



Hydraulic modelling and optimization for business case evaluation of capital improvement program

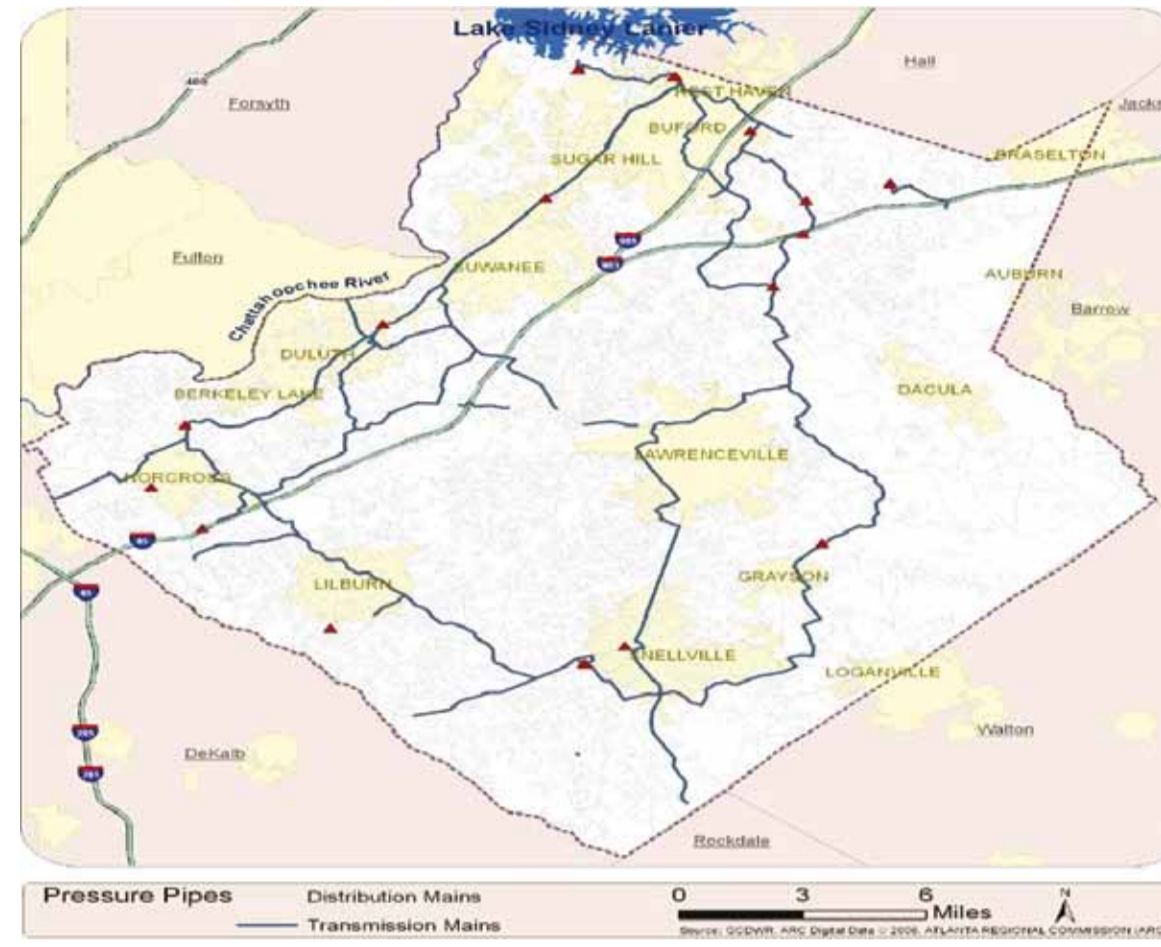
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George Kafzakis (GCDWR), Donna Joe (GCDWR)

