# City of Salina Raw Water Supply Study

## Planning Session with Salina City Commission

**December 8, 2008**
**2:30 PM**

# Introductions

- HDR
  - Donald Lindeman, Project Manager
- Wilson & Company
  - Jason Schlickbernd, Asst. Project Manager
- Layne Christensen
  - Luca DeAngelis Hydrogeologist

# Agenda for Today

- Summary of Raw Water Supply Study
  - Drivers/Purpose of Study
  - Scope of Study
- Work completed to date:
  - Demand Projections
  - Review of Water Rights and Regulatory Impacts
  - Review of Existing Sources of Supply
- Citizen's Advisory Board
- What's Next

# Summary of Raw Water Supply Study

# Study Drivers

- July 2006 experience
  - Water Emergency
  - Smoky Hill River flow 1.2 cfs (0.78 MGD)
  - City consumption normally approx 12 MGD (max day)
    - Reduced to 7.1 MGD (max day)
  - Water rights administration between Kanopolis Lake and City of Salina
- Drought of 2000-2006
  - Less severe in terms of precipitation than previous droughts
  - More severe in terms of stream flows than previous droughts
  - Future droughts likely to mimic drought of 2000-2006

# Purpose of Study

- Recent drought conditions (2000-2006)
  - Decreased flow in Smoky Hill River
  - Connectivity of groundwater and Smoky Hill River
  - Decreased groundwater levels
  - Reduced aquifer recharge
- Contamination issues near Downtown Wellfield
- Strained ability of City to maintain adequate water supply for customers
- Identify sustainable solutions for next 50 years
- Diversify water supply sources

