

# Out with the new, in with the old

Lessons learned during the rehabilitation of a 350 mgd pump station



City of Dallas

**WATER**  
OUR FOCUS  
OUR BUSINESS  
OUR PASSION

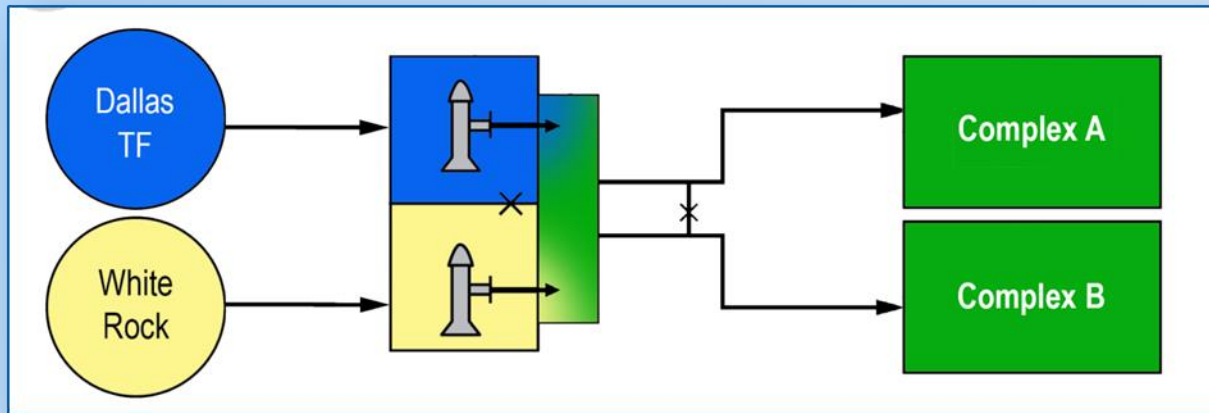
 **carollo**  
*Engineers...Working Wonders With Water®*



# Activated Sludge Influent Pump Station



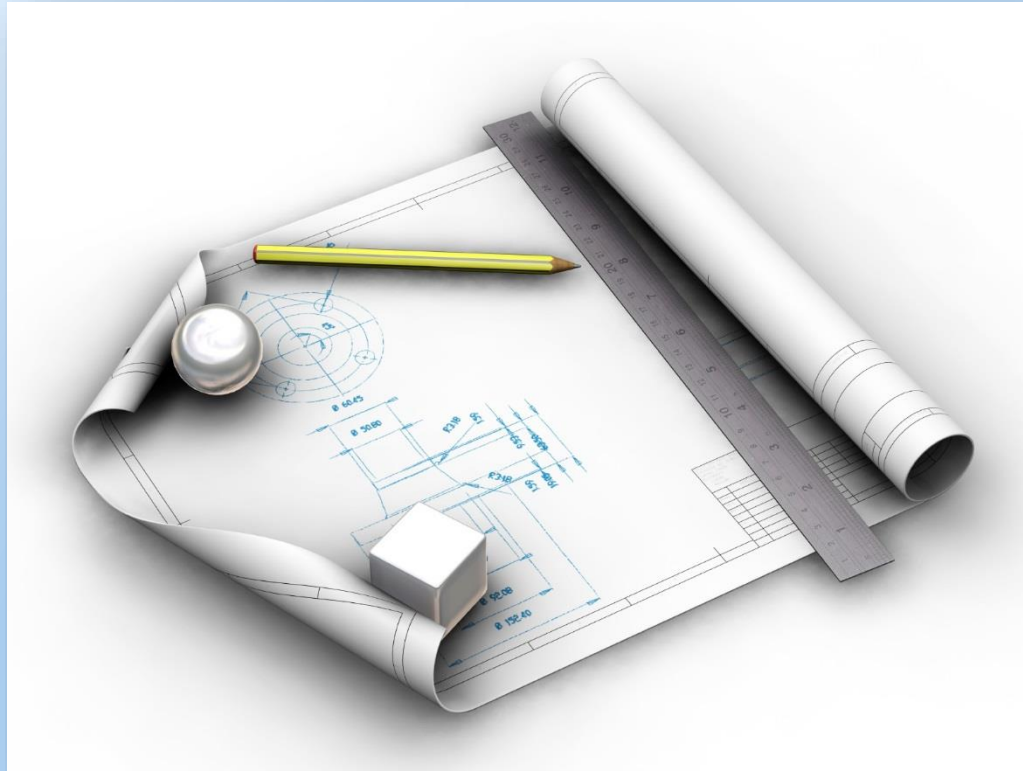
# All plant flow treated passes through ASIPS, making it one of the most critical facilities at the plant





