Identification and Control of Phosphorus Loading from Industrial and Commercial Sources

POTW Special Meeting

DuPage River Salt Creek Workgroup (DRSCW)

January 28, 2016

Overview

- NPDES Special Condition Requirement
- First Steps/Sampling/Roadmap
- Preliminary Findings - Sources, Loadings, Current Removals
- Local Limit vs. Surcharge ???
- Industrial Treatment Options
- Pollution Prevention/BMP Options
- Developing the PDOP Response
- Conclusion

NPDES Special Condition Requirement

- Development of a Phosphorus Discharge Optimization Plan (PDOP)
- Plan due within 24 months (to be implemented within 36)
- Shall include evaluation of both limiting influent sources and “tweaking” current operations to maximize removals.
- Annual reporting

NPDES Special Condition Requirement – Cont.

- Part (a) - WWTP Influent Reduction Measures
  - Evaluate the Phosphorus reduction potential of Users
  - Determine which sources have the greatest opportunity for reducing Phosphorus
    - Waste minimization and water conservation plans
    - Evaluate implementation of local limits
- *Part (b) – WWTP Effluent Reduction Measures*

First Steps

- Do I have an influent problem with Total -P?
- Existing Loadings vs. Expected Domestic Background Contribution
- Sampling Plan
  - Influent/Effluent
  - Background
  - Industrial (look at before and after treatment)
  - Commercial/Restaurants
- Identify Sources/Opportunities
- Wastewater Survey Data

Loadings – A.J. LaRocca Plant

Date	Influent P (mg/L)	Effluent P (mg/L)	Removal Rate
1/1/14	4.16	2.79	32.9%
2/1/14	3.39	2.17	36.0%
3/1/14	5.17	3.50	32.3%
4/1/14	2.74	2.05	25.2%
5/1/14	2.74	2.22	19.0%
6/1/14	4.01	3.62	9.7%
7/1/14	4.89	3.19	34.8%
8/1/14	4.73	3.41	27.9%
9/1/14	7.63	1.08	85.8%
10/1/14	3.78	3.52	6.9%
11/1/14	5.18	3.94	23.9%
12/1/14	5.44	1.35	75.2%

Loadings – North Plant

Date	Influent P (mg/L)	Effluent P (mg/L)	Removal Rate
1/1/14	4.71	3.08	34.6%
2/1/14	4.68	3.86	17.5%
3/1/14	4.58	2.8	38.9%
4/1/14	4.47	2.17	51.5%
5/1/14	3.08	2.43	21.1%
6/1/14	4.09	3.16	22.7%
7/1/14	7.43	4.14	44.3%
8/1/14	4.32	3.44	20.4%
9/1/14	2.67	2.71	-1.5%
10/1/14	5.38	3.36	37.5%
11/1/14	5.67	4.01	29.3%
12/1/14	5.49	1.49	72.9%

Loading Summary

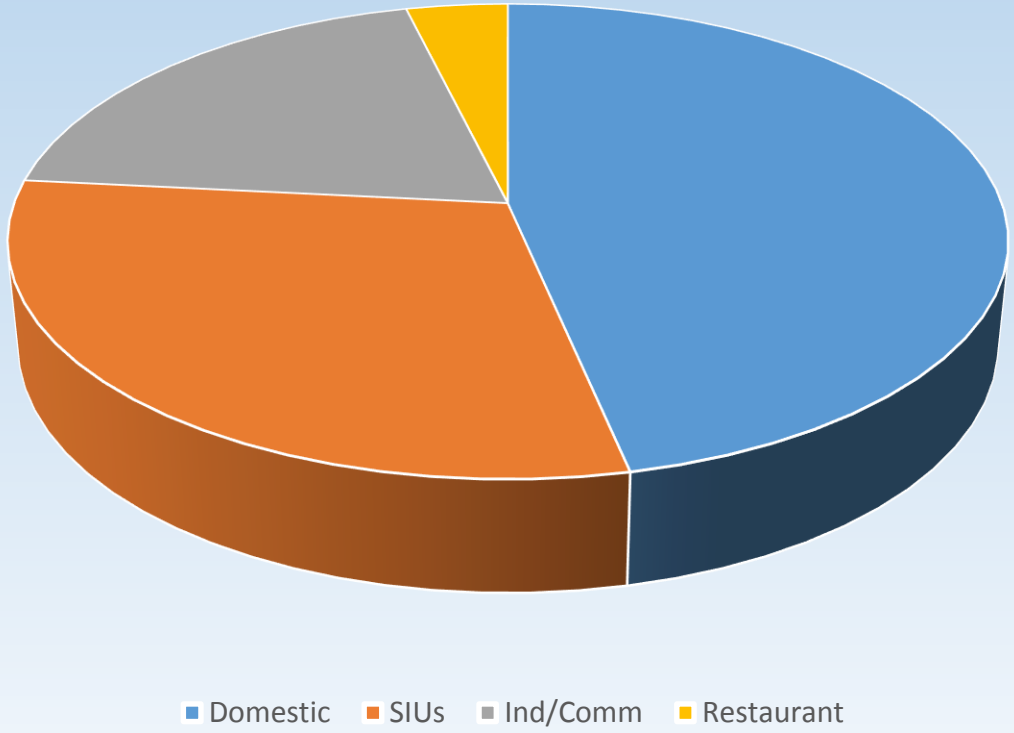
PLANT	MIN INFLUENT	MAX INFLUENT	AVG	AVG REMOVAL
AJ LAROCCA	2.74 mg/L	7.63 mg/L	4.73 mg/L	38.1 %
NORTH	2.67 mg/L	7.43 mg/L	4.92 mg/L	35.5 %

