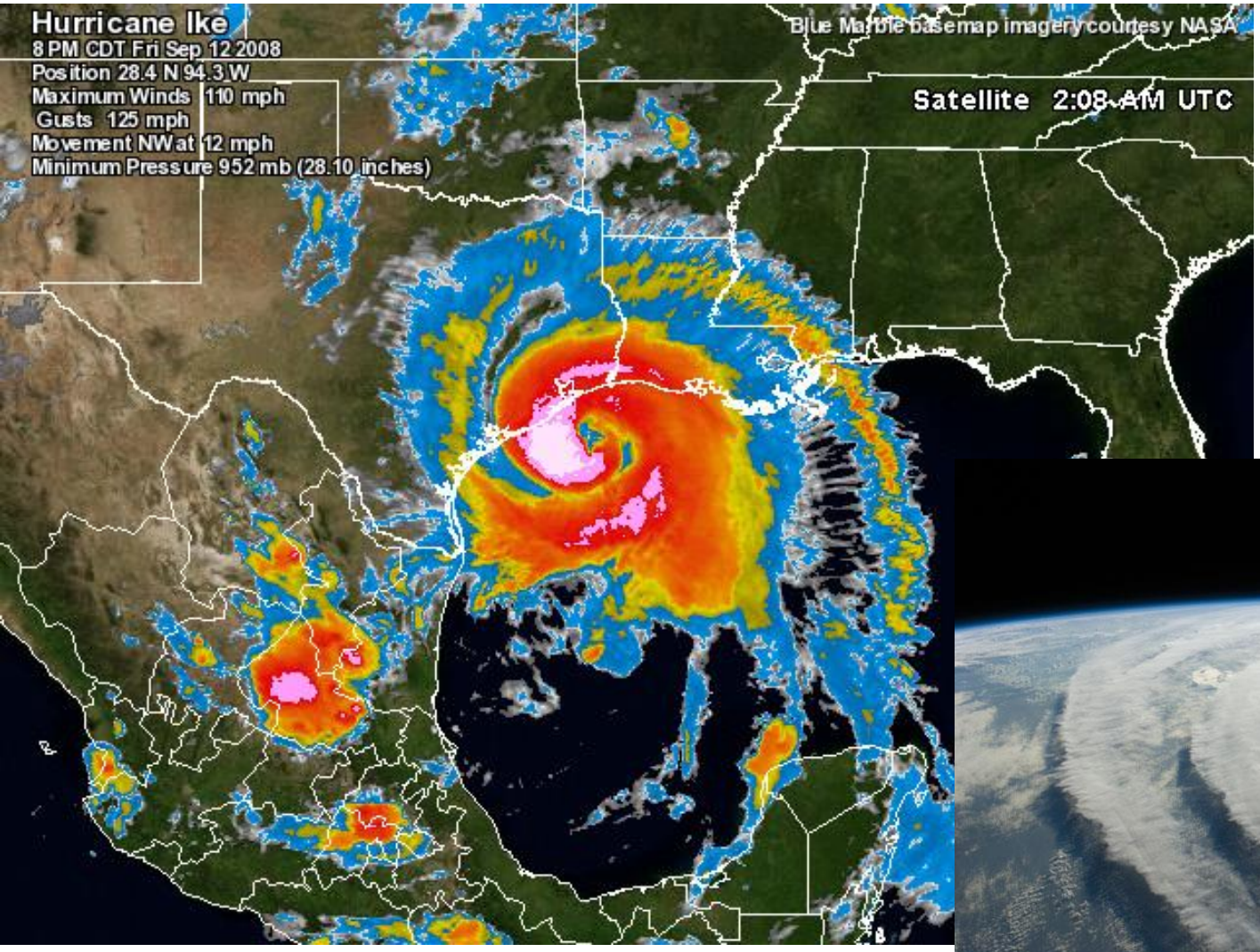


Image courtesy: noaa.gov

Hurricane Ike, September 13, 2008



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Hurricane Ike, September 13, 2008

Image courtesy: Ford, Powell & Carson Architects

After the Storm

Unique Debris Removal Challenges

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Hurricane Ike, September 12, 2008

UTMB Hospital Main Corridor

Cleaning of Library

Pumping out flood water

Back to Work

- Open 12 Clinics
- Students back to classes
- Staff relocations
- Temporary kitchen, tent cafeteria