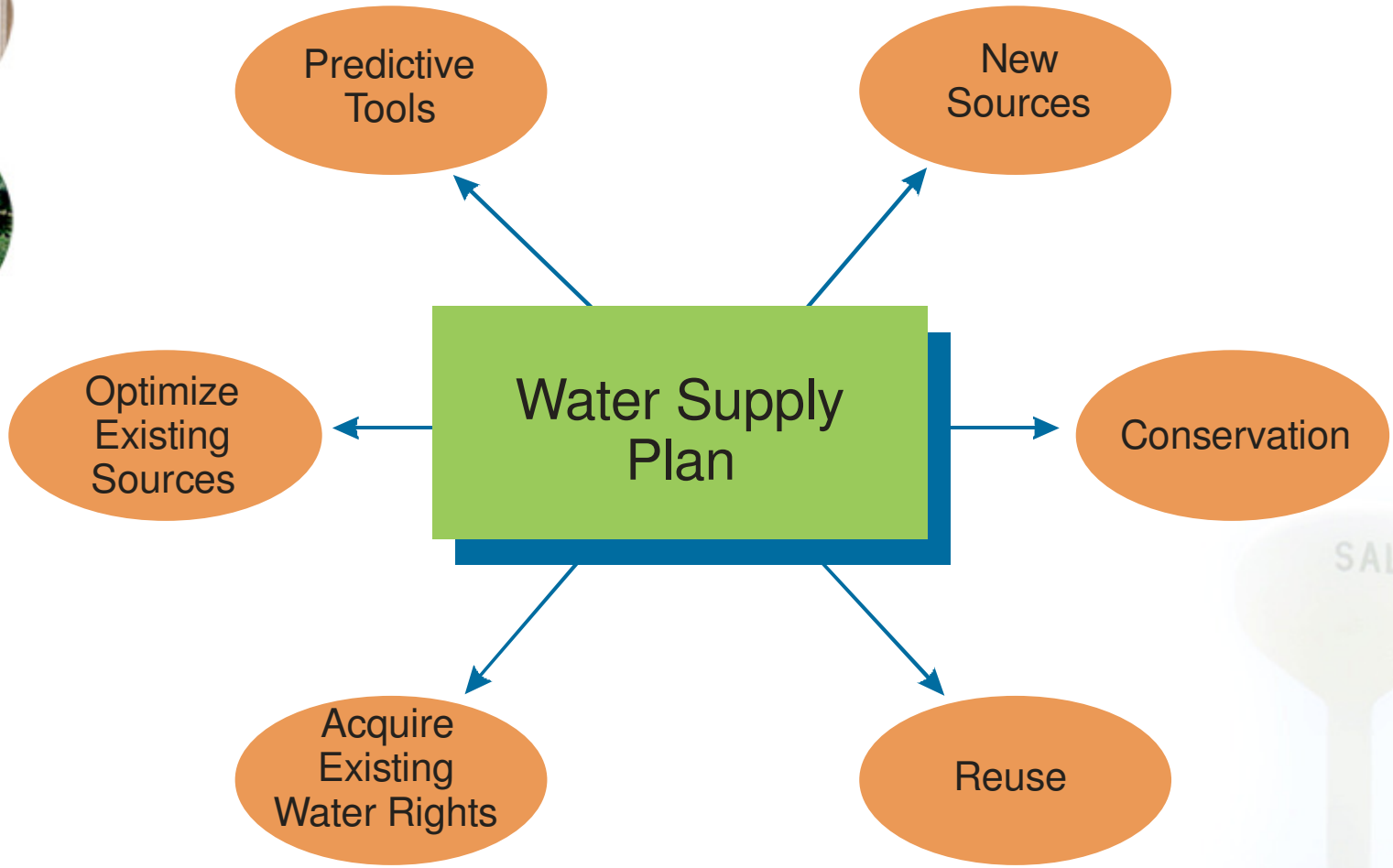
# Scope of Study

- Water Demand Projections – July, 2008
  - Update water demand projections through 2060
- Water Rights/Regulatory Review – Sept/Oct 2008
  - Summary of existing water rights
  - Water rights related to future demands
  - Existing and Future Regulatory Review
- Existing Sources of Supply – Oct/Nov, 2008
  - Smoky Hill River, Downtown Wellfield, South Wellfield
  - Evaluation of existing facilities
  - Optimization of existing sources
  - Water balance model

# Scope of Study (continued)

- Conservation Plan – Nov/Dec, 2008
  - Modifications to existing conservation plan
  - Conservation rate structure for water rates
- Reuse Evaluation – Nov/Dec, 2008
  - Available treated wastewater flows and regulatory requirements
  - Identify application options
- Alternatives Evaluation – Jan/Feb, 2009
  - Identify potential new sources of supply
  - Alternatives evaluation
  - Pull all options together (new sources, optimization of existing sources, conservation, reuse) into Capital Improvements Plan (CIP)