Introduction

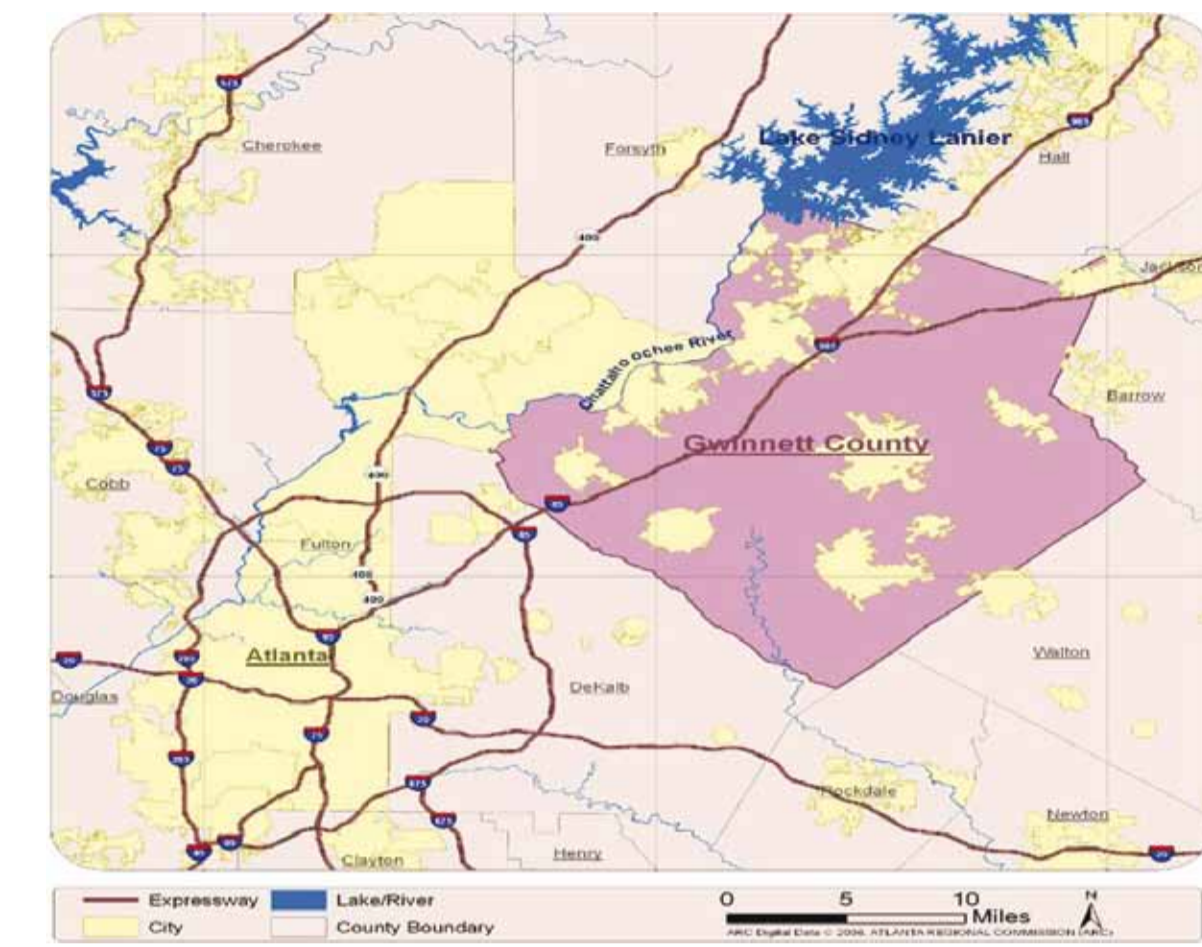
Problem statement:

Improve water system transmission, distribution, storage and pumping capacities to address low pressure and fire protection problems identified in the hydraulic model simulations for 2010, 2020 and 2030.

