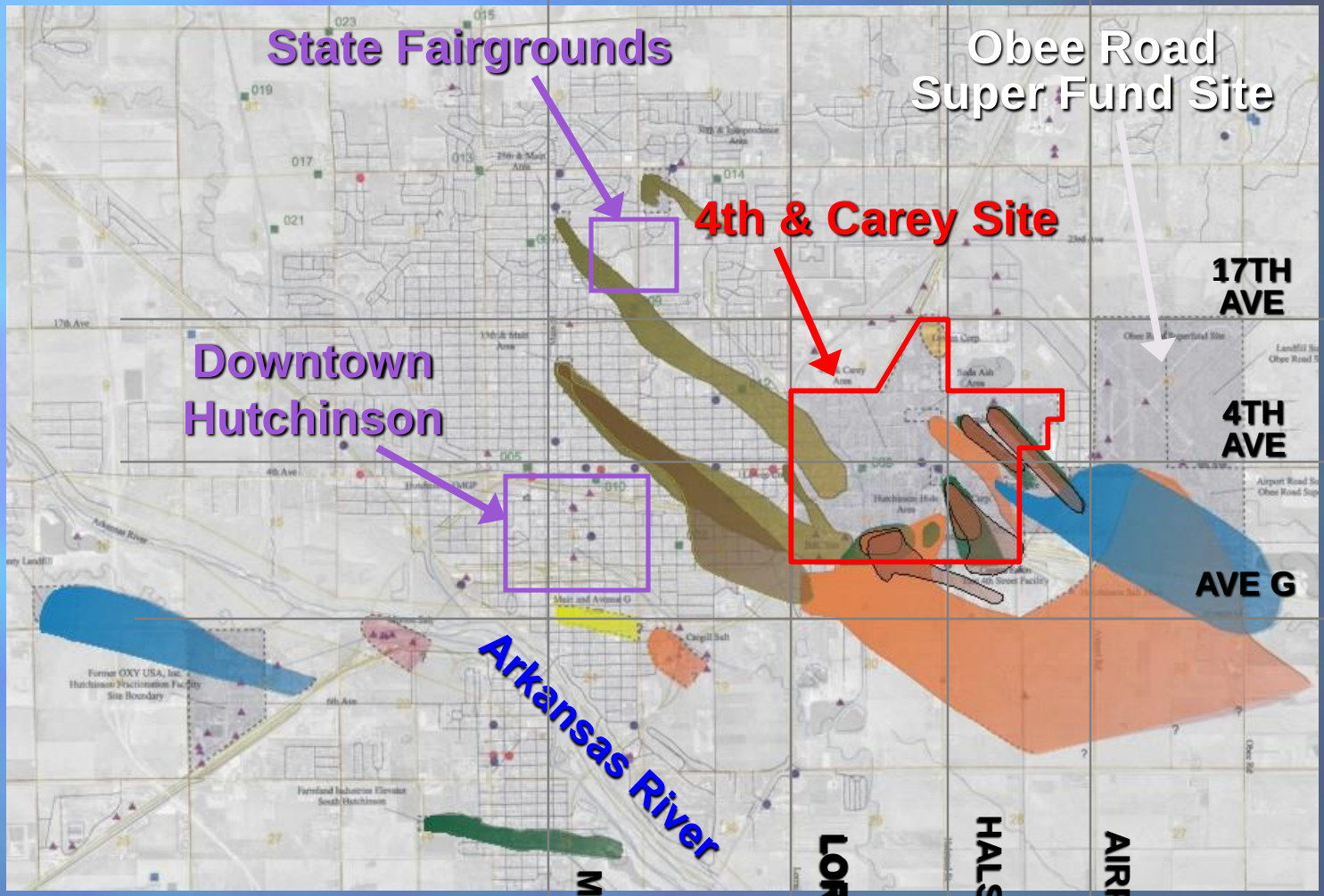
Municipal and Agricultural Cooperative Project for Groundwater Contamination Remediation