- Temporary sterile processing, pharmacy, and other ancillary facilities

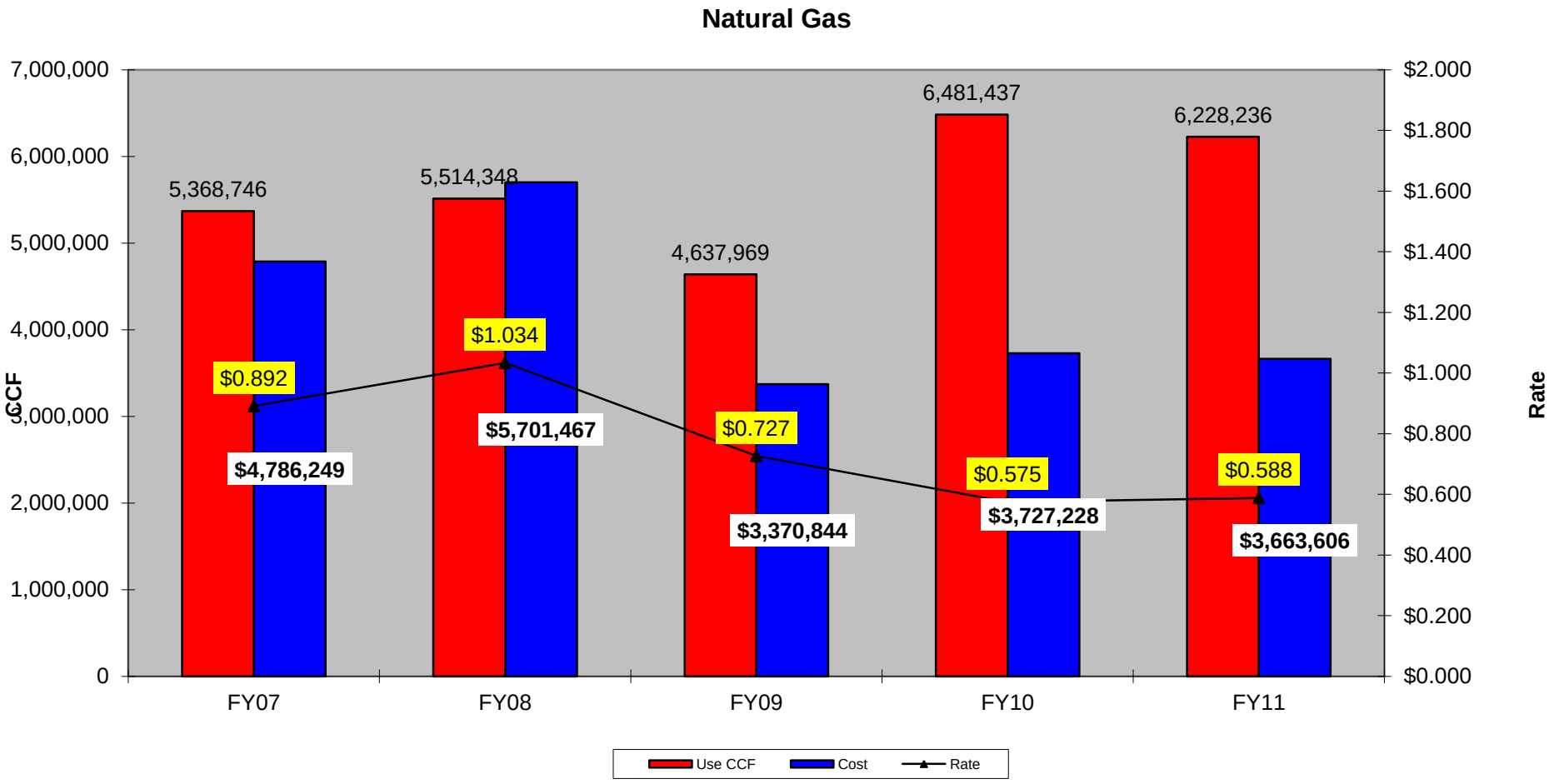
Impact of Ike

- Cost of stabilization: $14,000,000
- Unable to operate hospital: 90 Days
- Lost business revenue: $2,000,000/day
- Cost of evacuation
- Steam distribution systems a complete loss
- Chilled water pits a complete loss
- Lost research materials
- Over 1 million sf of campus buildings damaged
- Estimated 1 billion dollars in damages