# Solution will be Multi-faceted Plan



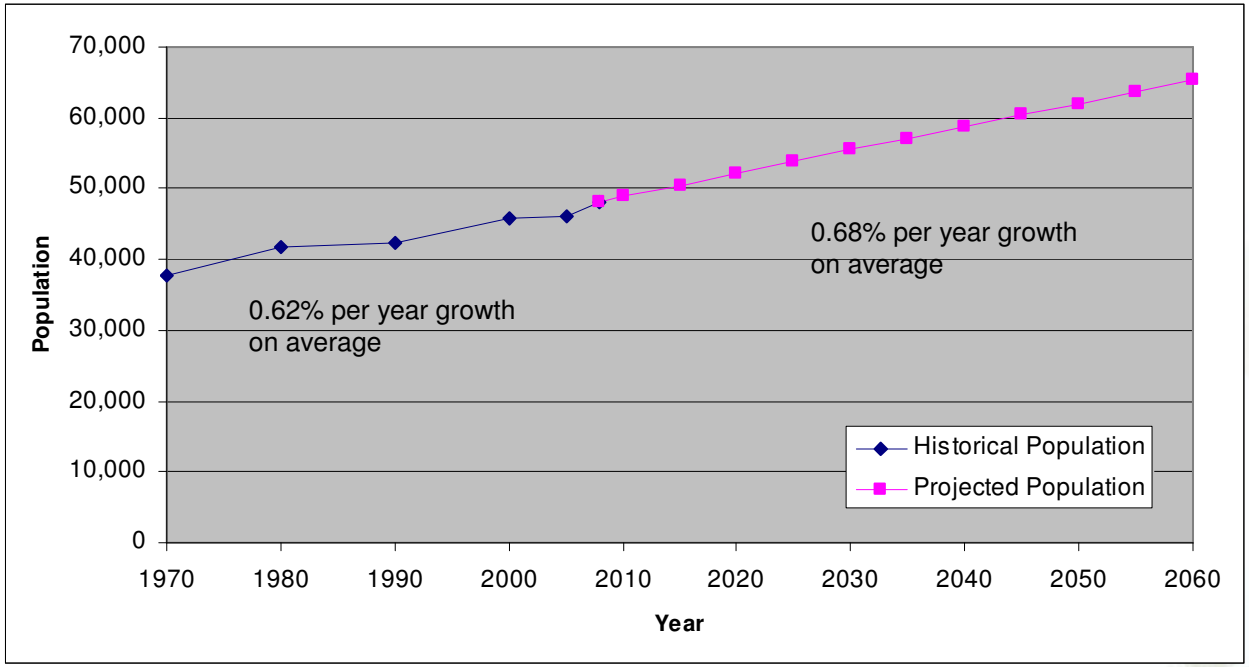
# Water Demand Projections

# Objectives – Water Demand Projections

- Determine water demand projections through 2060
- The following were considerations:
  - Population projections
  - Historical water sales
  - Historical per capita usage (126 gpcd)
  - Historical peaking factors (2.05)
  - Future reserve capacity
    - Reserve capacity for future industrial development
    - Valuable in attracting significant water users
    - 15% of average day demands

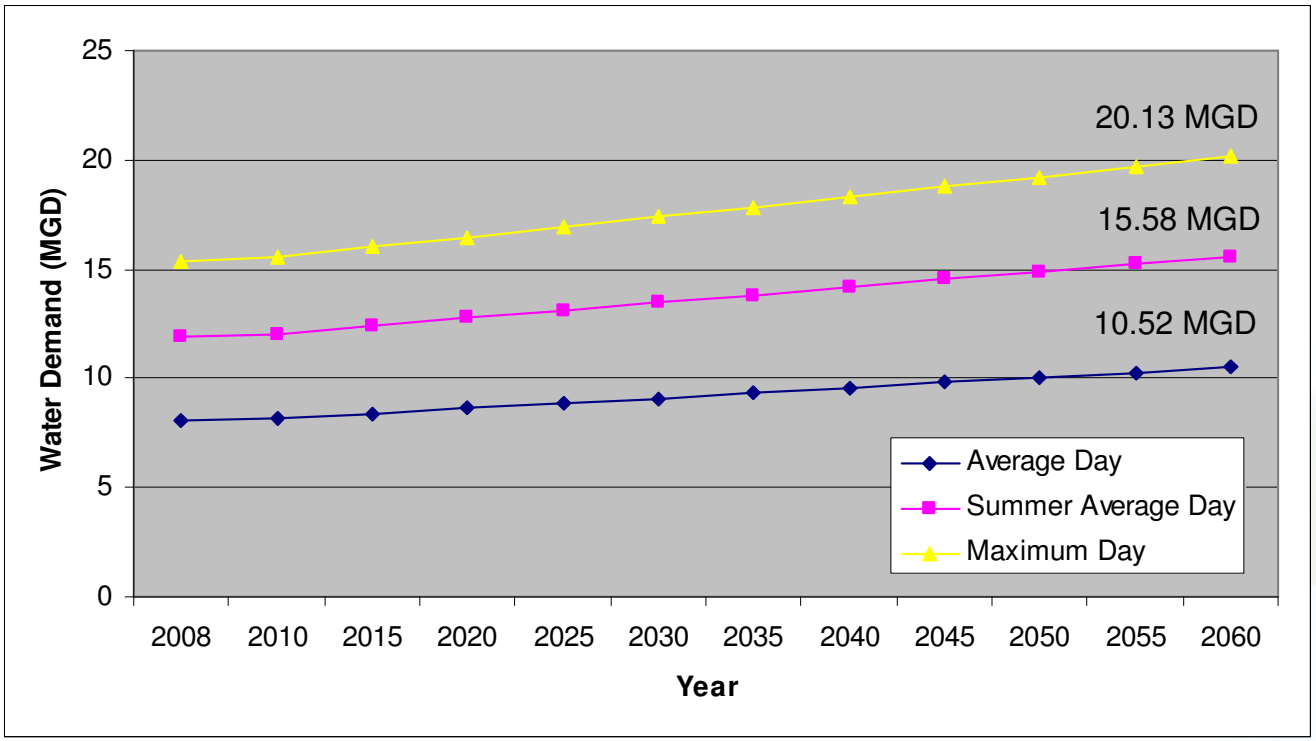
# Population Projections

- Same projections used in Comprehensive Plan update
- Linear projections out to 2060
- Approximately 65,000 people by 2060



# Demand Projections for Planning Horizon

- Demand projections are basis for identifying sustainable supplies for future water supply