An Agriculture /Municipal Partnership Success Story

City of Hutchinson & Brack Farms – Hutchinson, KS

Groundwater Contamination Plumes

- Chlorides (1000 mg/L)
- Trichlorethene (TCE)
- Tetrachloroethene (PCE)
- Carbon Tetrachloride
- Vinyl Chloride

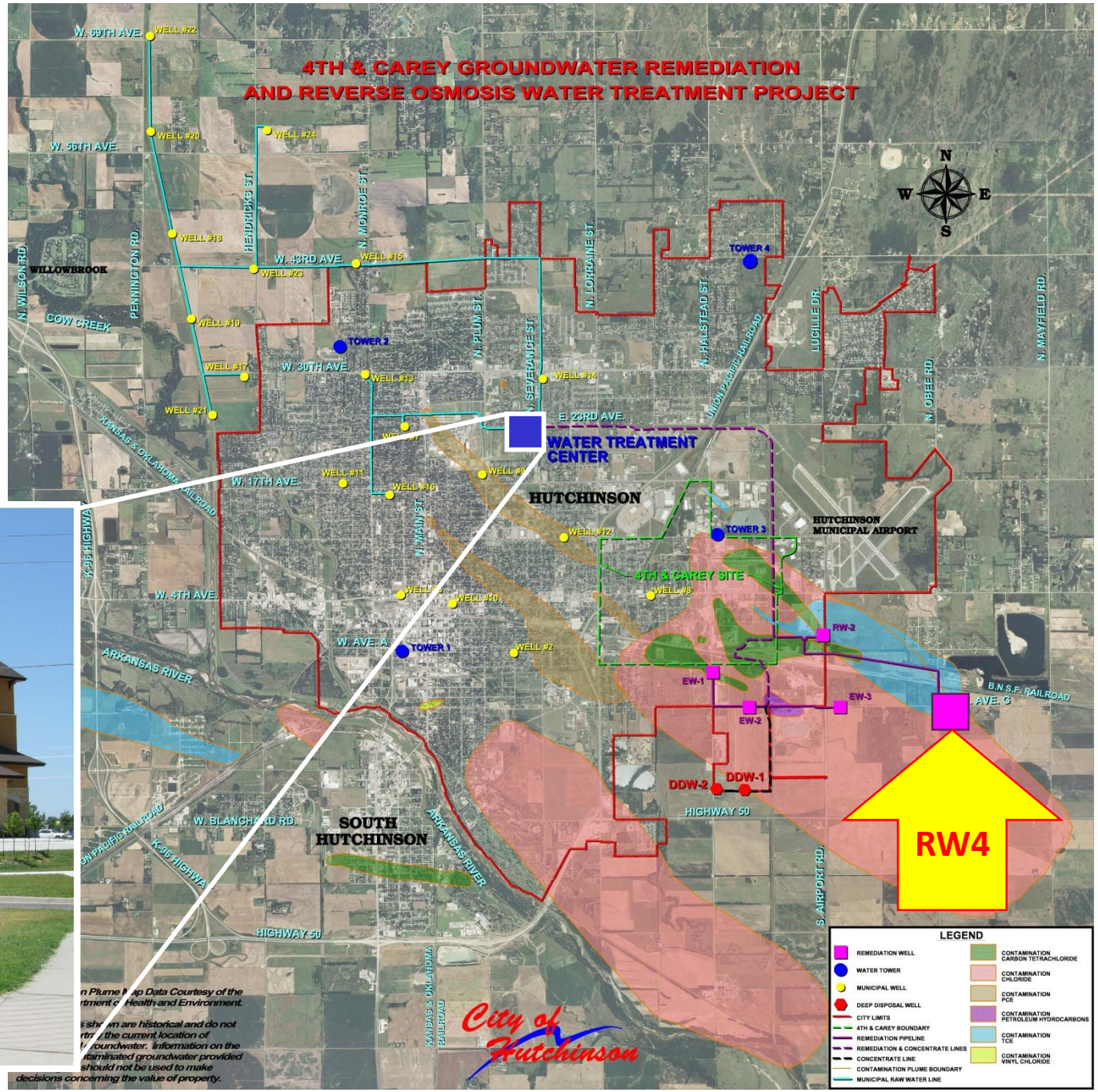


CITY OF HUTCHINSON

Primary Remediation Project Goals

- Prevent contaminant plume migration
- Remove contaminants from aquifer