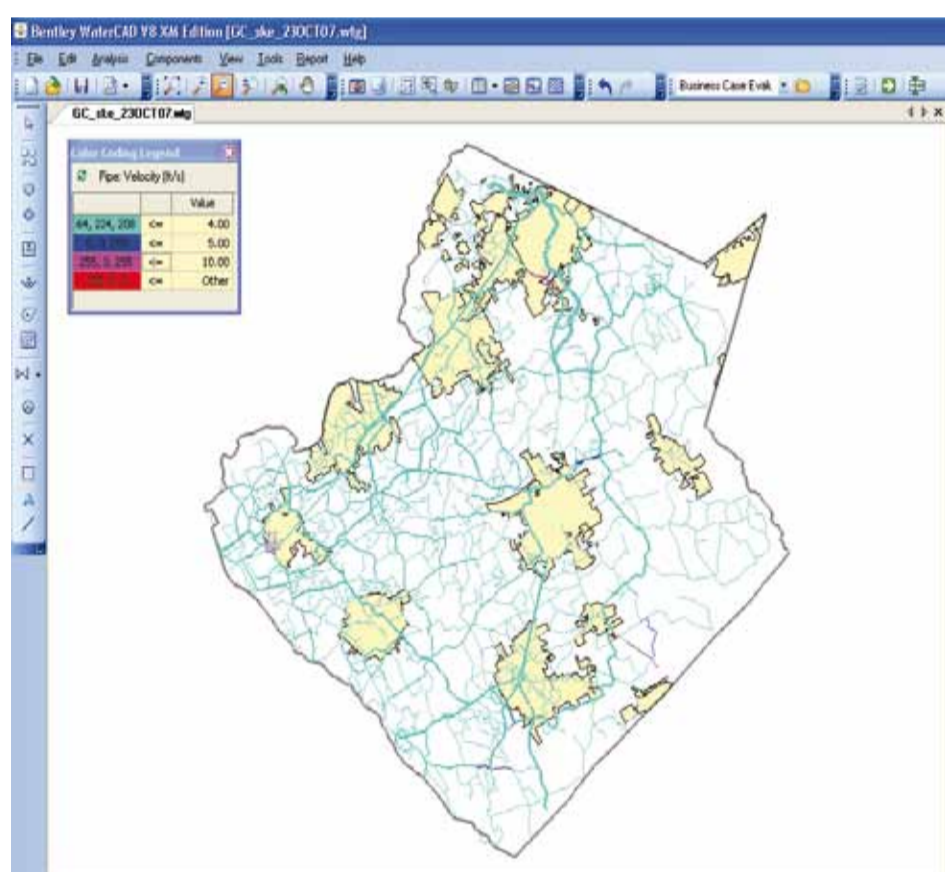
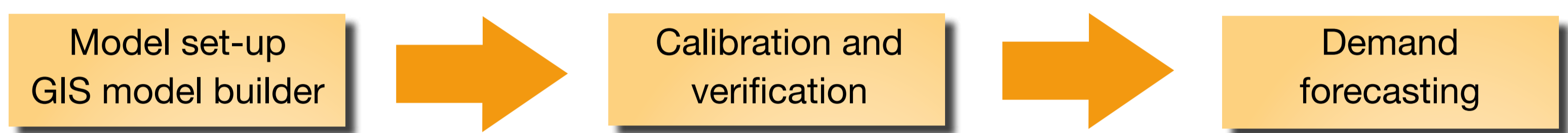
Gwinnett county water distribution system



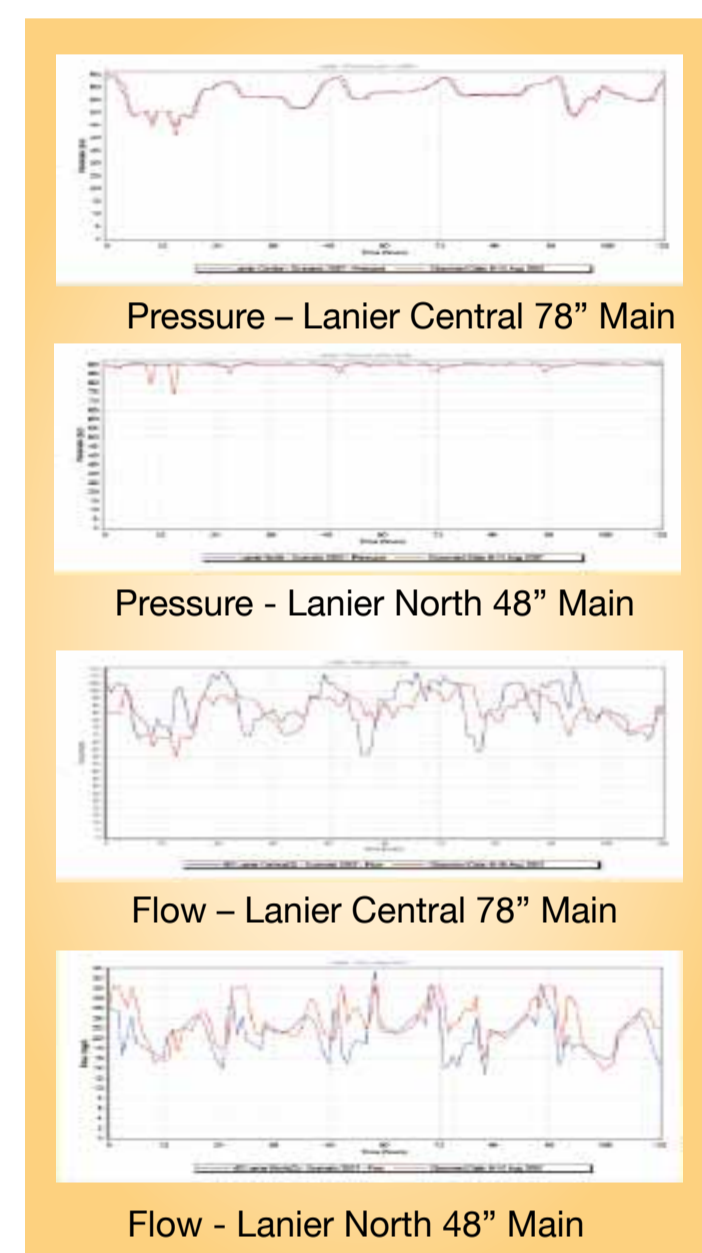
Gwinnett county location in Metro Atlanta