Where We Were

Inability to provide firm supply

Impact of Ike (Operating Expense)



Hurricane Ike, September 13, 2008

Image courtesy: Ford, Powell & Carson Architects

Where We are Going

Step One Go Away from Buried Steam Pipe

After 2 years the water is gone but …

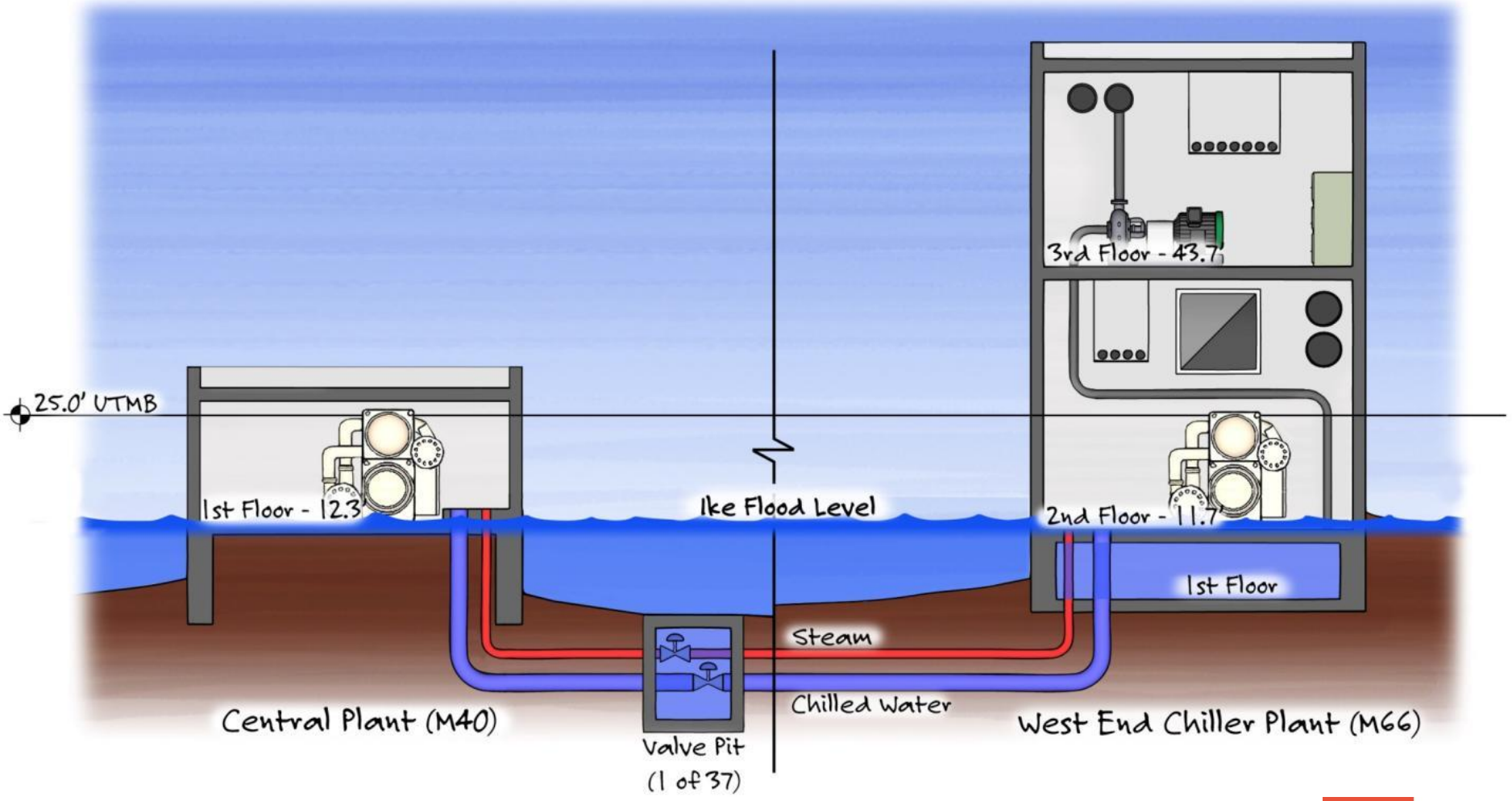
CORROSION FROM THE SALT WATER

LEAKS

Move to Buried Hot Water With Corrosion Resistant Valves and Fittings

Step Two Elevate or Protect the Boilers and Chillers

Impact of Ike…It could have been far worse !