- Reclaim contaminated water, treat and reuse beneficially
- Improve Water Quality for Public Water Supply
- Comply with Federal and State Regulations with a Comprehensive Solution

GOALS ACHIEVED!!



RW4 Groundwater Remediation Well
1000 GPM – Continuous Pumping

RW4 Biological Fouling

Creates Water Treatment Challenges

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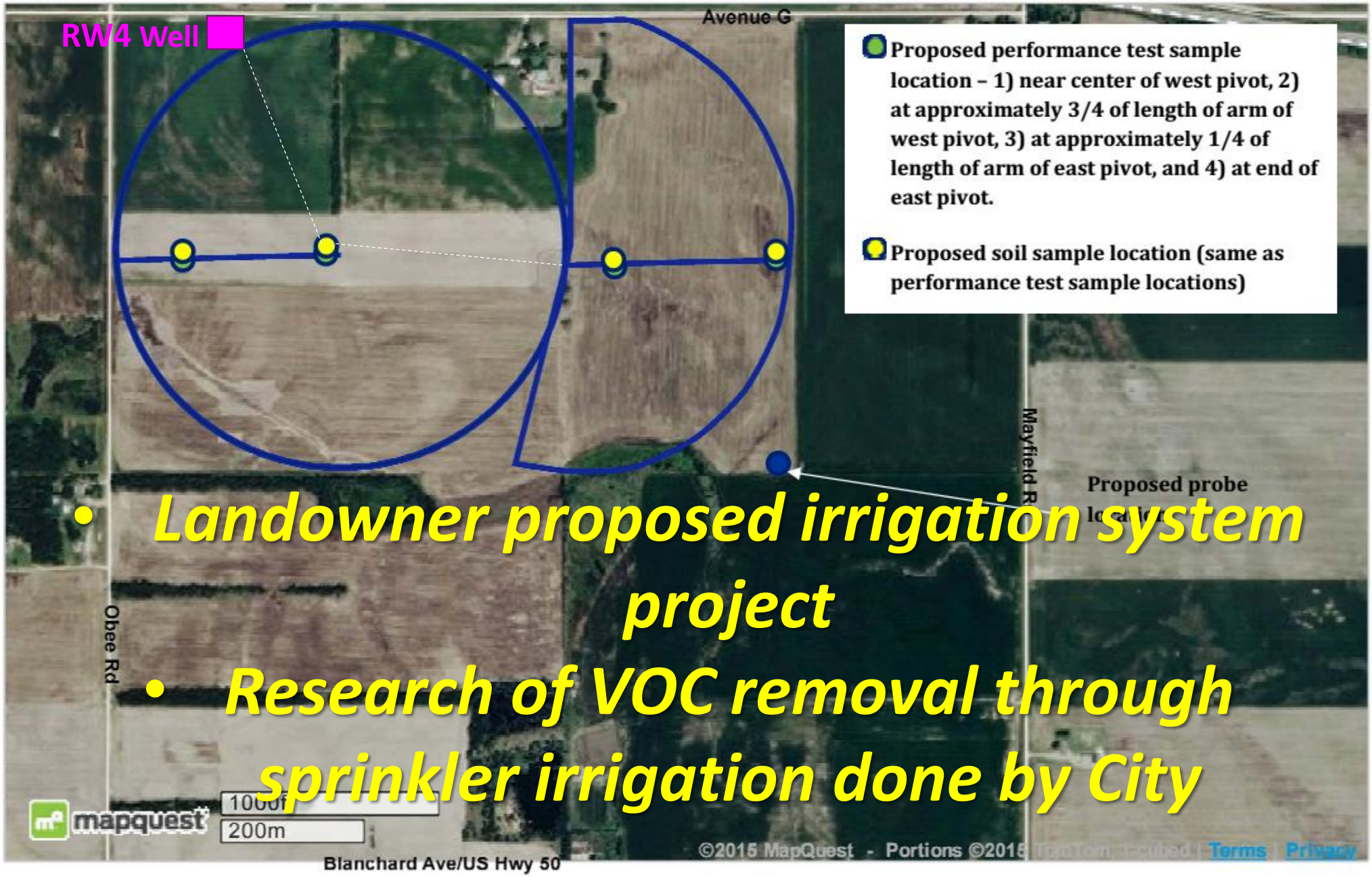
Creates Water Treatment Challenges