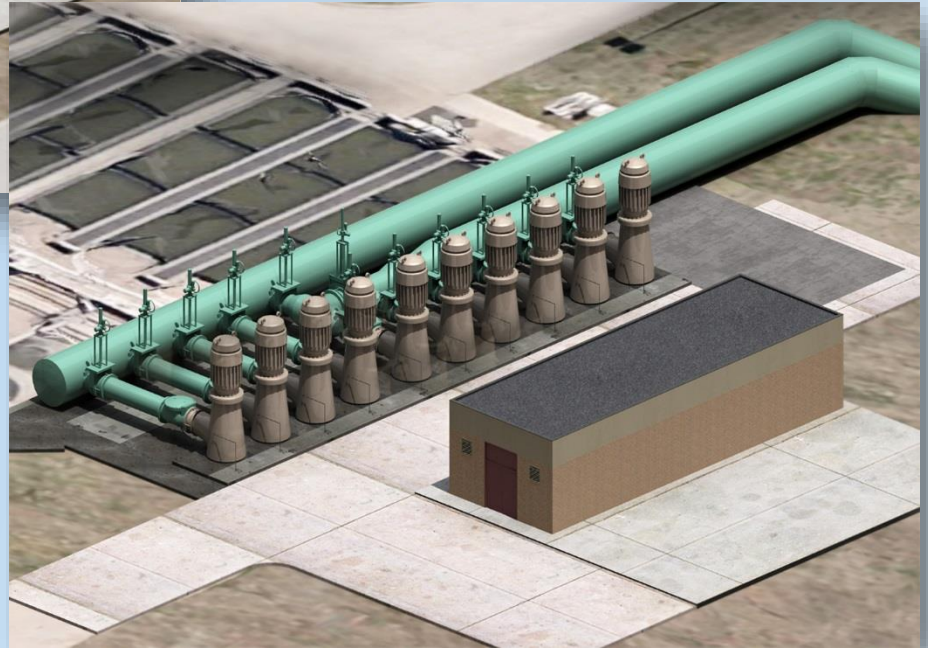
# Aged pumps, hydraulic restrictions, and air entrainment reduced reliability