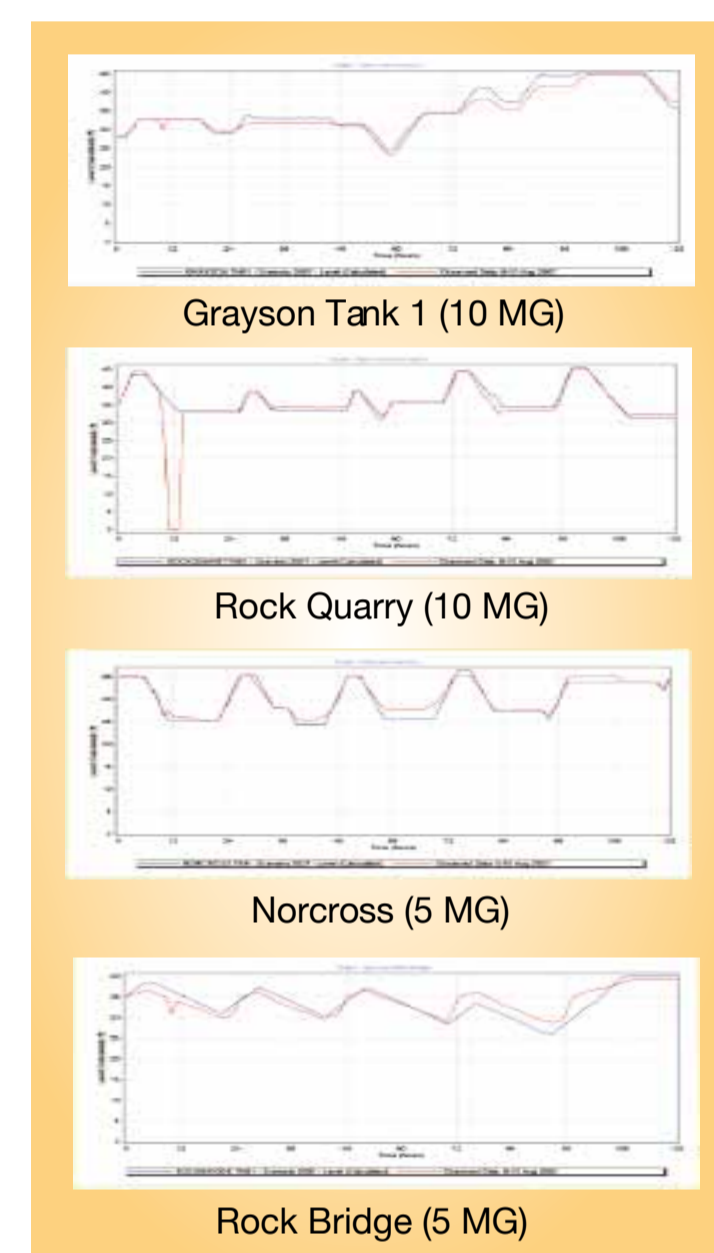
Business case evaluation steps



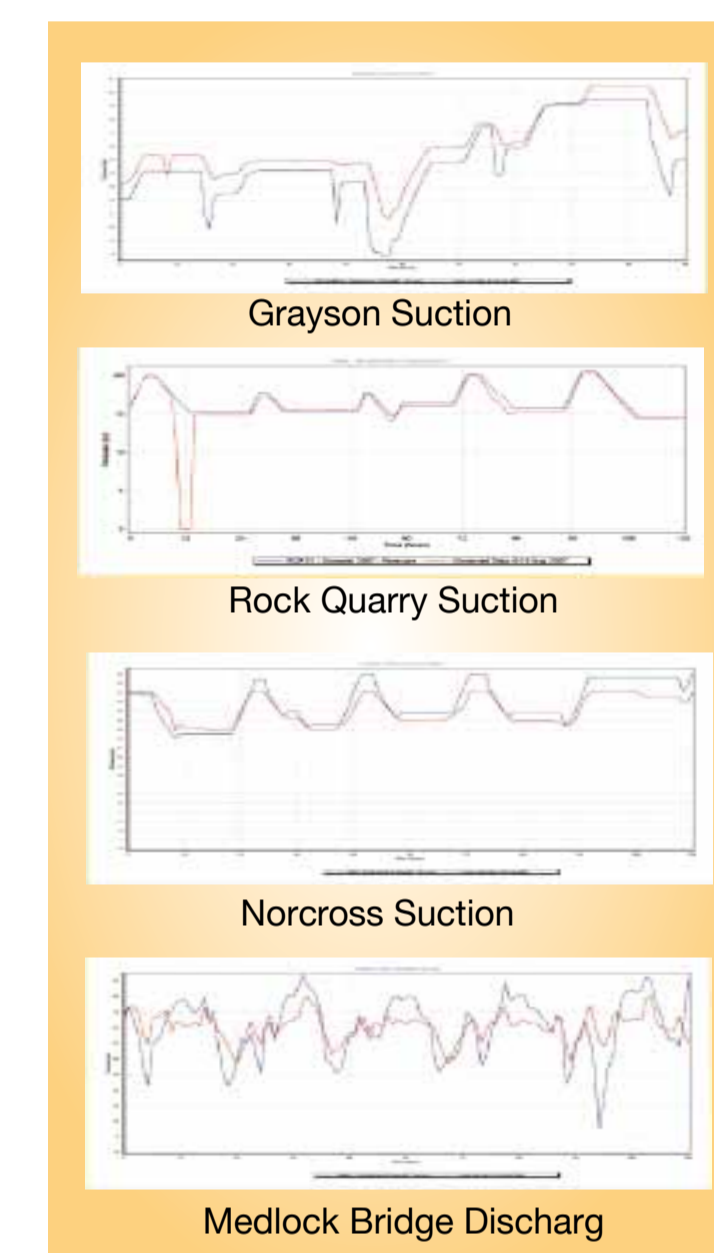
Gwinnett county skeletonized



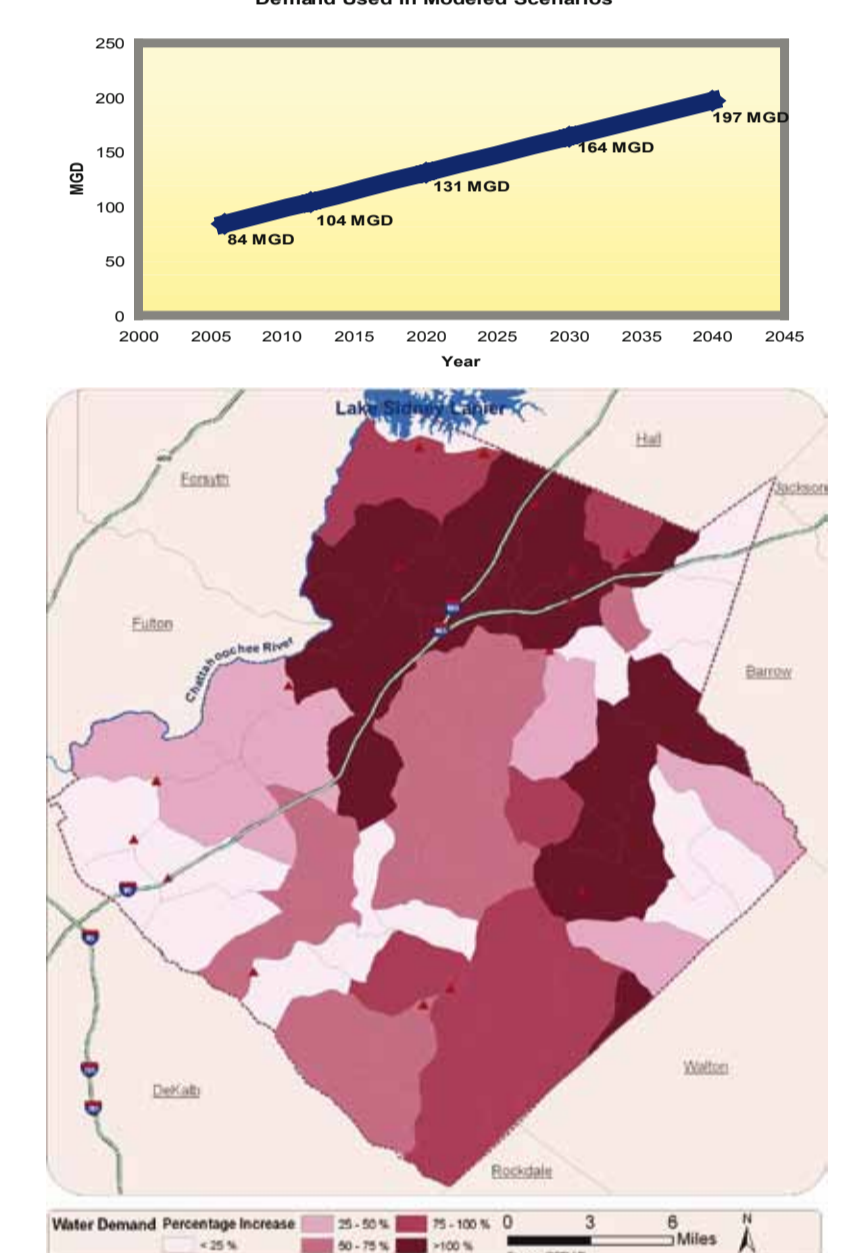
Lanier HSP transmission



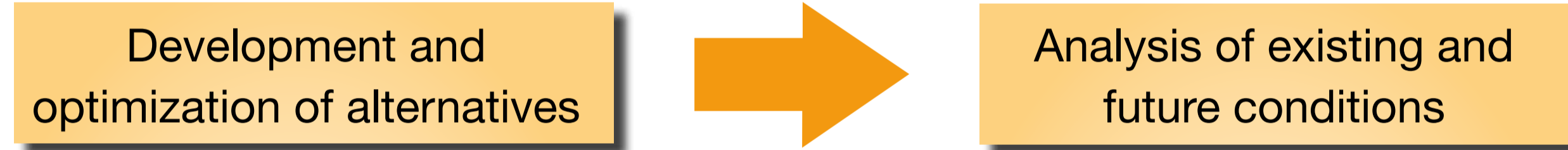