- *Landowner proposed irrigation system project*
- *Research of VOC removal through sprinkler irrigation done by City*

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RW4 Remediation Alternative Proposal

Project Benefits	Water from RW-4 has excessive mineralization and iron bacteria fouling that requires extensive water treatment. By eliminating the flow of water from RW-4 to the RO plant for a period of 2 to 3 months, numerous cost saving measures will take place. These measures include cost reductions in:
Water Treatment Cost Savings	RO cleaning chemicals RO process chemicals: antiscalant, sodium-bisulfite, sodium-hydroxide, chlorine Electrical costs: Low Service, RO Booster, Backwash and CIP pumping Lower production of finished water for filter backwashing Lower production of RO permeate water for RO membrane cleaning (CIP)
Equipment Cost Savings	Wear and tear on Waste Transfer, Backwash and CIP pumps/motors Degradation of RO membranes Degradation of pressure filter media: anthracite and greensand plus Pipeline maintenance

RW4 Remediation Alternative Proposal

RW-4 Groundwater Remediation/Irrigation Project

City Cost Benefit Analysis

Annual Savings

	Component	Cost Savings Estimate (per year)		Comments
1)	Electrical Power (well)	$	-	Minimal to no change anticipated in well electrical costs (landowner will reimburse City for irrigation power use)
2)	Electrical Power (plant)	$	2,330	Lower pressures from RO booster pumps/motors due to better quality feed water, less frequent use of CIP pump/motor for membrane cleanings, less frequent use of backwash pumps/motors, and less frequent use of low service and RO booster pumps in the production of backwash water
3)	RO Membranes	$	5,040	Reduction in membrane wear from fouling, cleaning and additional feed pressure prolonging life expectancy
4)	Pressure Filters	$	1,000	Reduction in damage to pressure filter media from poor quality water
5)	RO Membrane Cleaning	$	7,760	Reduction in clean-in-place chemicals
6)	Process Chemicals	$	330	
	chlorine	$	240	Reduced treatment of backwash supply water, and pretreatment water
	sodium-bisulfite	$	5	Reduced treatment of backwash supply water
	sodium-hydroxide	$	56	Reduced treatment of backwash supply water
	antiscalant	$	29	Reduced treatment of backwash supply water
7)	Pump/Motor Wear	$	1,000	Reduced effect of poor water quality on low service and waste transfer pumps
8)	Waste Concentrate	$	2,000	Improvement of concentrate quality will improve detrimental impact to disposal wells
9)	Well Treatment	$	-	No change
10)	Pipeline Maintenance	$	640	Increased time intervals between pipeline pigging due to iron bacteria removal
11)	Monitoring & Reporting	$	(1,500)	Additional sampling, analysis and reporting
12)	Easement	$	500	No easement cost for new well due to landowner benefit from irrigation
13)	Water Use Cost	$	(267)	No change in municipal use fee, but slight increase in water use assessment
	Total Annual Savings	**$**	**18,833**	