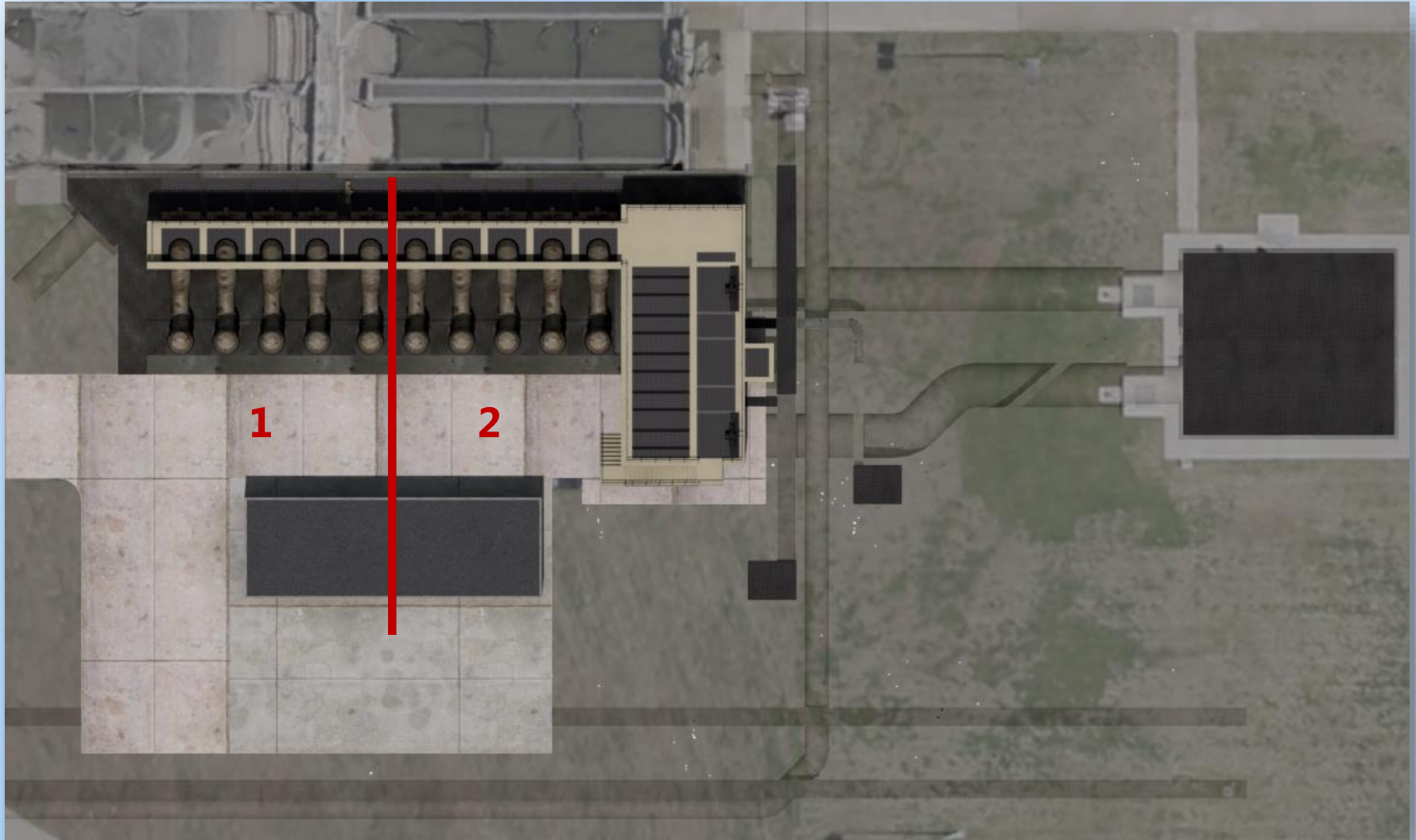
**The Plan...**

# Replace the entire pump station in place





# Construction sequence to work on half of the pump station at a time

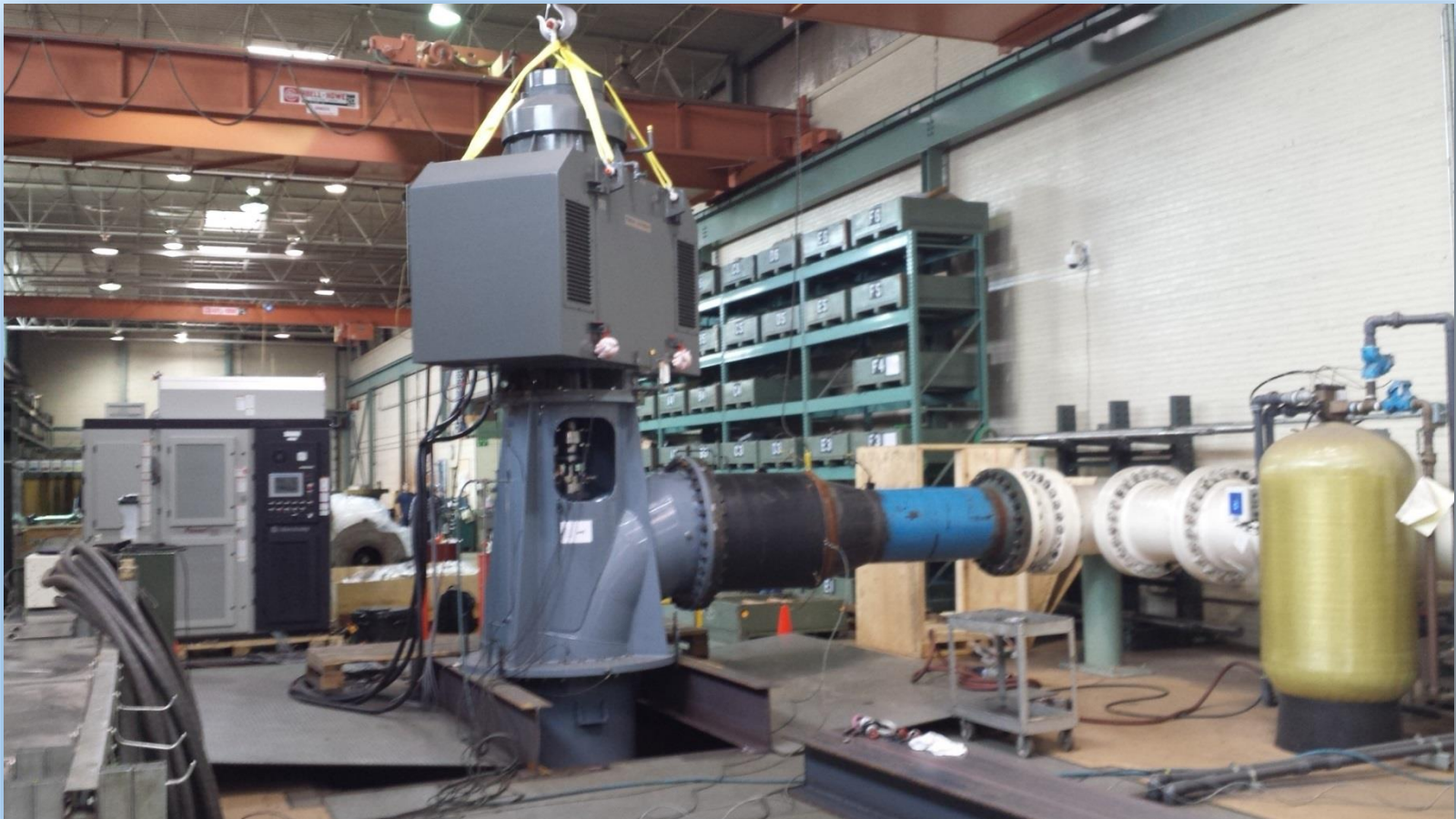


# Phase I – Demo pumps 1-5 (May 2016)





# Phase II – Witness test pump and VFD 1 (December 2016)