Tank levels



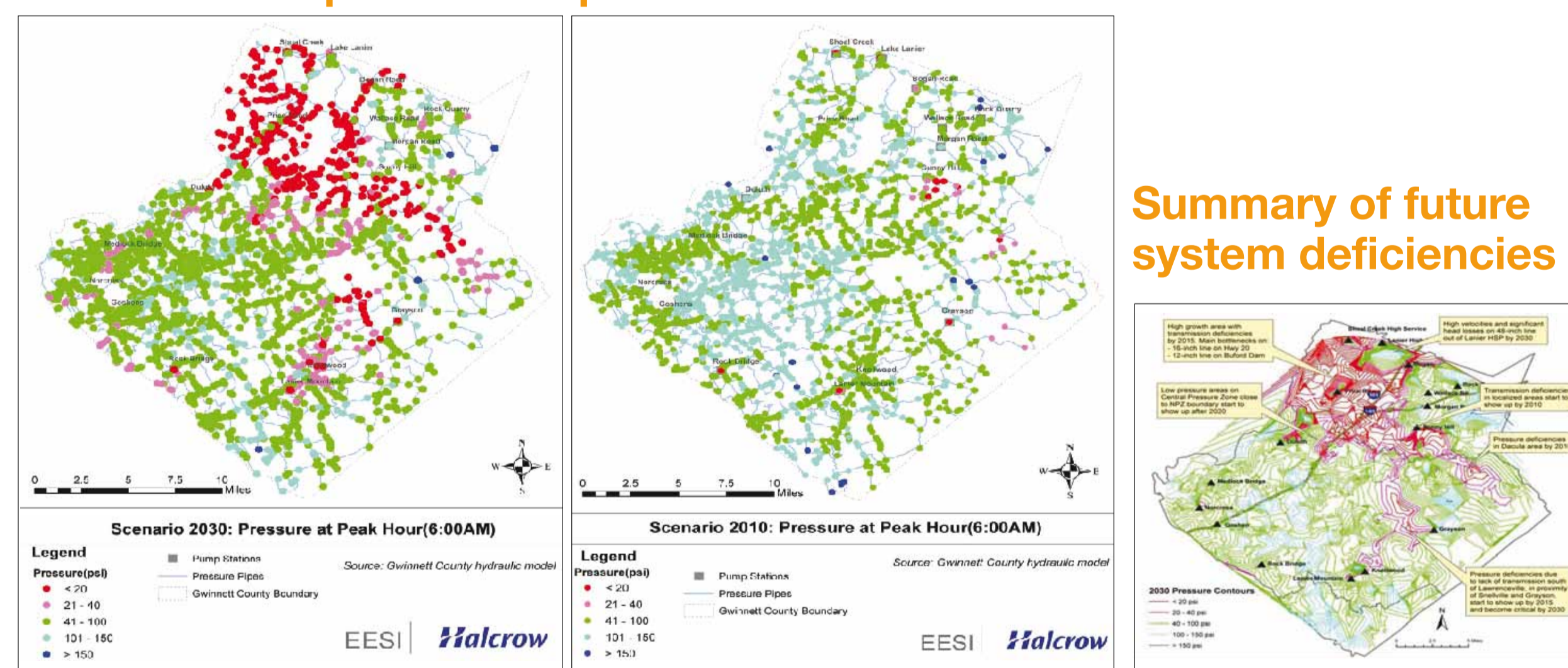
Pressure



Demand increase by year 2030



Model results pressure at peak hour



System Evaluation Criteria

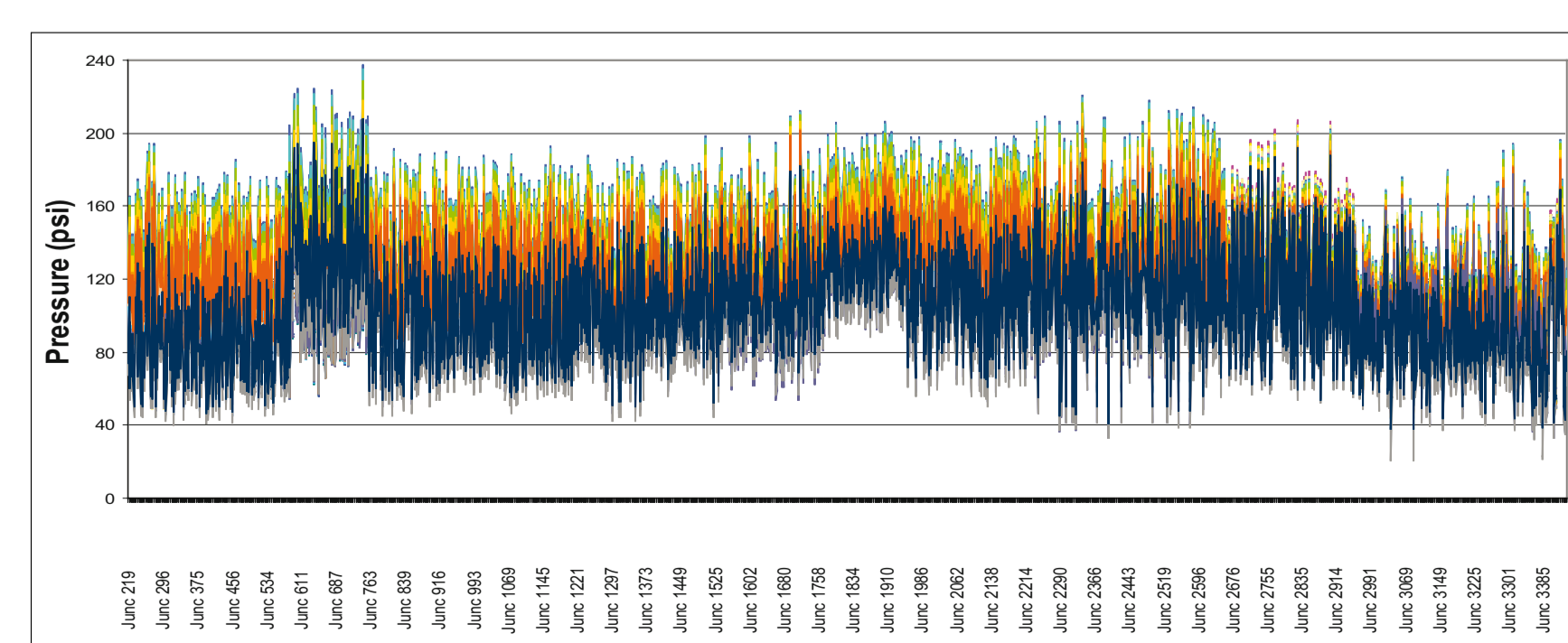
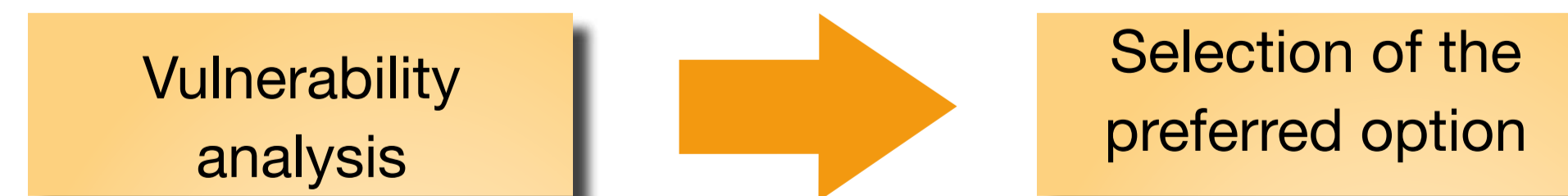
Pressure	Minimum pressure at MDD 40 psi	Head Loss	Maximum head loss of 10 feet/1,000 feet for pipes < 16 in diameter.
	Maximum pressure 150 psi		Maximum head loss of 4 feet/ 1,000 feet for large diameter transmission mains (generally pipes 16 inches in diameter and larger).
	Minimum pressure during 4 hr. fire at MDD 20 psi		
	Note: MDD = maximum daily demand		
Velocity			
	Maximum velocity of 5 feet/sec for pipes <12 in. diameter		
	Maximum velocity of 4 ft/sec for pipes > 12 in. diameter		