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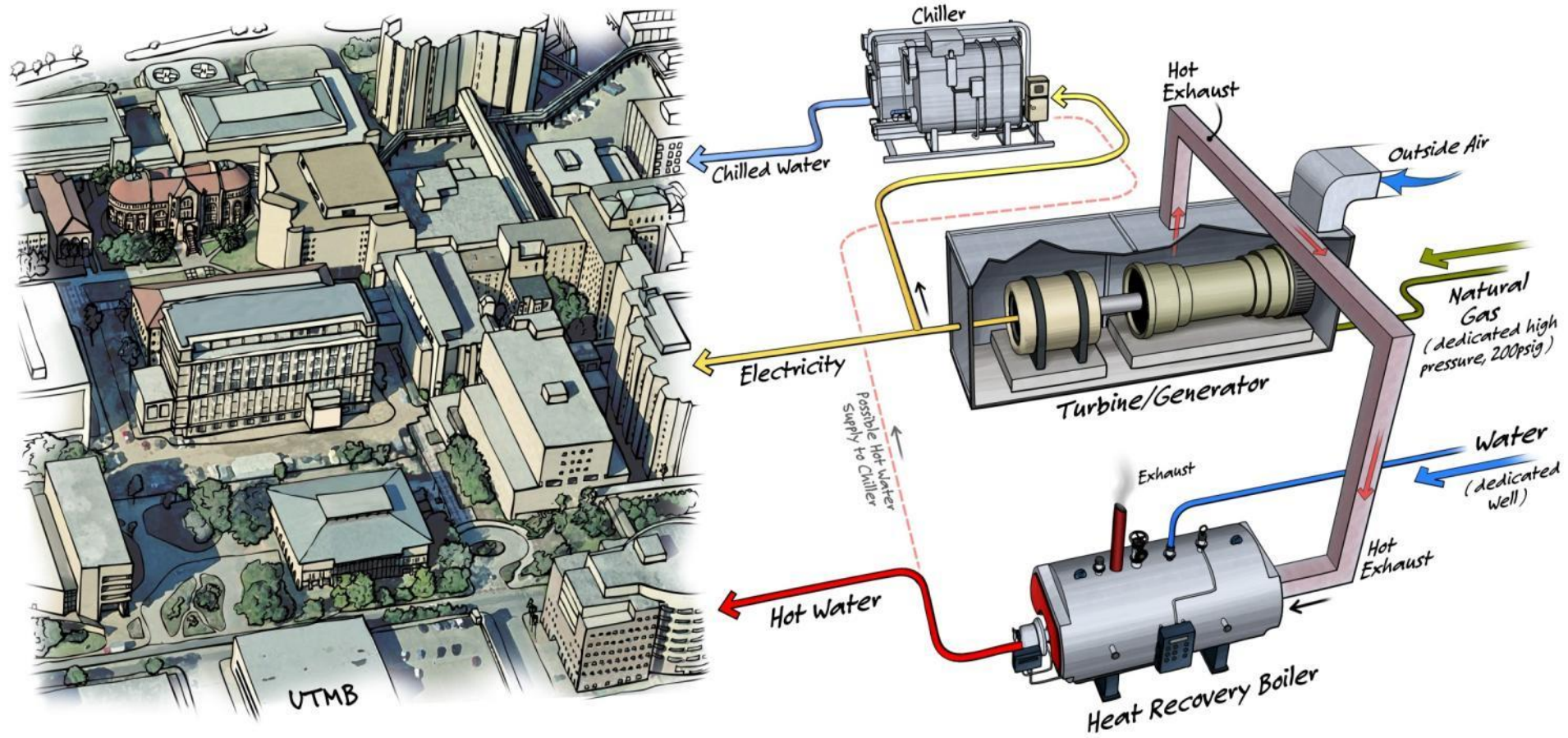
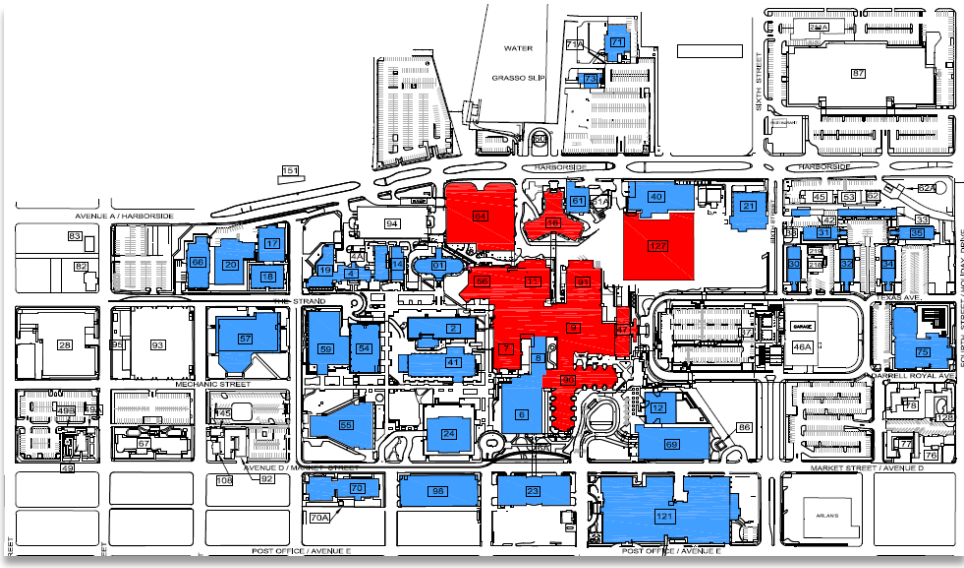
Step Three Produce On-Site Electricity via Combined Heat & Power (CHP)