# Phase III – Install header and 5 pumps (7-day test completed February 10, 2017)





# Phase IV – Demo remaining existing (beginning February 13, 2017)





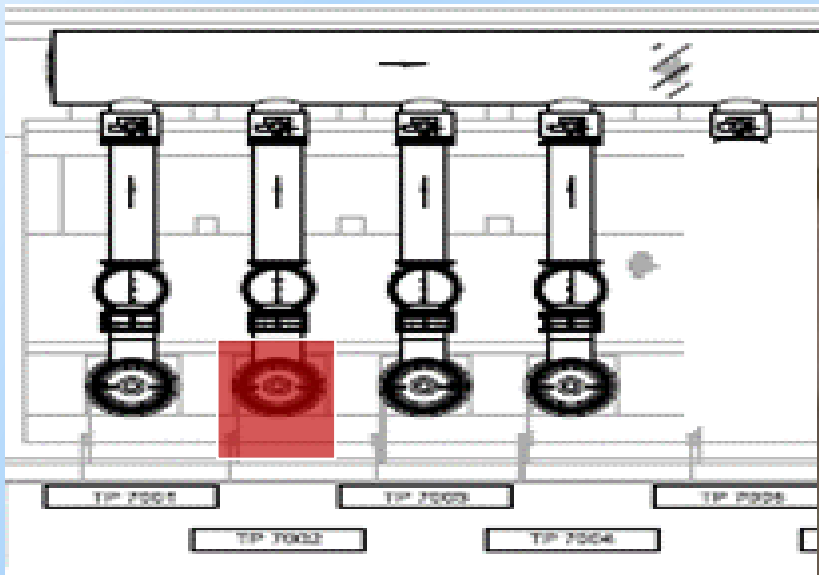
# Phase V – Witness test pump 7 and VFD (February 23, 2017)



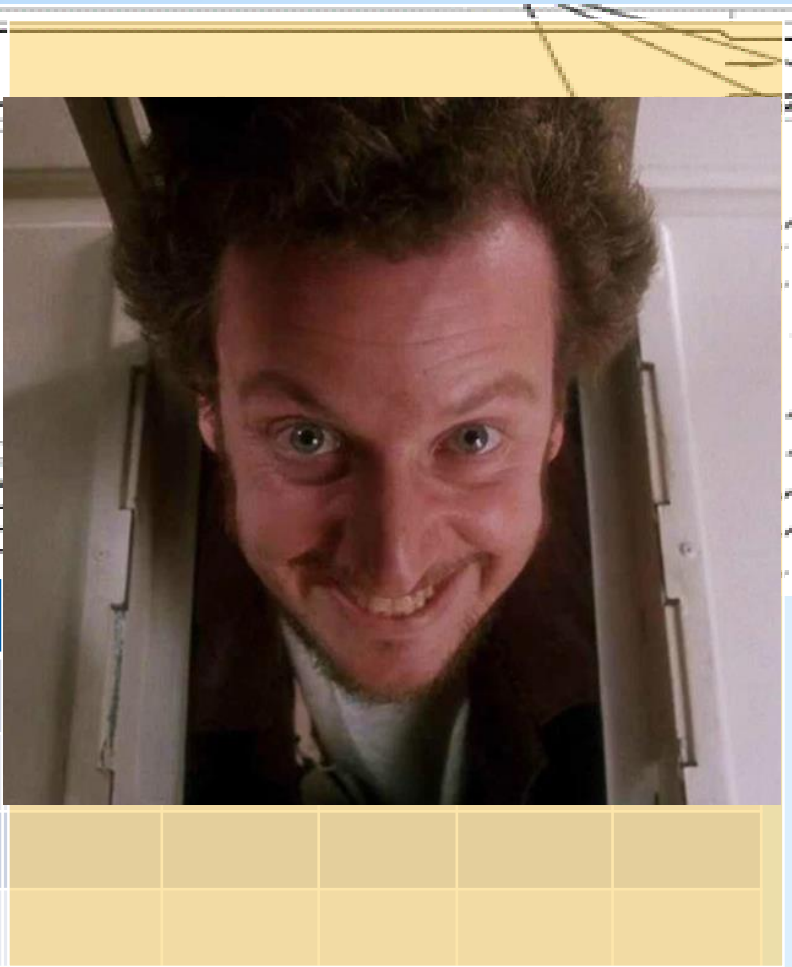


Things go wrong...