What is ENCOMS?

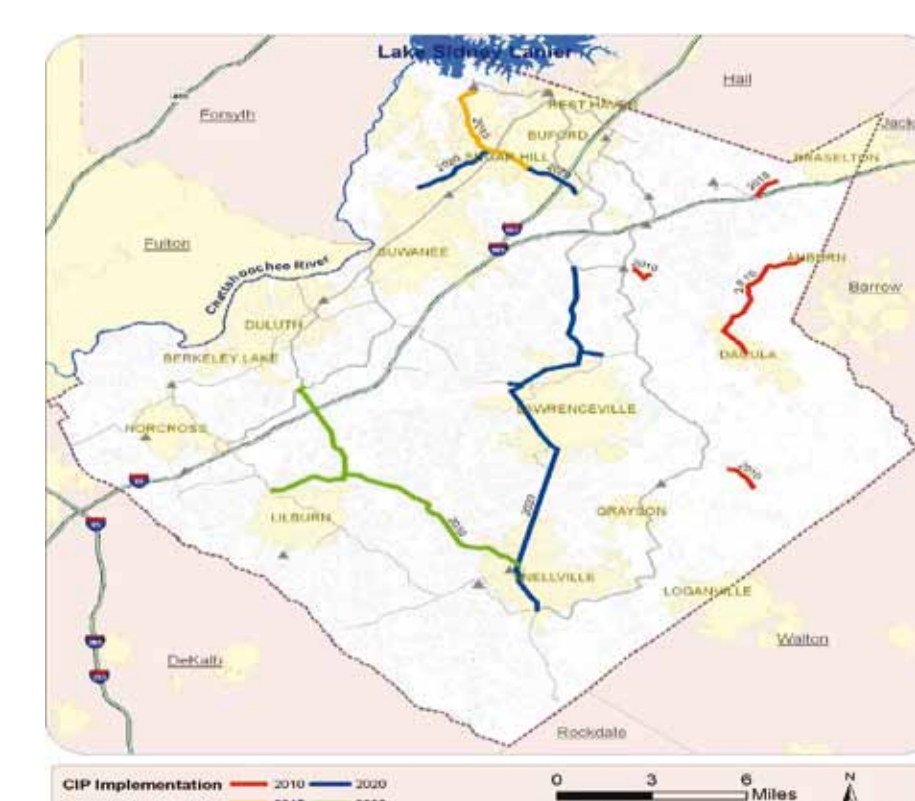
- Adaptive optimization software package powered by the use of genetic algorithms and hydraulic modelling.
- Initially developed as part of an EC framework V research program POWADIMA and further refined under Halcrow R&D.
- It has been successfully used for both the capital and operational optimization in the water industry.

Capabilities

- Automate sizing of new and parallel pipes.
- Compare hundreds of thousands of solutions in an organized and efficient way
- Improve confidence by expanding design options
- Maintain flexibility in defining boundary conditions
- Identify superior design alternatives at greatest saving.



Pressure at all modelled nodes



Resulting capital implementing plan

CIP Schedule		
Scenario	Cost	
CIP Previous Comprehensive Plan (Central Only)	\$ 230.5 M	
Improvements Developed under BCE (North and Central)	\$ 166.4 M	
GA Optimized Improvements (North and Central)	\$ 128.5 M	