# Water Rights and Regulatory Review

# Objectives – Water Rights and Regulatory Review

- Determine existing “paper” water rights
- Adequacy of water rights to meet future demands
  - Includes service limitations
- Evaluate existing compliance with water quality regulations
- Assess impacts of anticipated future regulations
- Hold meeting with State regulators

# Water Rights Overview

- A water right is the right to use water, not ownership of the water itself
- “Water” refers to groundwater or surface water
- Two types of water rights
  - Vested right – rights that were being used for beneficial use prior to 1945 (senior to appropriated rights)
  - Appropriated right – rights given after 1945 for beneficial use
- Water rights have the following provisions:
  - Priority date
  - Max annual quantity and diversion rate
- Administered by Division of Water Resources

# Summary of Water Rights

| Source | Annual Quantity (ac-ft) | Max Diversion Rate (MGD) |
|---|---|---|
| Smoky Hill River [1] | 5,028 | 10.02 |
| Downtown Wellfield [2,3] | 4,993 | 13.13 |
| South Wellfield [4] | 2,511 | 3.68 |
| Total | 12,532 | 26.83 |
| Limits | 11,760 | 23.69 |

[1] Appropriated cert. 3043 dated October 16, 1954

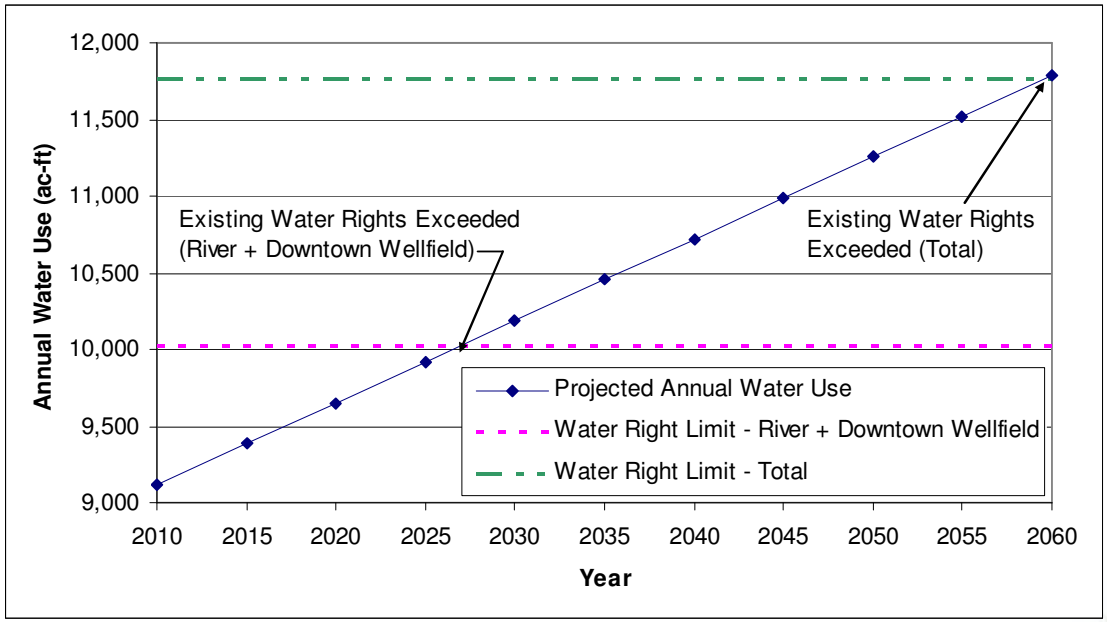
[2] Includes vested water right, appropriated cert. 7365 dated October 30, 1957, appropriated cert. 31,363 dated April 11, 1978.