# Couplings begin to fail February 24

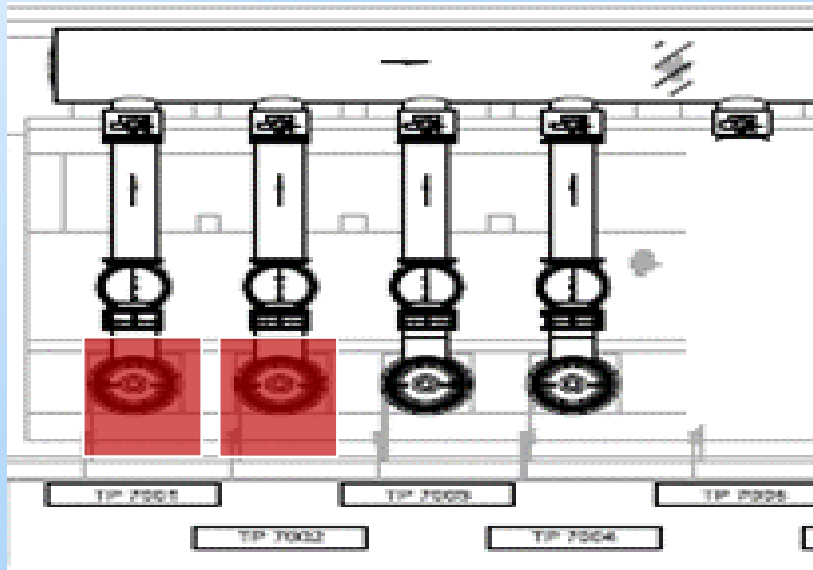


Tag	7001	7002	7003	7004	7005
		2/24			
	~150 mgd capacity, new pumps				





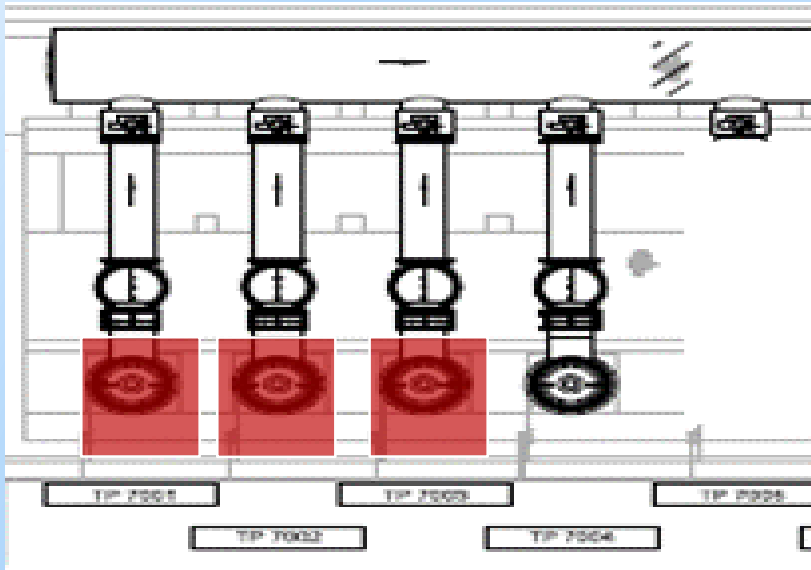
# ...and continue...