Phosphorus Results

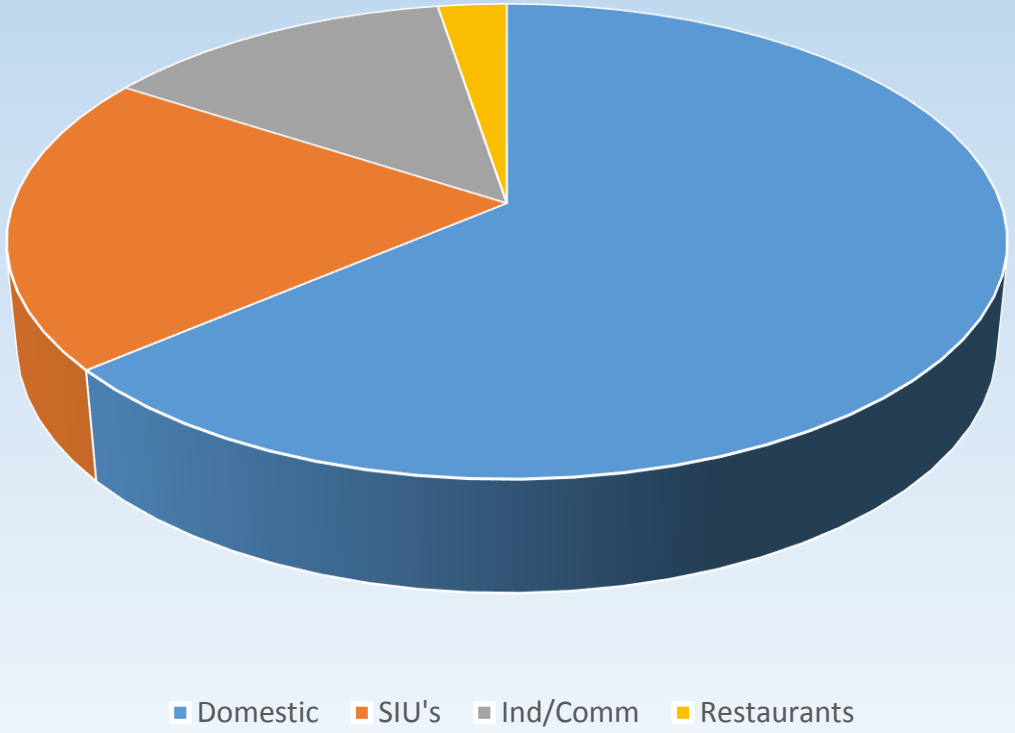
Source	Range	Average
Domestic Background	0.85 – 2.66 mg/L	1.87 mg/L
Industrial/Commercial Back.	0.02 – 16.0 mg/L	6.29 mg/L
Restaurants	N/A	5.00 mg/L
Permitted Users	0.20 – 46.9 mg/L	7.7 mg/L

Loading Summary – Mass Allocation

AJL WWTP Total-P Mass Loadings



North WWTP Total-P Mass Loadings



Sources*

- Car/Truck Washing
- Metal Cleaning
- Dairy
- Food Processing
- Meat Processing
- Metal Finishing
- Restaurants

* Taken from University of Minnesota Study, 2002

Sources* - Cont.

TYPE	AVG T-Phosphate	RANGE
Hospitals	4.5 mg/L	0.50 - 9.7 mg/L
Truck Wash	7.9 mg/L	0.1 - 34.2 mg/L
Dry Cleaners	25.7 mg/L	0.1 - 29.7 mg/L
Laundries	13.2 mg/L	4.4 - 18.4 mg/L

* Taken from USEPA Region V Local Limit Guidance, July 2007

Addison

Sources – Cont.