[3] Each well has limits on annual quantity and max diversion rate

[4] Vested water right

# Water Rights & Future Demands - Annual Water Use

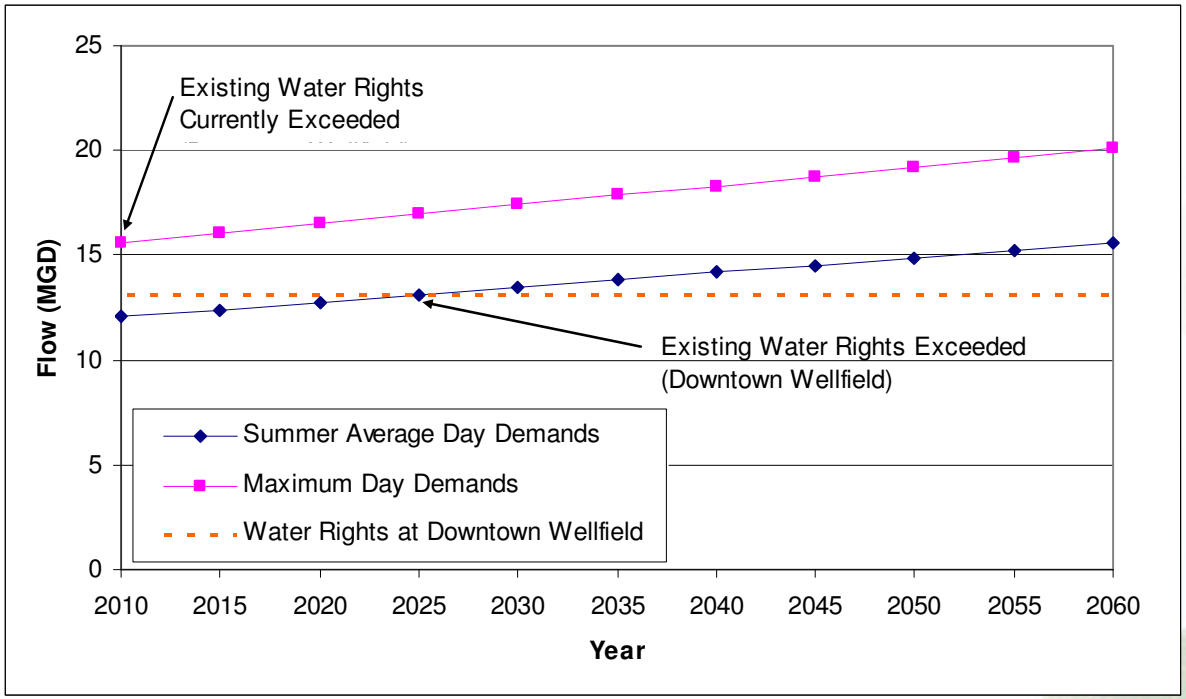
- River + Downtown Wellfield – 10,021 ac-ft (Average 8.95 MGD)
  - Shortfall in 2027
- Total Water Rights – 11,760 ac-ft (Average of 10.50 MGD)
  - Requires addition of treatment at South Wellfield
  - Shortfall in 2059




*Does not consider drought conditions

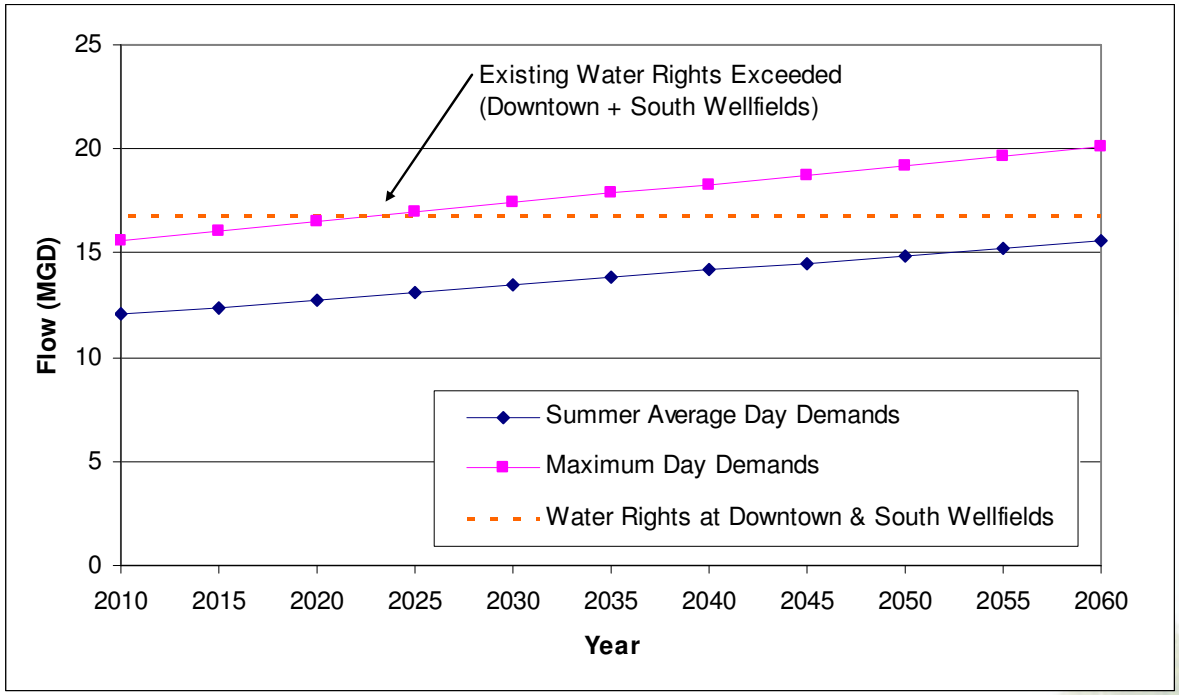
# Water Rights & Future Demands – Maximum Withdrawal Rate

