Going with the Flow

Handouts and presentations are available online at www.iowaleague.org

Steve Thompson, Program Manager, MSA Professional Services
Shawn Fuller, Public Works Director, City of Baxter
“GOING WITH THE FLOW”
I/I Reduction

- What Is I/I?
- How Do I get Rid of It?
- Tell us How it Worked in Baxter!

Steve Thompson, P.E. - MSA Professional Services, Inc.
Shawn Fuller, DPW – City of Baxter
What is I/I?

The two “I’s” are completely different

INFLOW
Rain Water or Surface Water that enters a sewer system quickly

INFILTRATION
Groundwater that enters the sewer system slowly
What is I/I?

- OTHERS
  - Sump Pumps
  - Area Drains
  - Field Tiles
  - Abandoned Service
What is I/I?

- We all have it
- DNR allows some of it
  - Up to 200 Gallons per inch per mile per day
- We used to encourage it
  - Floor Drains
  - Roof Leaders
  - Sump Pumps
Why do I want to eliminate it?

1. Costs
2. Costs
3. Costs
4. Costs
5. Costs
6. Costs
7. Regulations
Why do I want to eliminate it?

- Claims
  - Backups
- Fines
- Facilities Costs
  - Sizing
  - Labor
Why Do I want to Get Rid of It

- Operational Costs
  - Accelerated deterioration
  - Wear
  - Labor
  - Sizing

- Sewer Rate Impacts
  - Significant Range
How do I know if it’s a problem?

- Ask Operations Staff
  - Normal Flow
  - Wet Weather Flow
  - Peaking Factor
  - SSO’s
  - Backups
  - DNR Reviews
  - Compliance Schedule
Where do I start?

- INVESTIGATE
- IDENTIFY
- MITIGATE
Where do I start?

- Localization
- Visual Observation
- Flow Metering
Where do I start?

- **Private Sources**
  - Mostly Inflow
  - Some Infiltration

- **Public Sources**
  - Mostly Infiltration
  - Some Inflow
Where do I start?

- Ordinances
  - Is it in place?
  - Has it been enforced?
  - Are we willing to enforce it?
    - Education and Outreach
    - Inspection
    - Follow-up
    - 90/10 – Most want to comply
Where do I start?

PRIVATE SERVICE LINES
Where do I start?

- Smoke Testing
- Sump Pump Inspection
- Televising
- Sanitary Sewer Evaluation (SSES)
Collection System Evaluation

- Each segment reviewed, rated, for condition
  - Pipe condition
  - Pipe alignment
  - Joint condition
  - Active I/I
  - Roots
  - Grade (flat sewers)
Broken Pipe
Broken Pipe
Broken Pipe
Broken Pipe
Cracked Pipe
Cracked Pipe
Minor infiltration
Severe infiltration
Severe roots
Protruding taps
Sign through sewer
Gas lines through sewer
Rehabilitation Methods

- O&M recommendations (flushing)
- Spot Repairs
- Joint sealing with chemical grout
- Cured-in-place-pipe lining
- Pipe Bursting
- Replacement w/ new PVC sewer
- Any of the above in combination
Rehabilitation Methods

Spot Repairs
- Excavate and replace short pieces (nominally 4 feet) of crushed or broken pipe
- Used where most of pipe is in good condition
- If more than 2 spot repairs needed on a segment, then replace entire segment
Rehabilitation Methods

- Joint sealing with Chemical Grout
  - Seals leaking joints with a chemical grout (psi pressure test)
  - Used where pipe is generally in good shape
  - Assumed to be a 10-15 year fix
Chemical Grout Installation

Chemical Grout Packer for Test and Seal
Rehabilitation Methods

- Cured-in-place-pipe (CIPP) Lining
  - Installation of a new jointless pipe inside existing sewer
  - Thermosetting resin-impregnated felt hardens to form new pipe
  - Regarded as a 50-year solution
Cured-in-place-pipe Liner Installation
Inside of Cured-in-place-pipe Liner
Rehabilitation Methods

- Dig and Replace with new PVC sewer
  - Excavate and replace segment from MH to MH
  - For large sections of pipe in very bad condition
    - Crushed pipe
    - Badly cracked pipe
    - Severe offsets
  - Where surface either inexpensive to restore or in need of resurfacing
    - Coordinate with City’s Street Improvement Program
Rehabilitation Methods

- Manhole Lining
  - Reline Manhole where structural integrity is intact
  - Eliminates Surface Restoration
  - 50+ Years
CASE STUDY: Baxter, Iowa
Case Study Overview

- Baxter Background
- Issues
- LMI Survey
- Sludge Removal
- Flow Measurement Improvements
- Sewer Lining
- Manhole Repair
- Sump Pump Inspections

“Ogres have Layers
Onions have Layers”

Baxter’s sewer system has layers
Baxter
Background

EXISTING SEWER COLLECTION SYSTEM

Population: 1,101
Baxter
Background
October 11, 2002

City of Baxter
City Clerk - City Hall
P.O. Box 415
223 South Main Street
Baxter, Iowa 50223

Ref: NPDES Permit Number 59-03-0-01

Ace City Clerk

Enclosed is a copy of a proposed NPDES permit for the City's wastewater treatment facility.