One Time Costs

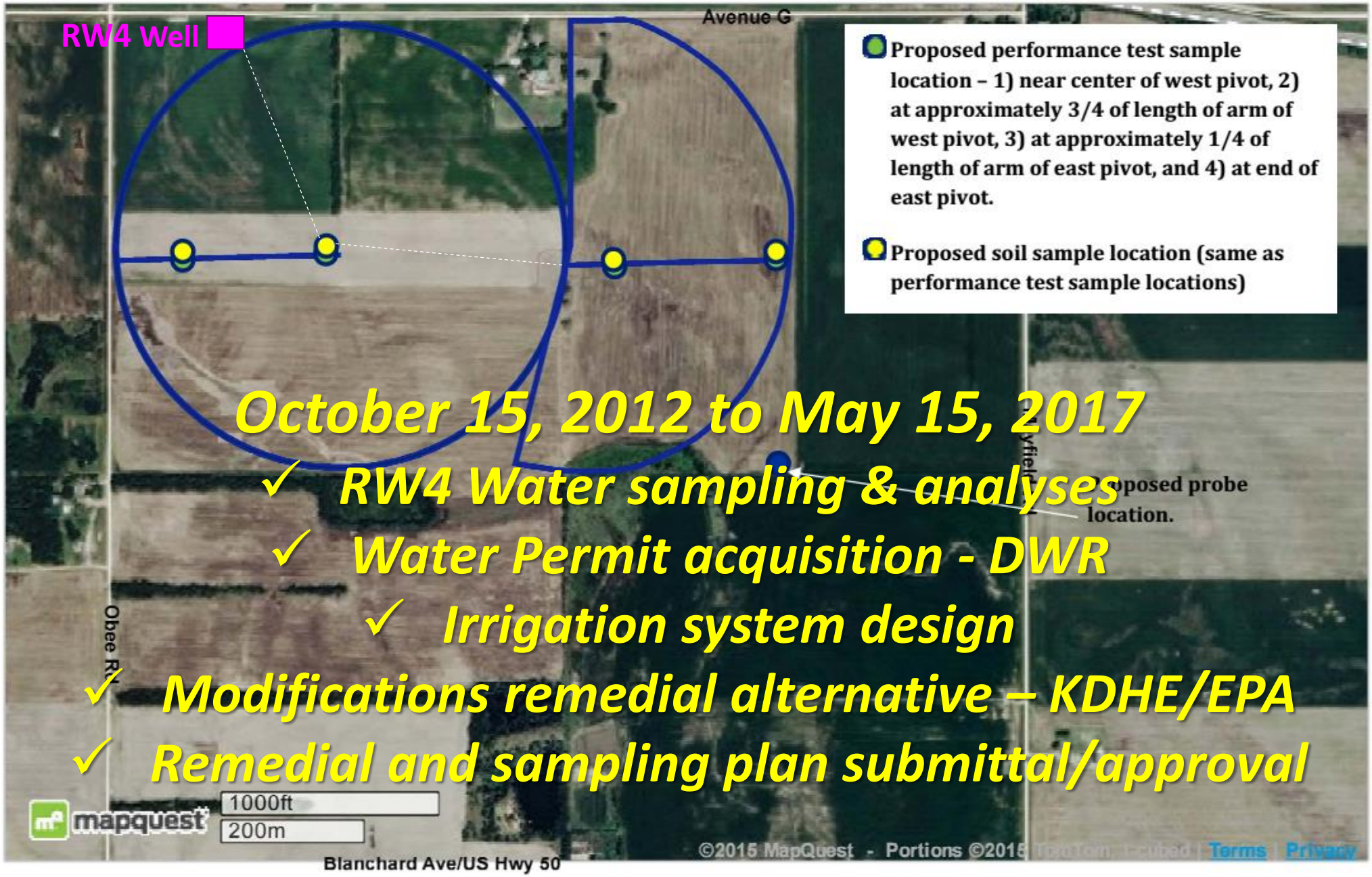
	Component	Cost Estimate		Comments
1)	Monitoring	$	8,000	MW well (1), Analyses (26), Equipment
2)	KDHE Oversight	$	7,500	Estimated - Not substantiated
3)	Piping Modifications, valves, flowmeter, controls, etc.	$	12,767	Estimated not to exceed value
4)	Consultant work	$	8,000	Included under Work Authorization
	Total Project Costs	**$**	**36,267**	

