Water System Simulation Report - 640 Gallon Configuration

Executive Summary

Technical Summary for Regulators & Engineering Review

System Overview & Regulatory Context:
The system includes one 20 GPM well, two 2900-gallon storage tanks, a single 20 GPM booster pump at 38 psi cut-in, and 640 gallons of pressure tank volume.
Simulation scenarios: 1.25, 1.00, 0.75, 0.50, 0.125 GPM per CN, 2.5-min timestep, 120-min run.

Regulatory Context:
EPA and TCEQ require maintaining 35 psi in normal conditions and no less than 20 psi during emergencies. Falling below 20 psi risks contamination via backflow.

Hydraulic Equations:
Continuity: $Q_{in} = Q_{out} + dV/dt$
Darcy-Weisbach: $h_f = f * (L/D) * (v^2 / 2g)$, with f from Reynolds number: $Re = (rho * v * D) / mu$
Bernoulli: $P1/gamma + v1^2/2g + z1 = P2/gamma + v2^2/2g + z2 + h_f$

Results Summary:
High-demand (>= 0.75 GPM/CN) fails in <60 min; low-demand (0.125 GPM/CN) sustains >120 min.

Regulatory Implications:
Non-compliant under high demand, requiring storage or pump capacity upgrades.

Combined Pressure Decay Chart

Combined Pressure Decay Chart - 640 gal