- Drought conditions – assume no supply in river
- Downtown Wellfield water rights – 13.13 MGD
  - Max day exceeds water rights for duration of planning horizon
  - Summer average day exceeds water rights in 2026



# Water Rights & Future Demands – Maximum Withdrawal Rate (continued)

- Drought conditions – no supply in river
- Downtown + South Wellfield water rights – 16.81 MGD
  - Max day exceeds water rights in 2023
  - Summer day average not exceeded during planning horizon
  - Requires addition of treatment at South Wellfield



# Regulatory Meeting Summary

- Meeting with regulatory agencies of the State of Kansas
  - Division of Water Resources (DWR)
  - Kansas Department of Health and Env. (KDHE)
    - Public Water Supply
    - Municipal Program (Wastewater)
    - North Central District (Local office)
    - Bureau of Remediation (Contamination Issues)
  - Kansas Water Office (KWO)
  - Kansas Farm Bureau (KFB)
  - United States Army Corps of Engineers (USACE)

# Regulatory Meeting Summary (continued)

- Purpose of meeting:
  - Introduce the challenges the City faces and potential solutions to the regulatory agencies
  - Understand regulatory impacts
  - Understand future availability of potential new sources and considerations
- Topics of meeting
  - Future drinking water regulations
  - Remediation of groundwater contamination
  - Incorporating private wells into conservation plan
  - Water reuse
  - Options for new sources of supply

# Review of Existing Sources of Supply

# Objectives – Existing Sources of Supply

- Evaluate current use and capabilities of Smoky Hill River
- Evaluate current use and capabilities of wellfields
- Evaluate existing water treatment facilities
- Evaluate existing and future conjunctive use
  - How the current supplies should be operated together
- Evaluate recharge potential near wellfields

# Salina Water System

- Currently two main sources for water supply
  - Smoky Hill River (intake and pump station) – 60%
  - Downtown Wellfield (15 wells) – 40%
- Water Treatment Facility (20 MGD)
  - Treats water from Smoky Hill River and Downtown Wellfield
- Additional Emergency Capacity
  - South Wellfield (3 wells)
  - Chlorinated on-site (no other treatment)

# Smoky Hill River

- Flow in Smoky Hill River at Salina controlled by:
  - Releases from Kanopolis Lake
  - Precipitation/runoff events
  - Upstream diversions (irrigation)
  - Interflow between alluvial aquifer and river
- Declining streamflows over time
- KWO/USACE looking to optimize releases from Kanopolis Reservoir
- Water quality suitable for water supply

# Downtown Wellfield

- 15 wells in the Smoky Hill River alluvial aquifer
- Downtown Wellfield is fully appropriated
  - No new water rights authorized, only replacement wells
- Water level decline occurs in direct response to pumping of the wellfield
- Water quality suitable for water supply
- Water right limitations – 13.13 MGD
- Recommended pumping capacity – 12.12 MGD
  - To protect pumping equipment
- KDHE continuing to study potential groundwater impacts cause by contamination north of wellfield

# South Wellfield

- 5 wells in the Smoky Hill River alluvial aquifer
  - Only 3 have pumps installed
- New water rights available in vicinity of South Wellfield
- Drought impacts unknown
  - Wells spaced further apart than Downtown Wellfield
- Currently only chlorination is provided for treatment
- Water quality high in iron, manganese, hardness
- Wellfield capacity estimate
  - Capacity 2.25 MGD based on installed capacity (3 wells)
  - Water right limitations 3.68 MGD
- No contamination impacts