As part of the review process, the Department has reviewed the wastewater treatment plant's history in complying with the current permit limits. According to the calculated revised design flows approved by Terry Lakeshore of the IDNR on September 9, 2002, the predicted plant is receiving an average dry weather (ADW) flow of 3.97 million gallons per day (MGD), an average wet weather (AWW) flow of 0.699 MGD, and a maximum wet weather (MWW) flow of 1.645 MGD. The Department completed a visual inspection on September 23, 2002 using the revised design flows.

It is now necessary for the City to submit an engineering evaluation by May 1, 2003 to evaluate the existing treatment facility to determine whether or not it can accept the revised ADW, AWW, and MWW design flows without violating the revised limits. The engineering evaluation shall consider, but not be limited to, the hydraulic capacity of the existing lagoon wastewater treatment facility in light of the revised design flows and current design standards for selected lagoon wastewater treatment facilities. The engineering evaluation shall also consider design discharge design capacity and comparison to the current hydraulic capacity, if used at your facility. If the evaluation demonstrates that the existing treatment facility has the hydraulic capacity to accept the revised design flows without violating the revised limits, the City must provide a further action.

If the engineering evaluation determines that the existing facility does not have sufficient hydraulic capacity, it is necessary for the City to submit a plan of action detailing the steps to construct improvements necessary to meet the revised limits. The plan of action should include an excess flow specification (EFS) flows into the sewer system and include a schedule for system modifications.

Yours sincerely,

[Signature]

Dave Terry
Environmental Specialist Sr.
Des Moines Field Office

Copy: IDNR Wastewater Section

March 20, 2006

City of Baxter
Baxter City Hall
223 E. Main Street, P.O. Box 415
Baxter, Iowa 50223

ATTN: Hawkmade Mayor and Council

Re: NPDES Permit #: 59-03-0-01

Non-Cumpliance
Ammonia discharge from WWTP before Sludge Removal

- **Ammonia (mg/l)**

- **Legend**
  - WWTP Effluent Ammonia
  - New Discharge Regulations
  - Existing Discharge Regulations
  - New Discharge Regulations
  - Existing Regulations
Non Compliance

- Persistent SSO and Sewer Basement Backups

April 18, 2003

Jack Edge
PO Box 431
Baxter Iowa 50028

Dear Jack,

Your request for reimbursement for costs from a recent sanitary sewer back up has been reviewed and considered by the Baxter City Council. They have determined that in your case assistance is warranted and they have agreed to pay the $250 deductible as you requested. Area residents have been flushing items that are not typical to a sanitary sewer system and we are working to identify those individuals and educate them to prevent future problems. Please contact the City IMMEDIATELY if you notice any further problems.
Wastewater flow = Drinking Water

INFILTRATION

EXFILTRATION
Baxter
OTHER ISSUES

- “Annual” Flooding
  - School building floods consistently
  - Limited Existing Storm Sewer
Baxter
Economic Issues

- Low to Moderate Income Status
  - Minimum 51% required for all GRANT award
  - 2000 Census Data 40.1%
BAXTER LMI SURVEY

- Low to Moderate Income Survey completed by MSA in 2007
  - CHANGED
    - 2000 Census Data of 40.1% to 57.8%
  - City is now Grant Eligible

GRANTS AWARDED FOR WWTF IMPROVEMENTS

- $900,000 WTFAP Grant
- $2,000,000 Stimulus Funding
- $500,000 CDBG Funding
CONTROLLED DISCHARGE LAGOON OPTION

- Required 85 Acre Property Purchase
WWTF IMPROVEMENT OPTIONS

COVERED AERATED LAGOON

FIGURE 5-7 PROPOSED AERATED LAGOON UPGRADE
WWTF IMPROVEMENT OPTIONS

ACTIVATED SLUDGE PLANT
“The people in this town know where I live, the DNR doesn’t”

1) Obtain compliance with existing permit;
2) Upgrade Collection System, to:
   - Minimize Sewer Backups; and
   - Reduce size and cost of WWTF;
3) Construct Reduce Size WWTF Improvements
Phase 1 - “Get out of the DNR off our back”

Existing Lagoon constructed in 1984

- Sludge NEVER removed
- Aeration System has leaks
Estimates of 4,850,000 gallons of sludge

Average 2 feet of sludge over entire lagoon
Phase 2 – Lower costs by obtaining accurate Flow Measurement

Existing Influent Flow Measurement Caused WWTF to be too large
Phase 3 – Sewer Rehabilitation

- Investigate
- Identify
- Mitigate

PROPOSED SEWER SYSTEM UPGRADES

**Legend**
- Parcel's
- Sanitary_System_Valve
- Sanitary_Pump
- Sanitary_Manhole
- Sanitary_Pressurized_Main
- 6'' Pipe
- 8'' Pipe
- 10'' Pipe
- 12'' Pipe
- 16'' Pipe
- Sanitary_Structures