Combined heat and power systems are approximately 50% more efficient than traditional systems



Options Given Consideration

- On October 28, 2010 the Facility Steering Committee directed UTMB Infrastructure Team to proceed with increasing the energy security of the UTMB Campus



OPTION		5.0 MW	15 MW	30 MW
On-Site Power Production	Production Equipment	X	X	X
	Clinical Core		X	X
	Critical Buildings			X

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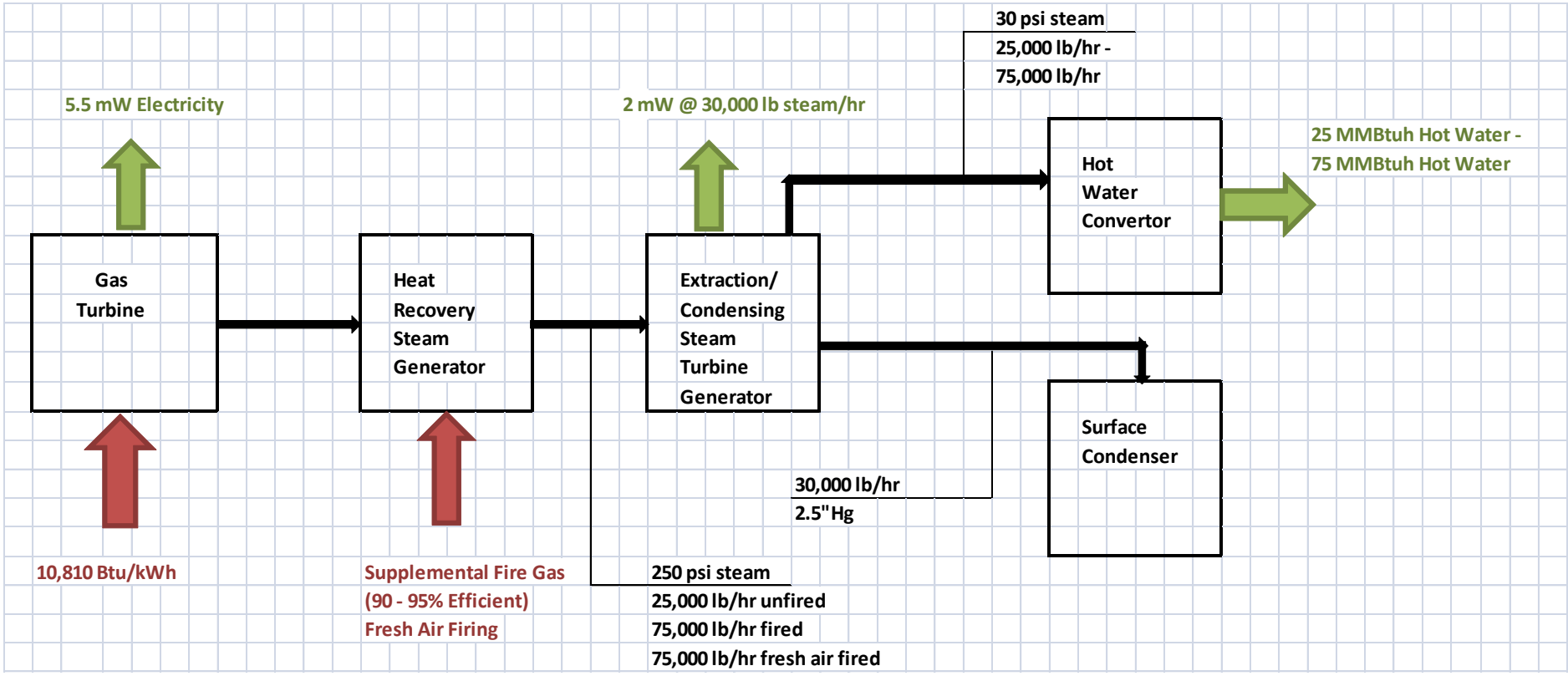
Summary of CHP Economic Analysis

