STELCO

The Steel Company of Canada

Hamilton Works
Community Liaison Committee Meeting

21 June 2017 | K. Chan

Agenda

1. Welcome and Safety Contact
2. Review and Approval of Agenda
3. Review and Approval of Minutes of 26 January 2017
4. CCAA Restructuring Update
5. Water Treatment at Hamilton Works
6. Performance under O.Reg. 419/05 Site Specific Standard Order - Particulates
7. Community Concerns
8. Adjournment

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Know Your Emergency Exits

Review Evacuation Routes of the room you are located in

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CCAA Restructuring and Stelco's Future

- It has been more than 1,000 days since Stelco entered into creditor protection under CCAA in September 2014.
- During that time, we have conducted two independent sale processes, changed our name, and built a strong foundation for the future of our business.
- We have succeeded to this point in the process due to the continued support of our loyal customers and suppliers.
- Stelco has also benefited greatly from the resiliency and dedication of our more than 2,000 employees who have managed our business well, and created value that is recognized by others.

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CCAA Restructuring and Stelco's Future

- On June 9, 2017, the Court approved Stelco's proposed Plan of Arrangement.
- The Plan was met with no opposition from our key stakeholders and set the stage for the negotiation of final agreements prior to emerging from CCAA.
- The target for completion of the transaction is June 30, 2017.
- Upon emergence, our name will formally change to Stelco Inc. under the ownership of Bedrock Industries.
- New 5-year collective agreements will take also effect for our unionized employees.
- Other proposed measures of the plan will also take effect including agreed to payments to creditors, and the creation of an independent land trust that will oversee the sale of lands to support pensions and OPEBs.

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Stelco - Hamilton Works
Waste Water Treatment Plant

June 21, 2017 | Carter Dumont

AGENDA

- Introduction to waste water.
  - Objectives of Wastewater Treatment
  - Influent and Effluent Water Quality
- Waste water treatment unit processes.
  - Equalization
  - Biological Treatment (AIS)
  - Cyanide Precipitation
  - Fluoride Precipitation
  - Sludge Dewatering
- Discussion

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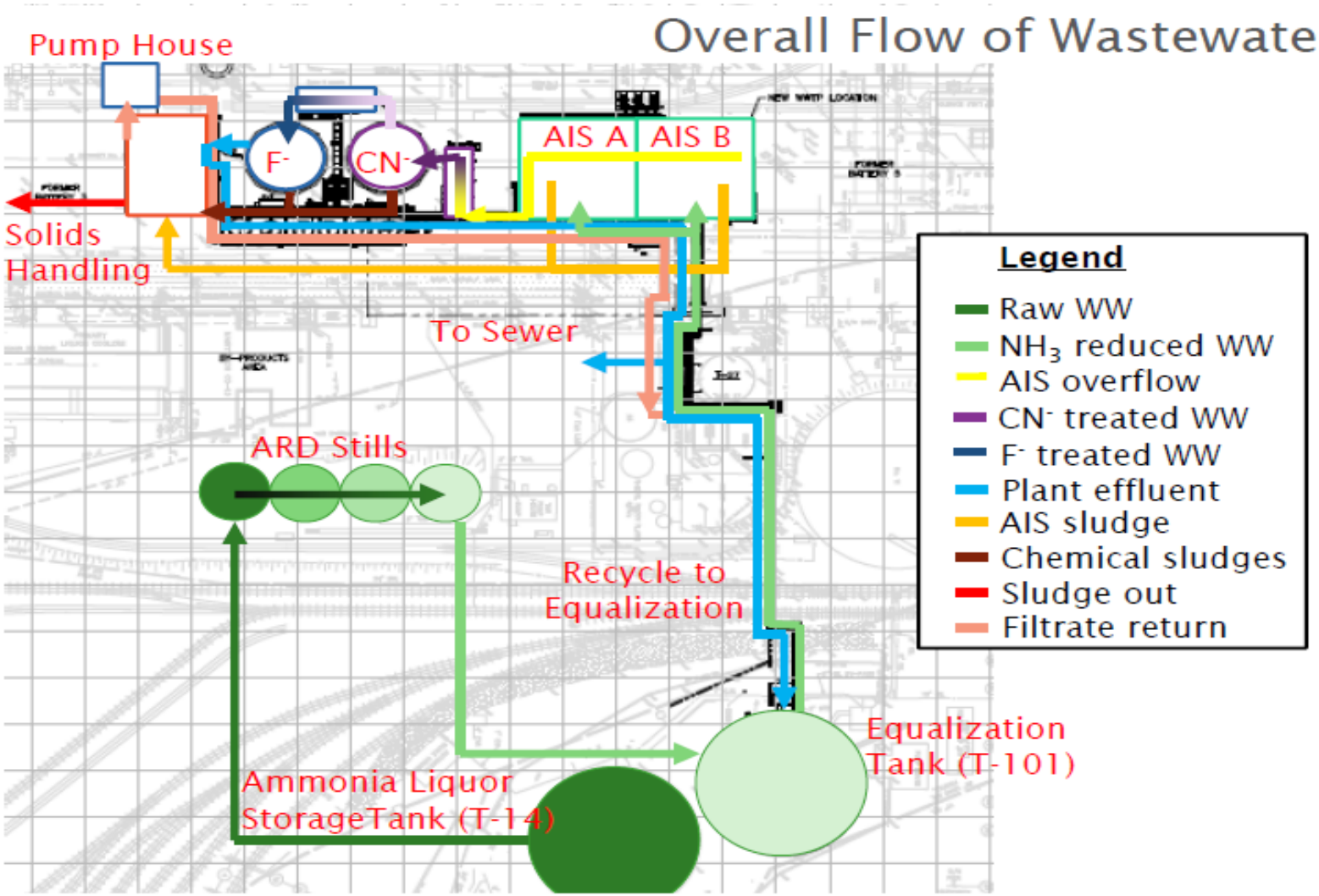
Design of Hamilton Works WWTP