- 70% of the non-agricultural Phosphorus is used to make Phosphoric acid
- The remaining 30% are for things like match tips and flares, detergents
- Most household products have gone “Phosphate Free”, however, commercial and industrial grade products may still contain significant levels

Industrial Sources

Industry Type	Treatment Type	Total-P Effluent Concentration
Electro-polishing	pH, Filtration	0.5 mg/L
Textile Dyes/Printing	Sediment Removal	1.9 mg/L
Metal Finishing, De-Burring	pH, Filtration, Floc	1.4 mg/L
Soap/Cleaner Mfg	(None)	5.2 mg/L
Circuit Boards	pH, Filtration, Floc	0.2 mg/L
Electro-plating	pH, Floc, Micro Filtration	1.8 mg/L
Ink/Pigment Mfg	Sediment Removal, Skimmers	15.8 mg/L
Paint/Coatings Mfg	Sediment Removal, Filtration	26.9 mg/L
Food – Meat Based	Grease Separator, Solids Removal	15.0 mg/L
Electro-plating	pH, Filtration, Floc	0.2 mg/L

Addison

Industrial Sources – Cont.

Industry Type	Treatment Type	Total-P Effluent Concentration
Phosphating/Powder Coating	Settling, pH	46.9 mg/L
Electro-plating	pH, Filtration, Floc	2.6 mg/L
Printing (Aqueous)	pH, Filtration, Floc	0.5 mg/L
Truck Wash	Sediment Removal	20.9 mg/L
Electro-plating	pH, Filtration, Floc	2.0 mg/L

Pre-Treatment Removals - Industrial

Industry Type	Treatment Type	Raw Waste	Post Treatment
Food - Meat Based	pH, DAF, Grease Separation, Floc, Polymer, Filtration	11.7 mg/L	7.5 mg/L
Food - Bakery	pH, DAF, Grease Separation, Floc, Polymer, Filtration	1.2 mg/L	6.31 mg/L
Mfg - Phosphating, E-Coating, Plating	pH, Floc, Polymers, Sedimentation	115.7 mg/L	5.2 mg/L
Mfg - Phosphating, Powder Coating, E-Coating	pH, Floc, Polymers, Sedimentation	140.0 mg/L	3.2 mg/L

Addison

Pre-Treatment Removals-Restaurants (Total P)

TYPE	RAW WASTE	TRAP EFFLUENT*
Mexican	3.77 mg/L	0.88 mg/L
BBQ	48.9 mg/L	13.0 mg/L

*Approximate 75% reduction across conventional grease trap

Local Limit Evaluation

Criteria	AJ LaRocca WWTP	North WWTP
Daily Average Flow (DAF)	2.0 MGD	3.5 MGD
Domestic Flow	1.5 MGD	3.0 MGD
Effluent Total-P Limit	1.0 mg/L	1.0 mg/L
Effluent Mass Limit	16.7 lbs./day	29.2 lbs./day
Plant Removal Rate	88% (Lit.)	88% (Lit.)
Influent Mass Limit	139.0 lbs./day	243.3 lbs./day
Background	-25.0 lbs./day	-50.0 lbs./day
Allowed to Industry	114.0 lbs./day	193.2 lbs./day
Safety/Growth Factor	-20%	-20%
Local Limit	**21.8 mg/L**	**46.3 mg/L**

Surcharge Calculation

Criteria	AJ LaRocca WWTP	North WWTP
Capital Cost	$4.8 Million	$2.8 Million
Annual O&M Cost	$58,000	$75,000
Total Cost (20 yr. Cycle)	$6.0 Million	$4.4 Million
Total Pounds P Treated	60 lbs./day	105 lbs./day
Annual Pounds	21,900	38,350
20 year Total	438,000	767,000
Cost/Pound	**$13.70**	**$5.73**

Pre-Treatment Options

- Conventional Pre-Treatment for heavy metals, solids, grease, and other conventional pollutants significantly reduces the level of Phosphorus (70 -90%)
- Standard treatments with Ferric Chloride and alum, similar to Municipal Chemical treatment strategies, can reduce levels below 2 mg/L.
- Additional removals require a second, high dose of ferric or alum and membrane or micro filtration. Levels below 1 mg/L can be achieved

Best Management Practices (BMP's)

- Product Substitution
- Streamlining Rule – 2007
- Permit Requirements
- Community Outreach
- Industrial Workshops – Pilot Projects
- Recognize Limitations (Meat Products)

BMP Example - Phosphating

- New technologies in development driven by regulations
- Sol-Gel and Transition Metal Coatings
- May require process modification
- Loss of cleaning power of Phosphate
- High Risk to Implement (Amnesty Programs)

PDOP Components

1. Evaluation of Headworks Loadings
2. Source Identification/Sampling Results
3. Strategies to Reduce Phosphorus – Industrial, Commercial, Community Outreach
4. Short Term Implementation of Voluntary Reductions with BMP's
5. Long Term Implementation of Local Limits and Surcharge Fees as Deterrent to Discharge
6. Ongoing Testing and Reporting to Document Improvements

Conclusion

- There is time to prepare and perform analysis for reporting
- Short term opportunities – easy to implement
- Development of Local Limits and Surcharging will probably occur with installation of Phosphorus treatment 7-10 years in future
- Annual reporting can demonstrate improvements

Questions?

Rick Federighi
Village of Addison - Public Works
Rfederighi@Addison-il.org
(630) 620-2020