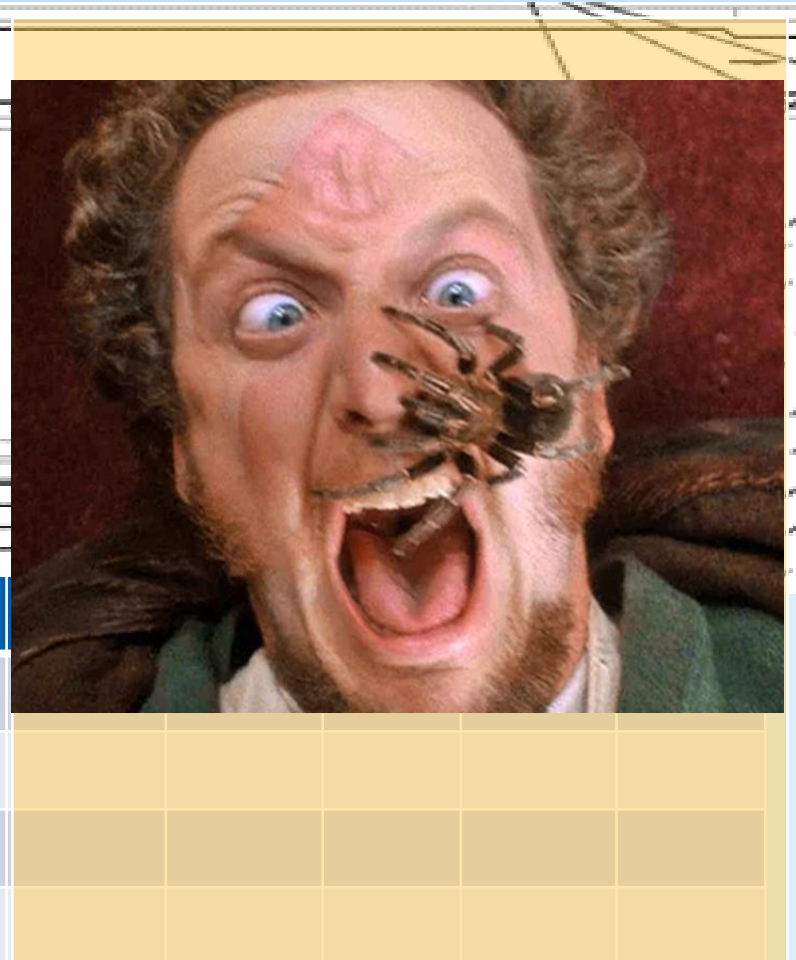
Tag	7001	7002	7003	7004	7005
		2/24			
	3/2				
	~100 mgd capacity, new pumps				



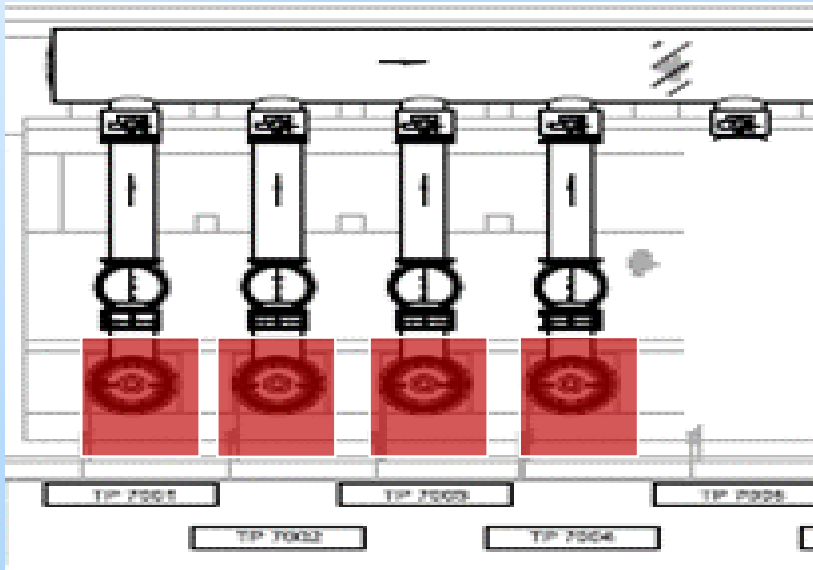
# ...and again...



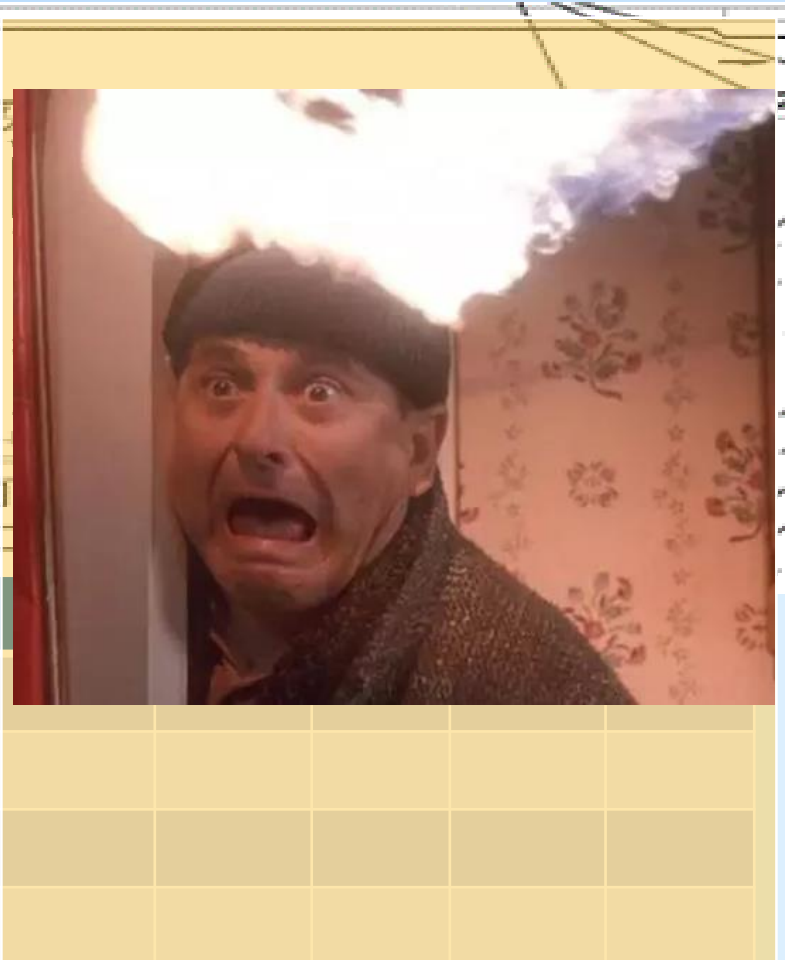
Tag	7001	7002	7003	7004	7005
		2/24			
	3/2				
			3/6		
	~50 mgd capacity, new pumps				