- Achieve compliance with the City of Hamilton Sewer By-Law limits.

- Key parameters for pretreatment in new unit process include:

    - Total Suspended Solids (TSS)
    - Total Kjeldahl Nitrogen (TKN)/Ammonia (NH3)
    - Total Phosporous (TP)
    - Total Cyanide (TCN)
    - Dissolved Fluoride (F)
    - Chloride (Cl)
    - Sulfate (SO4)
    - Chemical Oxygen Demand (COD)
    - Biological Oxygen Demand (BOD)
    - Oil and Grease (O&G)
    - Phenolics
    - Polyaromatic Hydrocarbons (18 PAH’s defined in the by law)

Stelco – Hamilton Works Waste Water Treatment Plant Flow



Equalization Tank

- Size – 1.5 million U.S. Gallons
- Open top for ambient cooling

-Consistent feed quality/quantity is important.

- Handles spikes in hydraulic load

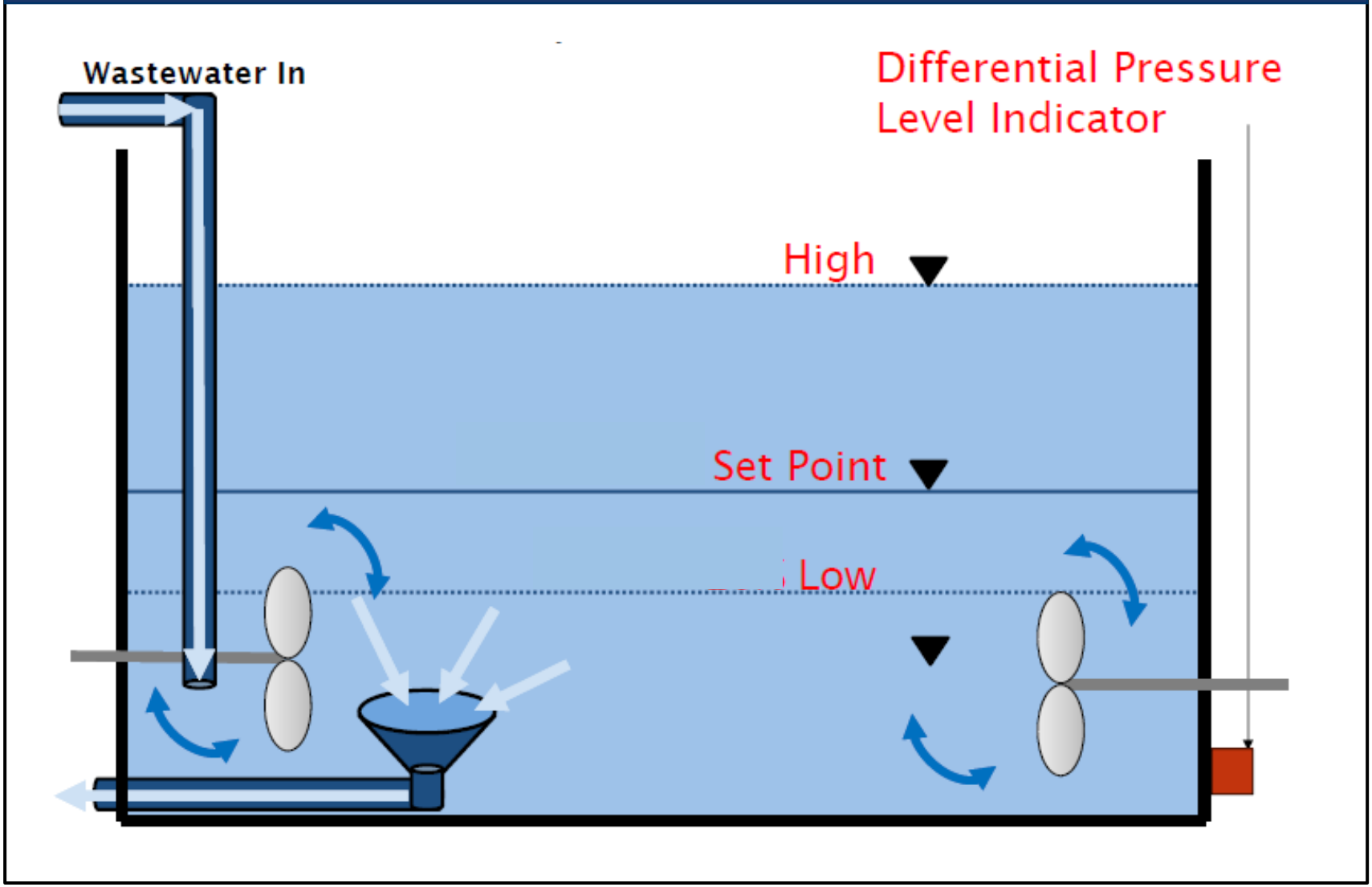
- Handles spikes in contaminant load

- Allows for storage of wastewater inventory

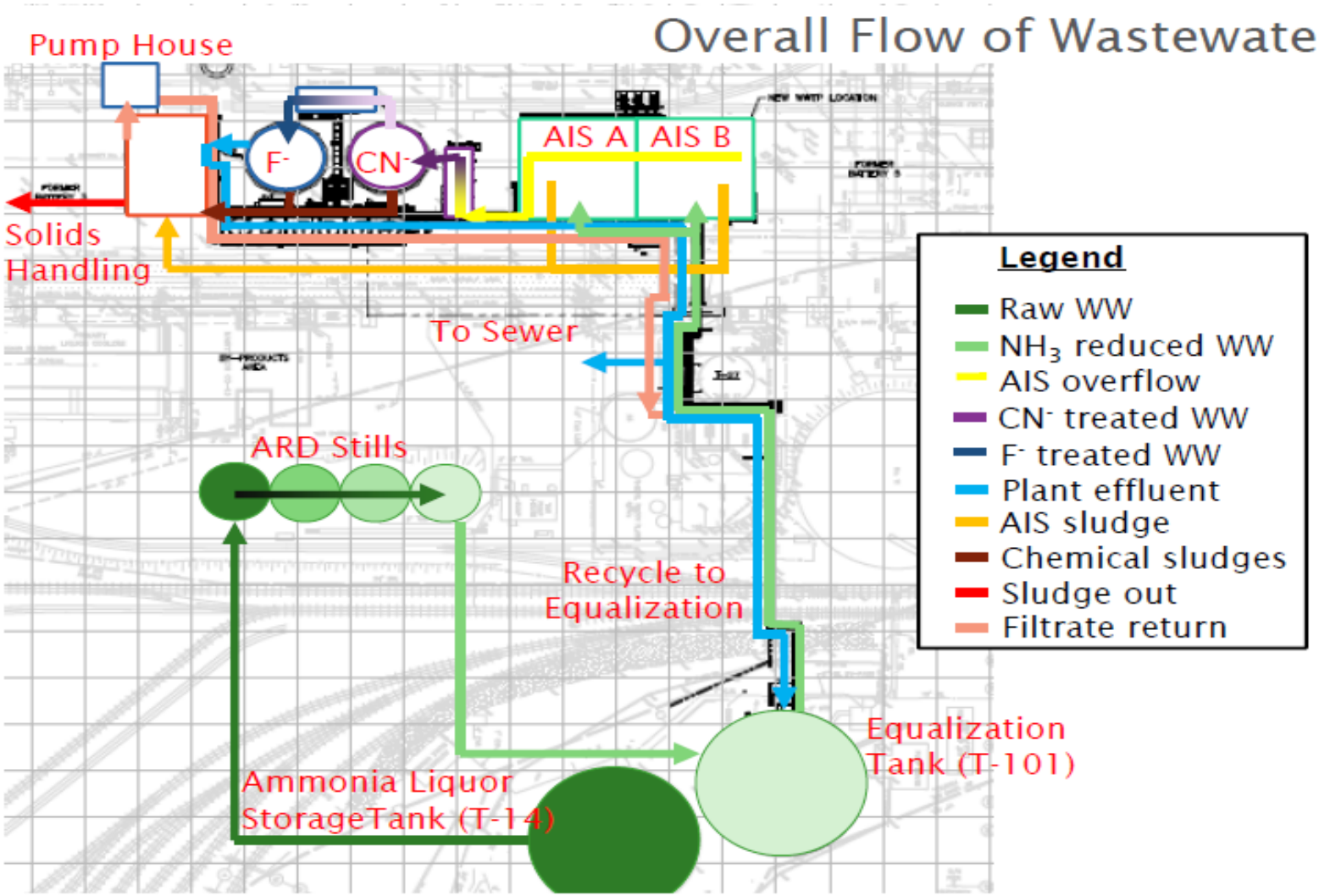
- Maintain feed to activated sludge treatment during upstream outages.

- Limited storage available for off spec effluent.