**Sewer Upgrades**
- New Sewer Installation
- Reline Existing Sewer

City of Baxter

0 260 520 1,040 Feet
CIPP SEWER LINING
LATERAL RE-ESTABLISHMENT

- Robotic for mainline diameters up to 24”
- Man-entry >24” mainline diameter
Lateral “Top Hatting”

$85,000.00
MANHOLE RETROFIT

44 out of 68 existing manholes are Brick
MANHOLE RETROFIT

Centrifugally Cast Cementitious Mortar Lined with Epoxy Seal
OTHER MANHOLE ISSUES

Brick Manholes with No Bottom!

SOME NEW MANHOLES HAD TO BE INSTALLED
OTHER SEWER ISSUES

“This lateral is broken every two feet”
Sump Pump Observations

Sump Pump Inspection Program Initiated in November 2008:

Existing Ordinance States:

No sources of gray water, including sump pumps, downspouts, nor foundation drains are allowed to connect with the sanitary sewer.

One Sump Pump pumping 20 gpm for 1 hour results in approximately 1,200 gallons of water

Every inch of rainfall on an average household results in approximately 1,000 gallons of water
PUBLIC NOTICE - SUMP PUMP OBSERVATION PROGRAM

THE CITY OF BAXTER IS PROACTIVELY WORKING TO MINIMIZE FUTURE IMPACTS TO YOUR SEWER UTILITY BILL. THE STATE OF IOWA HAS RECENTLY ADOPTED RULES THAT IMPACT THE CITY’S WASTEWATER TREATMENT SYSTEM. THESE RULES MANDATE A VERY STRICT DISCHARGE THAT WILL BE VERY COSTLY TO COMPLY WITH. A PROACTIVE APPROACH TO MINIMIZE THIS COST TO YOU IS TO REMOVE CLEAR WATER FROM ENTERING INTO THE SANITARY SEWER. THIS WILL MEAN THAT THE CITY WILL ONLY HAVE TO PAY TO TREAT SEWAGE, NOT RAIN WATER.

THE CITY HAS RECENTLY COMPLETED THE FIRST PHASE OF THIS PLAN BY REHABILITATING THE MAIN SEWER LINES AND MANHOLES IN TOWN. THESE REPAIRS HAVE HELPED TO REDUCE THE GROUND WATER THAT WAS LEAKING INTO THE SEWER MAINS.

THE CITY IS NOW WORKING ON THE SECOND PHASE OF THIS PLAN, WHICH INCLUDES OBSERVATIONS AT EACH HOUSEHOLD TO CONFIRM RAINWATER IS NOT ENTERING THE SEWER SYSTEM. THESE OBSERVATIONS WILL INCLUDE CONFIRMING THAT YOUR SUMP PUMP IS NOT CONNECTED TO THE SANITARY SEWER, YOUR HOUSEHOLD GUTTERS ARE NOT CONNECTED TO THE SANITARY SEWER AND NO ILLEGAL WATER CONNECTIONS ARE PRESENT AT YOUR HOME.

YOU ARE HEREBY NOTIFIED THAT THE CITY SHALL SHUT OFF YOUR DRINKING WATER SUPPLY WITHIN 48 HOURS OF ANY OF THE FOLLOWING OCCURRENCES:

- HOMEOWNER DENIES ACCESS OR IS UNAVAILABLE FOR SCHEDULED INITIAL INSPECTION;
- HOMEOWNER DOES NOT COMPLETE REPAIRS IN COMPLIANCE WITH REGULATIONS;
- HOMEOWNER DOES NOT COMPLETE REQUIRED REPAIRS WITHIN ALLOTTED 30 DAY TIMELINE.
CITY OF BAXTER: SUMP PUMP OBSERVATION PROGRAM SCHEDULE

- September 6
- September 13
- September 20
- September 27
- City Limits
- Existing Structures
Improper Downspout Connections
Improper Downspout Connections
Proper Downspout Connections
Improper Sump Pump Connections
Improper Sump Pump Connections
Improper Sump Pump Connections
Improper Sump Pump Connections

Of 302 residences 64 had improper connections

• 21%
• 5 GPM x 24 hours per day
• Equivalent to 1,300 homes
Flow Measurement Improvements

Flood of 2008

Collection System Rehab
What About Storm Water?
What About Storm Water?

Storm Water Detention and Collection system Improvements

- Two Detention basins North of City Limits
- One infiltration basin east of City Limits
- Increased size of Storm Sewer throughout

CDBG Green Initiative Grant ($500,000)

SRF Stimulus Green Initiative ($150,000)
“Presentation Take Away

Keep expectations of I/I reduction modest
   – Results Vary Greatly

I/I Costs Money
I/I Reduction Costs Money
Resolve to enforce ordinances
Where will the water go?

http://www.epa.gov/region1/sso/toolbox.html

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