# ...until 4 new pumps fail in 2 weeks



Tag	7001	7002	7003	7004	7005
		2/24			
	3/2				
			3/6	3/8	
	~0 mgd capacity, new pumps				







**Panic time!**

# Out with the new, in with the old!

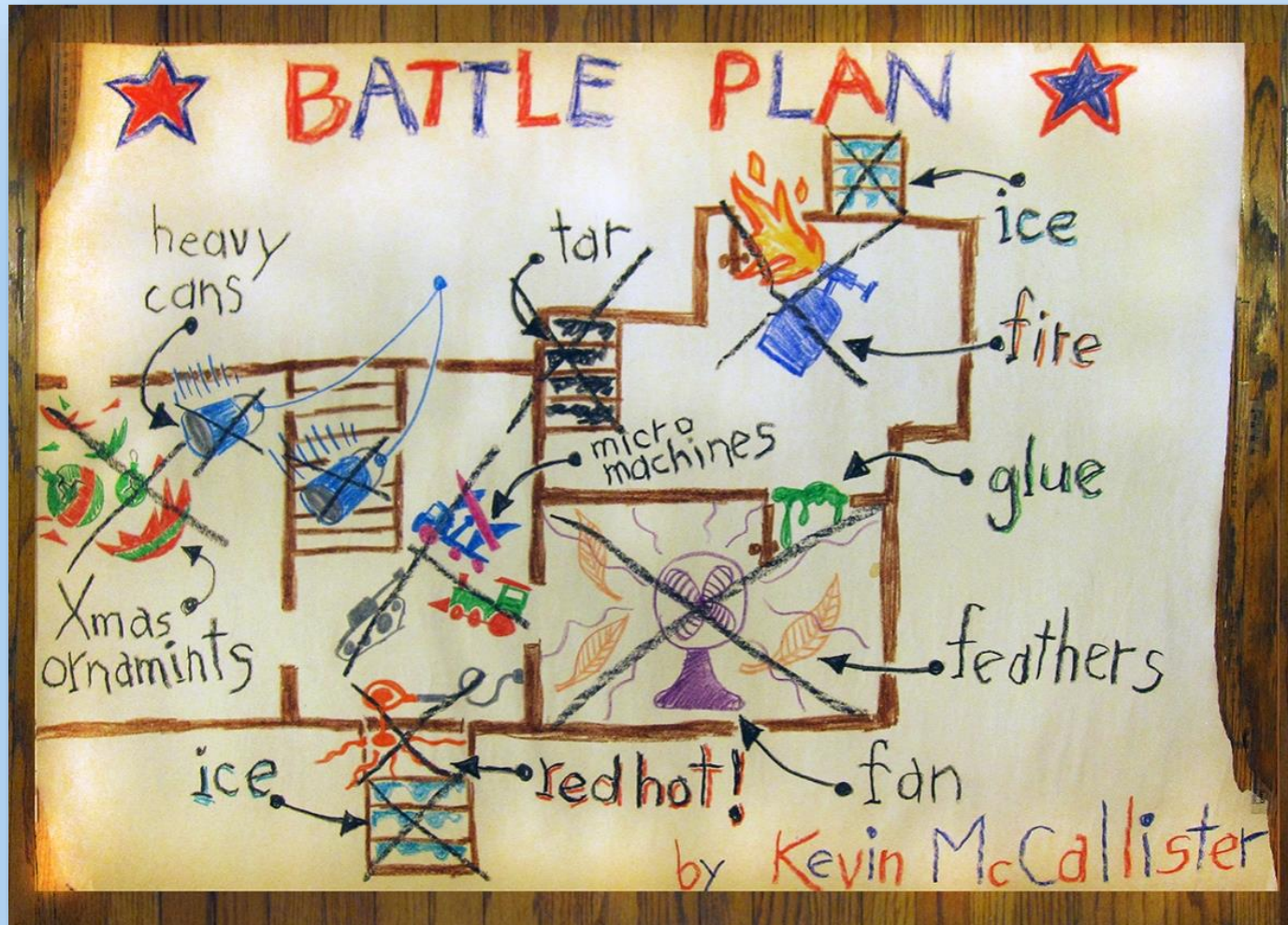


5 original pumps were reinstalled within 20 days after the first failure





All hands on deck to keep the plant in service long enough to find a solution



Filename.ppt/23



VOLUME 2 OF 2

CONFORMED DOCUMENTS



DALLAS CWWTP  
SEE LOCATION MAP



IN ASSOCIATION WITH:



ORIGINAL SEALED BY SCOTT PATRICK HOFF 52215 TX LIC. No. 68054 01		ORIGINAL SEALED BY TROY T. LAMAR 52215 TX LIC. No. 05701 01	
FILE	NUMBER	DWG	SHEET
4520	48	G-01	1

