Paddock Lake’s Chloride Reduction
Update, Results & Lessons Learned

Lila Johnson – Baxter & Woodman
Tim Popanda – Village of Paddock Lake
Overview

- Population 3,000
- Sanitary sewer users 1,475
  - 290 users served by sanitary sewer and municipal water
  - 1,185 users with private wells
Overview

- Design Average Flow 0.8 MGD
- Previous permit chloride interim limits
  - 612 mg/L weekly average - May to November
  - 683 mg/L weekly average - December to April
- Current permit
  - 510 mg/L weekly average
Historic Chloride Concentration
Historic Chloride Concentration

Weekly Average Chloride Effluent Concentrations

Effluent Chlorides

Limit

Concentration (mg/L)

Jan
May
Sep
Jan
May
Sep
Jan
May
Sep
Jan
May
Sep
Jan
May
Sep
Jan
May
Sep
Jan
May
Sep
Jan
May
Sep
0
100
200
300
400
500
600
700
800
Jan 13
May 13
Sep 13
Jan 14
May 14
Sep 14
Jan 15
May 15
Sep 15
Jan 16
May 16
Sep 16
Jan 17
May 17
Sep 17
Jan 18
May 18
Sep 18
Jan 19
May 19
Sep 19
Jan 20
May 20
Sep 20
2013 Source Reduction Measures

- Public education and outreach
- Reduction for municipal operation
- Study
Public Education and Outreach

• Developed FAQ’s
  – Village’s plans to reduce use of road salt
  – Encouraging reduction of water softener use and salt

• Newsletters and web page – residents

• Business and institutional users
  – Proper use of deicing materials
  – Efficient water softeners
Chloride Reduction for Municipal Operations

- Audit of Snow Removal Operations
  - 40% Reduction Target
  - Plow then Salt
  - Southern Exposure Reductions
- Snow Removal and Salt Use Policy
  - Priority Zones
  - Snow Fence in Selected Locations
- Annual Training
- Road Salt Additives-Mixture
  - Birds Eye Stone
  - 40% to 50% Ratio
- Equipment Purchases
  - Spill Guards
  - Infrared Thermometers
- County Coordination-Spring Road Cleaning
2013 Study

- Evaluation of possible sources of chloride
  - 3 residential neighborhoods
  - Village commercial business district
  - Impact from institutional occupancies

2013-2014 Chloride Grab Samples

- Residential Zone "C"
- Residential Zone "B"
- Residential Zone "A"
- Carwashes
- High School

Concentration (mg/L)
Outcome of 2013 Study

- Met with commercial and public users contributing greatest concentration of chlorides to system
  - School replaced two inefficient manual water softeners with new automated brine reclamation systems – 35% reduction in salt use
  - School removed irrigation water lines from softened water
  - Car washes modified process to use reclaimed and recirculated under body wash system – 15% reduction in water use
Road Salt

- Reduction of use by 35%
Results of 2013 Source Reduction Measures

- Overall
  - 23.42% reduction in chlorides
  - 450 pounds reduce per day
  - Reduction of 70,000 pounds annually from 2019-2020
2019 Source Reduction Measures

- Public education and outreach
- Continued municipal operation reduction
- Expansion of water system
- Study
Residential Softening

- 71% of residential users have water softeners
  - Softeners regenerate 1-2 times per week and use 5-10 pounds of salt per regeneration
  - Load from homes 1,400-2,700 pounds daily
Strategies for Compliance

• Residential water softener optimization program
  – Anticipated participation – 40%
• Further reduction of road salt use
• Implementation of commercial business water softener optimization program
• Continue repairs of collection system to reduce I/I
• Water main expansion
2019-2023 Source Reduction Study

- Gather samples from all 8 zones
- Test private water wells and zones for water hardness, levels of iron, manganese and hydrogen sulfides
- Install groundwater sampling wells
Preliminary Zone Sampling Results

- Zone 7 – Village business district
- Zone 8 – businesses and residential
- Average hardness 210 mg-CaCo$_3$/L
Future Actions

• Ongoing optimization of deicing
• Continuation of source reduction measures
• Continuation of source studies
• Mandate – demand initiated regeneration for new residences
• Mandate – residential softener tune-up program
• Mandate – water softener bypass to outside hose bib
• Mandate – new businesses chloride reduction plan
Lessons Learned

• Proactive approach resident communication
• Focus on institutional, commercial and industrial customers
• Optimize deicing
Tim Popanda – Village Administrator
• tpopanda@paddocklake.net

Lila Johnson – Baxter & Woodman
• ljohnson@baxterwoodman.com