No. of Years for Return on Investment = 1.93

Project Partnership

Project Responsibilities

City Responsibilities	Landowner Responsibilities
Well drilling and construction (completed)	Irrigation check valve
Pumping equipment and operation (completed)	Pressure regulating valve (if needed)
Pumping equipment & remediation piping maintenance	Irrigation system, electrical & controls
Well operation and maintenance	Irrigation piping from well house to pivot(s)
Flowmeters	Irrigation electrical use charges (for well)
Flowmeter maintenance	Irrigation electrical use charges (for center pivots)
Water use reporting	Provide easement, rights of ingress and egress at no cost to City
Verified claim filing	Standard irrigation system O & M
Water quality monitoring	Irrigation system repairs and other associated costs
Building enclosure	Irrigation system monitoring
Application fees and processing work (completed)	
Municipal electrical use charges (for well)	
Access road (if needed)	
Irrigation system monitoring	



October 15, 2012 to May 15, 2017

- ✓ RW4 Water sampling & analyses
- ✓ Water Permit acquisition - DWR
- ✓ Irrigation system design
- ✓ Modifications remedial alternative – KDHE/EPA
- ✓ Remedial and sampling plan submittal/approval

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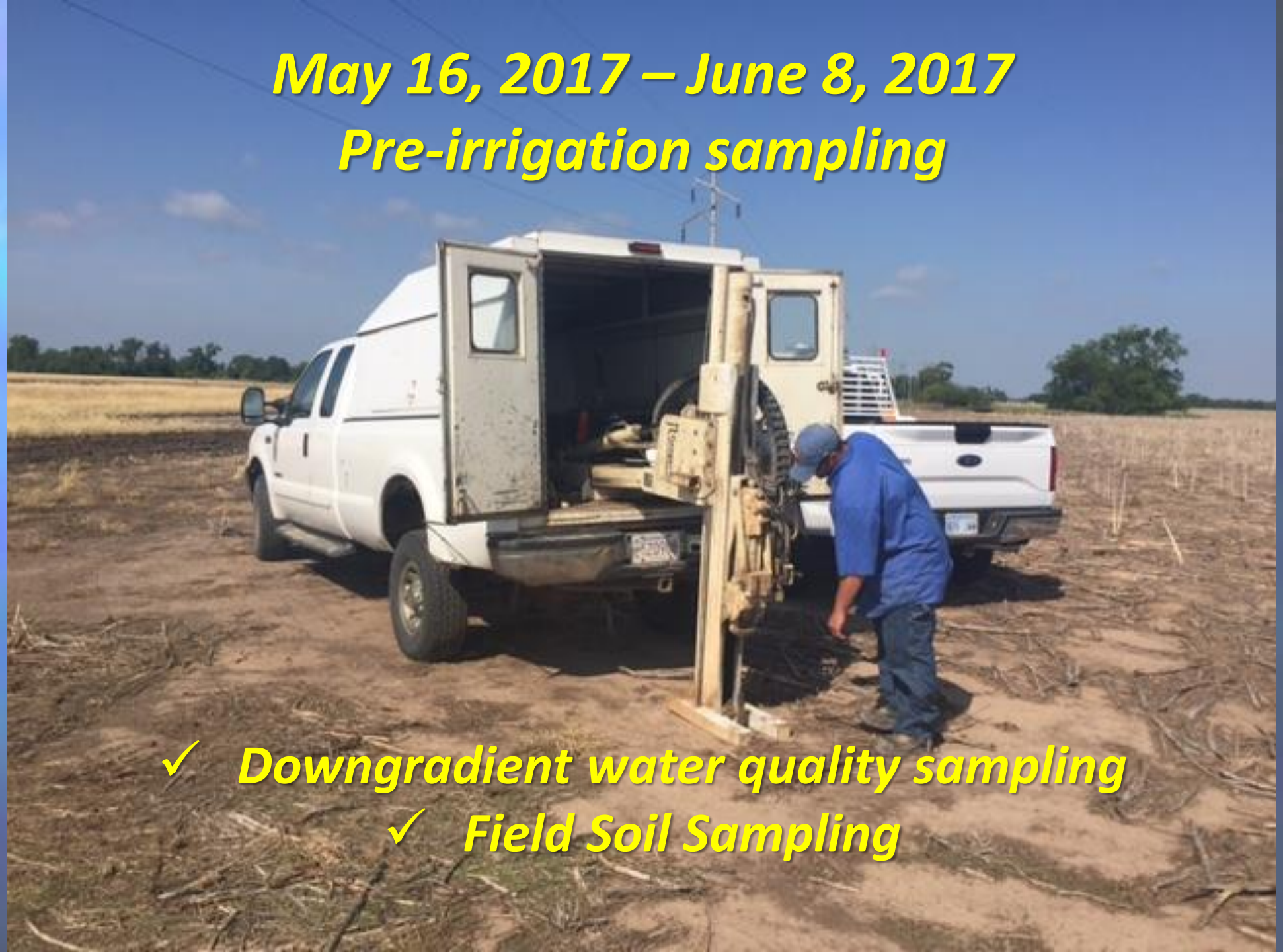
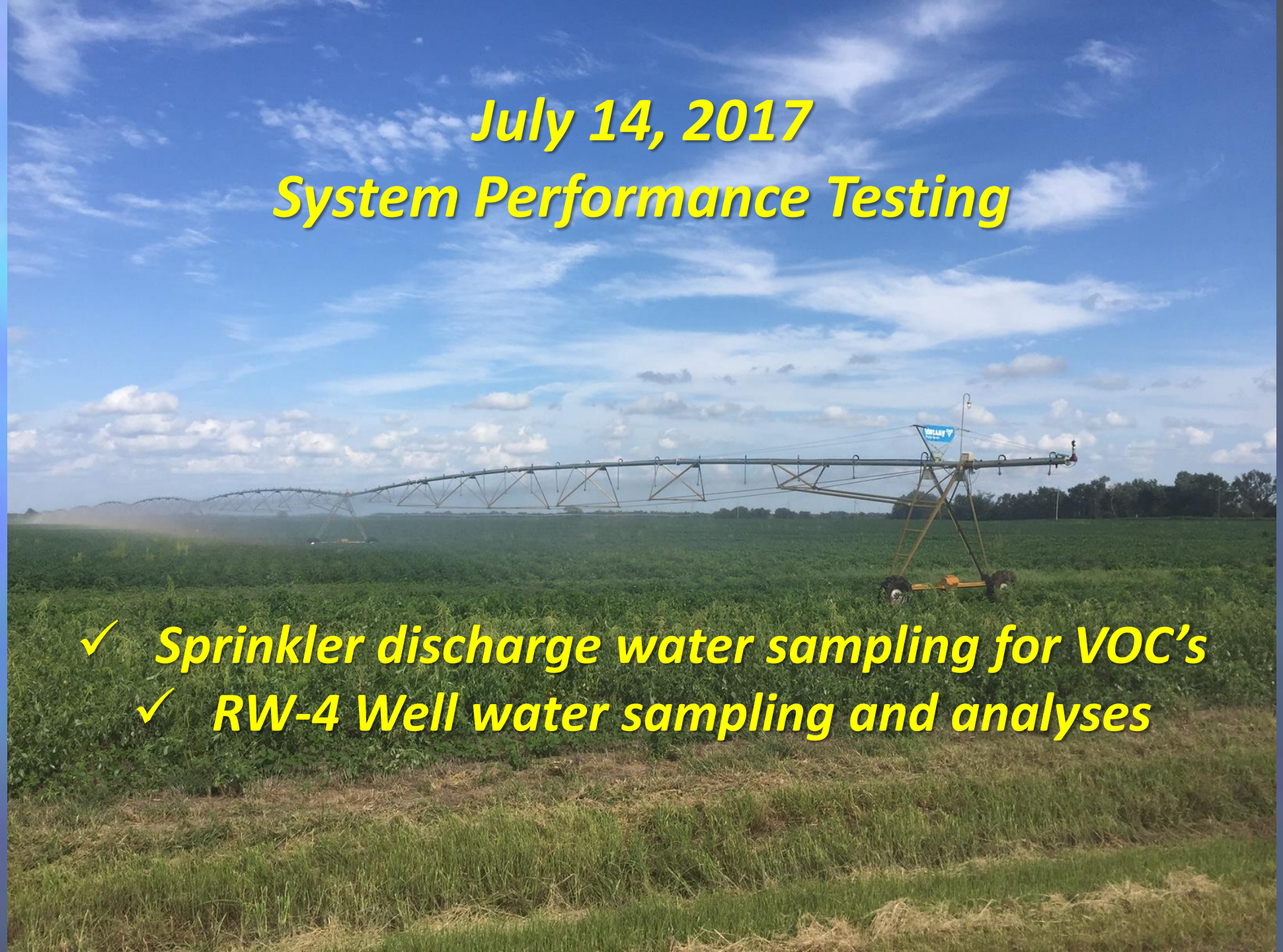
May 16, 2017 – June 8, 2017
Pre-irrigation sampling