# Root cause analysis found coupling design and manufacturing problems



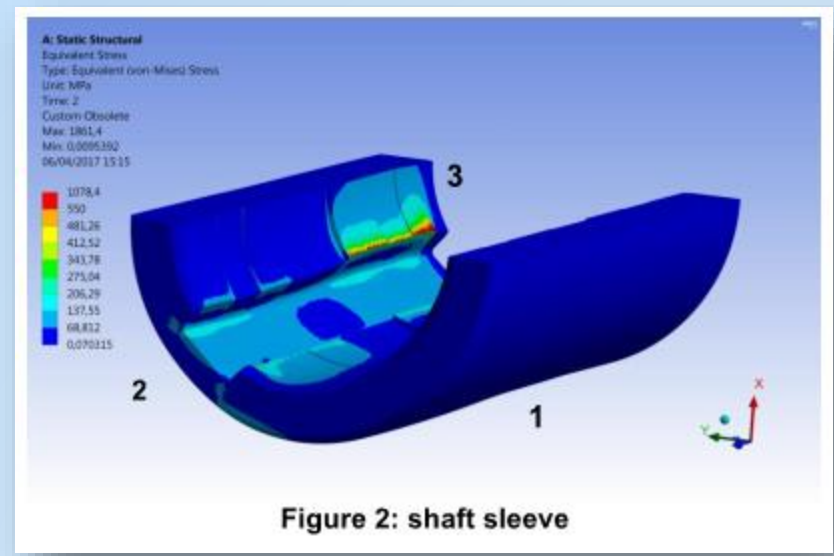
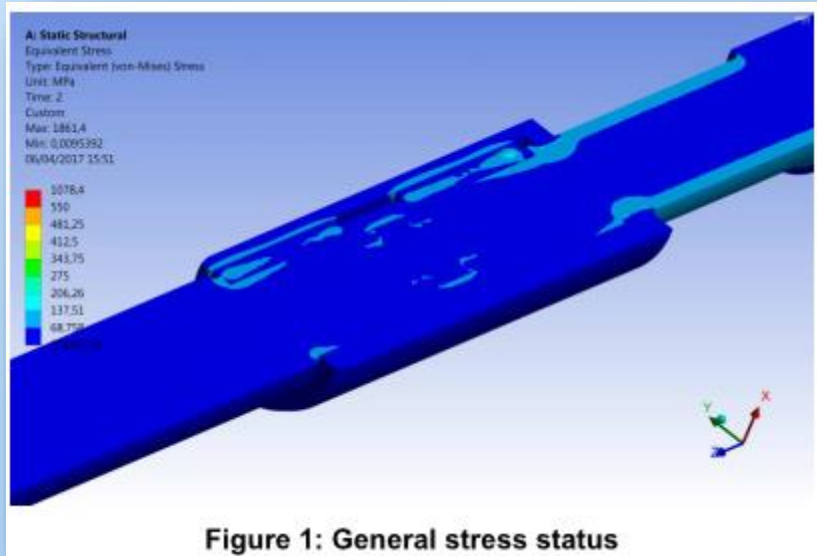
Broken shaft coupling sleeve (typical)



Broken shaft coupling sleeves, typical break patterns



# A new coupling design was completed using finite element analysis



# New couplings on the way



# All pumps had been retrofitted and reinstalled by July 2017





# How you respond to a problem makes the difference

- Murphy's law is real
- Keeping the old equipment was a key decision
- Owner understanding and participation is critical
- Blame assignment should not be the priority when problems arise
- Relationships and trust across the board were retained and improved

# This story has a happy ending!





**Thank you!**