	Base Case	Option 1	Option 1A	Option 2A	Option 3	Option 4A	Option 5
	stand-by generators w/o CHP	2 Taurus 60s, 600 psi combined cycle with one 150 psi steam turbine driven chiller	2 Taurus 60s, 250 psi combined cycle with one 250 psi steam turbine driven chiller	2 Taurus 60s, 250 psi HRSG and one steam turbine driven chiller	2 Mercury 50s with Heat Recovery	2 mW gas Engines with Heat Recovery and 4 2mW diesel engines with SCRs*	2 Taurus 60s, with backpressure condensing STG and all electric chillers
First Cost (Includes soft cost)	$ 29,302,000	$ 50,921,000	$ 45,903,000	$ 40,898,000	$ 44,070,000	$ 40,742,000	$ 44,005,000
Premium Cost for CHP		$ 21,619,000	$ 16,601,000	$ 11,596,000	$ 14,768,000	$ 11,440,000	$ 14,703,000
Annual Savings		$ 3,985,000	$ 3,641,000	$ 3,127,000	$ 2,661,000	$ 2,569,000	$ 3,403,000
Simple Payback (years)		5.4	4.6	3.7	5.5	4.5	4.3
Present Value of Life cysle Cost ($1,000)	$ 158,680	$ 117,530	$ 117,930	$ 121,020	$ 131,530	$ 129,660	$ 119,780
Ranking	7	1	1	4	6	5	3

Note: Variance between all CHP options is within the accuracy of the estimates.