# Existing System Deficiencies

- Raw Water Supply Sources
  - Supply from river during drought conditions is decreased
  - Aquifer recharge not sufficient
  - Well pump capacities are reduced when aquifer levels are low
  - Presence of contamination at Downtown Wellfield limits use
  - Piping from wellfield very old and limits capacity to 9 MGD
  - Wells that date back to 1930s have problems with fouling
  - South Wellfield not used due to water quality issues
  - Currently no control over private wells within City
- Water Distribution System (based on study by PEC)
  - Available fire flows inadequate for most of City (lacking main lines)
  - Additional water storage is required
  - There are taste and odor problems and/or low chlorine residuals in some areas

# Existing System Deficiencies (continued)

- Water Treatment Facility
  - River settling basin with a reliable capacity of less than 20 MGD
  - Seasonal taste and odor issues with use of river
  - River settling basin unable to treat turbidity greater than 800 NTU
- Additional Considerations
  - No additional space at existing water treatment facility
  - Account for future water quality regulations
  - Additional treatment may be needed if new sources are brought on-line

# Recommendations for Existing Sources of Supply

- Primary goal – maximize use of existing water supply
- Smoky Hill River
  - Increase use during off-season times – seasonal water right
- Downtown Wellfield
  - Current pumping capabilities below water right allowance
    - 12.12 MGD pumping vs. 13.13 MGD water right – redrill wells
  - Improve piping between wellfield and treatment plant
- South Wellfield
  - Construct a water treatment facility
    - Treatment scheme to remove hardness, iron, manganese
  - Redrill the existing wells that do not have pumps
    - 3 wells can produce 2.24 MGD compared to 3.68 MGD water right
  - Opportunities to expand by obtaining additional water rights

# Recommendations for Existing Sources of Supply (continued)

- Water Treatment Plant
  - River settling basin
    - Limited to 8.2 MGD based on KDHE design criteria
    - Not able to treat turbidities greater than 800 NTU
    - Increase capacity to 10 MGD
    - Improve settling capabilities to treat higher turbidities

# Proposed Conjunctive Use Procedures

- Maximize the use of river during off-peak times
  - In 2007 used 80% of annual surface water right
  - In 2007 used 70% of total annual allowance (Downtown Wellfield and Smoky Hill River)
- Flows in Smoky Hill River sufficient most of the time
- Obtain a seasonal water right (Oct – June)
  - Conditioned with a minimum river flow requirement
  - Does not guarantee City can withdraw everyday
- Use this water right to meet all demands during off-season times
- Save appropriated/vested water right on river and wellfields for peak summer usage
- Preserves aquifer levels for summer usage

# Artificial Recharge Objectives

- Maintain elevated water levels within the aquifer so that water is available when it is needed
- Two methods:
  - Passive recharge: maximize the use of surface water in order to reserve aquifer levels
  - Active recharge: infiltrate or directly inject water into the aquifer to increase water levels
- Methods of active recharge
  - Infiltration ponds
  - Infiltration through existing oxbow
  - Direct injection wells
  - Aquifer storage and recovery system (ASR)

# Artificial Recharge Alternatives

- Recommendations
  - Passive Recharge – obtain an off-season water right on Smoky Hill River to preserve aquifer levels
    - Direct stream flow diversion
    - Bank storage wells
  - Active Recharge – put excess surface water into the oxbow
    - Aesthetic benefits
- Active aquifer recharge has limited benefit due to stream/aquifer interaction

# Citizens Advisory Board

# CAB Process

- Citizens Advisory Board (CAB)
  - Composed of 13 citizens
  - Various backgrounds
- Purpose of CAB
  - Give citizens input in planning for future
  - Provide ideas, concepts, and recommendations
  - Have an open mind and broad vision to do what is best for Salina as a whole
- Incorporate ideas and recommendations into study
- CAB meetings at key project milestones
  - August, 2008 - Demand projections, water rights
  - November, 2008 – Future regulatory impacts, existing facilities
  - December, 2008 - Conservation, reuse
  - January, 2009 - Alternatives

# What's Next

- Conservation Planning
  - Review existing conservation plan
  - Recommend modifications
  - Identify water conservation measures
  - Incorporate private well usage within City
- Water Reuse
  - Identify state regulations and requirements
  - Determine water quality and quantity
  - Evaluate application options
- Alternatives
  - Identify new sources of supply
  - Identify alternatives and evaluate
  - Prepare capital improvements plan (CIP)
- Next City Commission Briefing – February, 2009

# Questions?