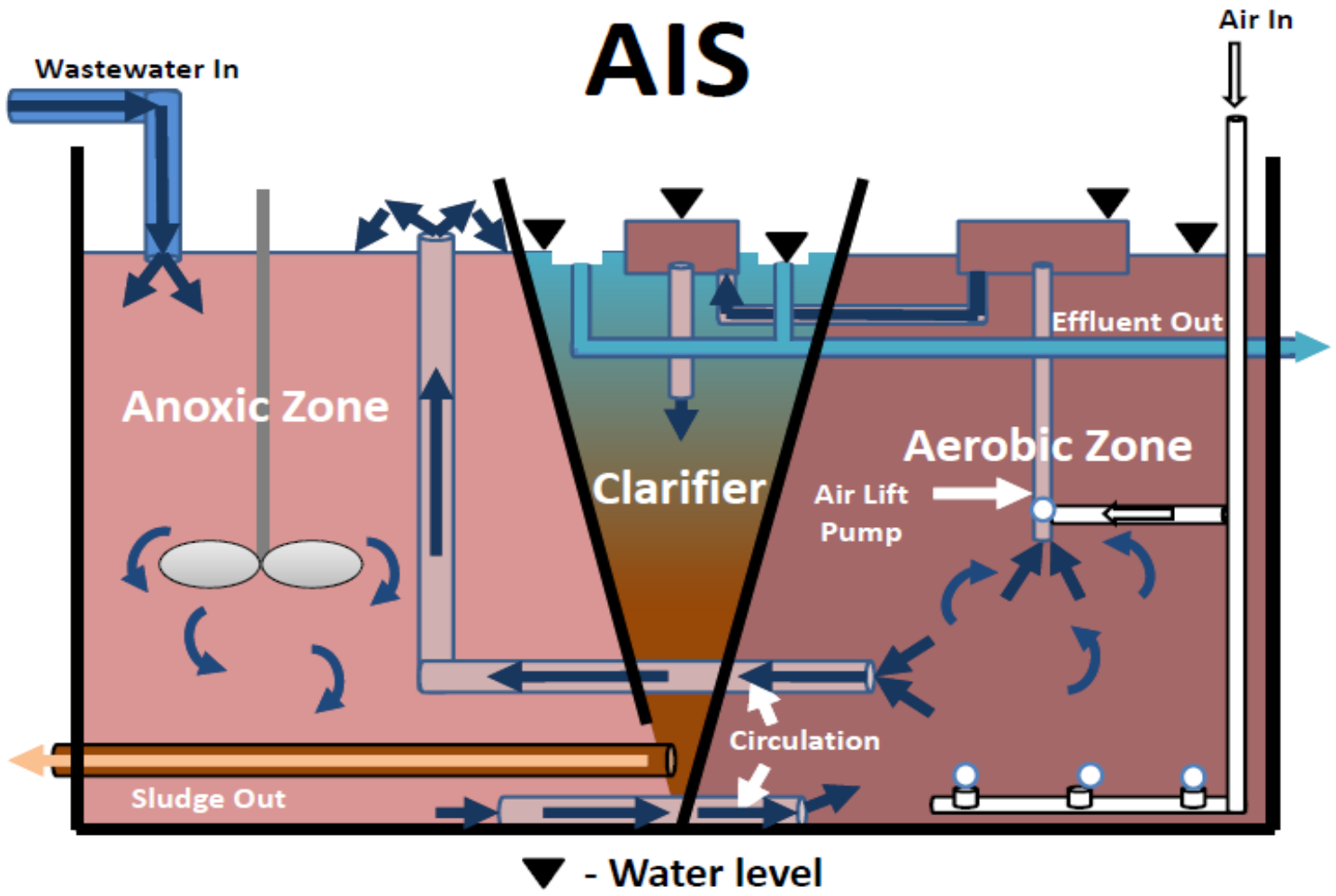
Equalization Tank, Tank 101



Stelco – Hamilton Works Waste Water Treatment Plant Flow

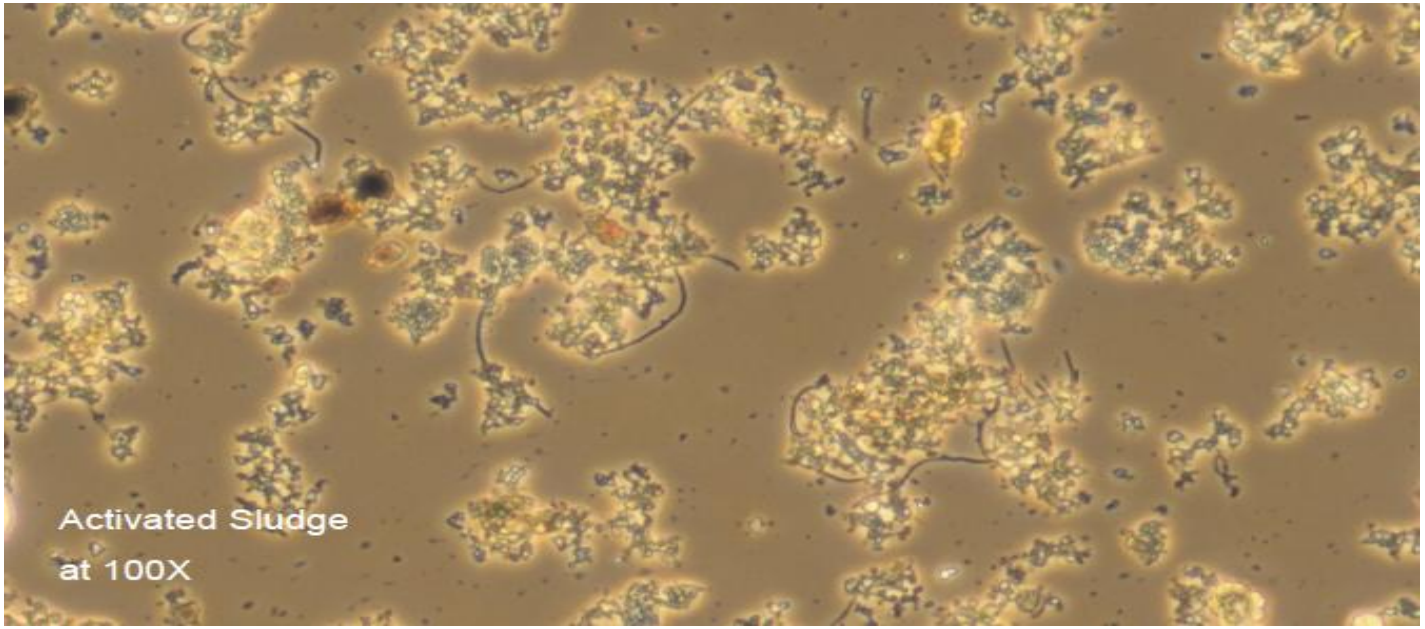


AIS – Activated Sludge Treatment



AIS – Activated Sludge Treatment

- What is Activated Sludge?
  - Referred to as “bugs” or “biomass” or “microbes” or “microorganisms”
  - It is the same bacteria found in soil