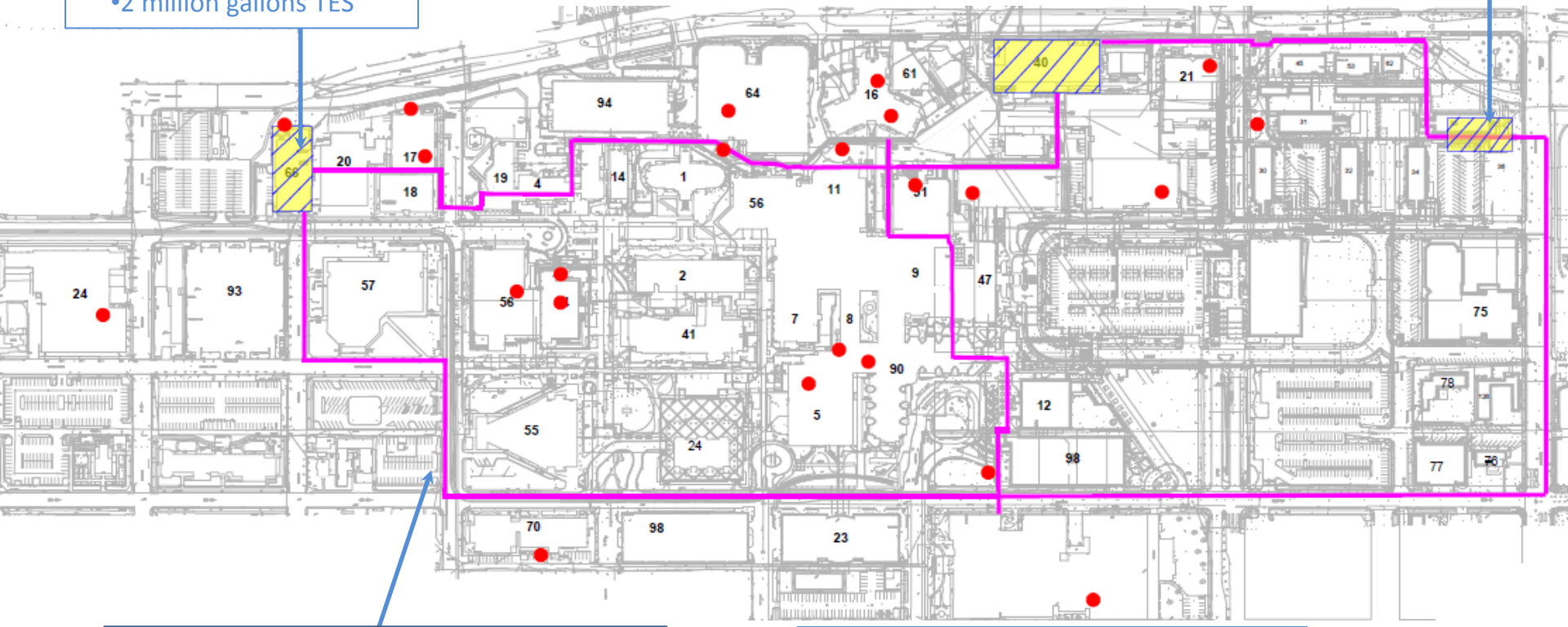
CHP Option Five (Recommended)



Mitigation Plan

#2 - Harden West Plant w/
- •Floodwall
- •7.5MW CHP
- •2 million gallons TES

#1 – New Elevated East Plant w/
- •7.5MW CHP
- •14,000 Tons of Cooling
- •2 million gallons TES



Hot Water Distribution System

Legend

- Thermal Distribution Main Loop
- Emergency Generators
- Plants

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New Elevated East Plant

New Elevated East Plant – Cooling Towers

New Elevated East Plant - Chillers

New Elevated East Plant - HRSG

West Plant Hardening

- 5.5 MW CHP
- Two One MW Diesel Generators
- 2 million gallons of chilled water storage
- Floodwall to protect existing plant and new improvements

New Elevated East Plant

CHP Results

The results generated by the CHP Emissions Calculator are intended for eductional and outreach purposes only; it is not designed for use in developing emission inventories or preparing air permit applications.

The results of this analysis have not been reviewed or endorsed by the EPA CHP Partnership.

Annual Emissions Analysis					
	CHP System	Displaced Electricity Production	Displaced Thermal Production	Emissions/Fuel Reduction	Percent Reduction
NOx (tons/year)	21.52	39.58	16.36	34.41	62%
SO2 (tons/year)	0.36	37.13	0.10	36.87	99%
CO2 (tons/year)	70,330	67,713	19,092	16,476	19%
Carbon (metric tons/year)	17,390	16,743	4,721	4,074	19%
Fuel Consumption (MMBtu/year)	1,205,306	825,561	327,198	(52,547)	-5%
Number of Cars Removed				2,721	

This CHP project will reduce emissions of Carbon Dioxide (CO2) by 16,476 tons per year

This is equal to 4,074 metric tons of carbon equivalent (MTCE) per year

This reduction is equal to removing the carbon emissions of 2,721 cars

District Energy Article

THE UNIVERSITY OF TEXAS MEDICAL BRANCH (UTMB) AT GALVESTON

Turning Adversity into Opportunity

QUESTIONS

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