- ✓ Downgradient water quality sampling
- ✓ Field Soil Sampling

May – June 2017
Construction

- ✓ Wellhead modifications
- ✓ Center Pivot Sprinkler installations
- ✓ Pipeline installation



July 14, 2017
System Performance Testing

- ✓ Sprinkler discharge water sampling for VOC's
- ✓ RW-4 Well water sampling and analyses

Automated Control Valves

Verizon 10:21 PM 100%

Map View

List | Map

List | Device | More

Verizon 10:21 PM 100%

City West
112424

No Warnings

Start
None Scheduled

Stop
None Scheduled

Last Reading: 09/11/17, 9:56 PM

IDLE	184.5°	50.0%	OFF Endgun
FWD	0 psi	0.66"	OFF Endgun 2

Direction

Reverse | Forward

No Commands

List | Device | More

Verizon 10:21 PM 100%

City East
123657

No Warnings

Complete Revolution
12 hr 12 min

Remaining Revolution
11 hr 41 min

Last Reading: 09/11/17, 9:58 PM

ON	174.1°	70%	OFF Endgun
REV	37 psi	0.44"	OFF Endgun 2

Direction

Reverse | Forward

No Commands

List | Device | More

First Year Project Results Summary

- ✓ 94% to 100% VOC removal
- ✓ Sprinkler water VOC's (<= 2.2 ppb cis 1,2 DCE) below 70 ppb MCL
- ✓ Uninterrupted flow transfer without well operation stoppage
- ✓ Post-irrigation season soil samples all non-detect for VOC's
- ✓ Total amount of water remediated through sprinkler Irrigation: 53,930,000 gallons (165.5 acre-feet)
- ✓ Soybean crop yield gains achieved from irrigation
- ✓ Municipal water treatment savings as projected

Agriculture/Municipal Project Partnership Success

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Questions?