  - Concentrated in liquid and referred to as “activated sludge”

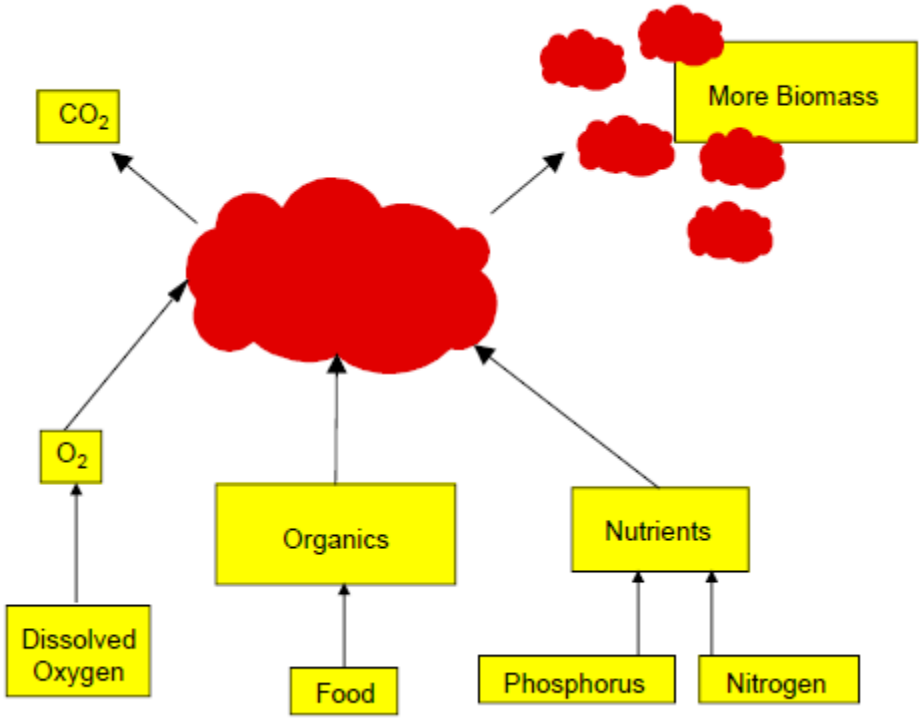


AIS – Activated Sludge Treatment

- What parameters are the target of treatment?
  - Total Kjeldahl Nitrogen (TKN)/Ammonia (NH3)
  - Total Phosporous (TP)
  - Thiocyanate (SCN)
  - Chemical Oxygen Demand (COD)
  - Biological Oxygen Demand (BOD)
  - Oil and Grease (O&G)
  - Phenolics
  - Polyaromatic Hydrocarbons

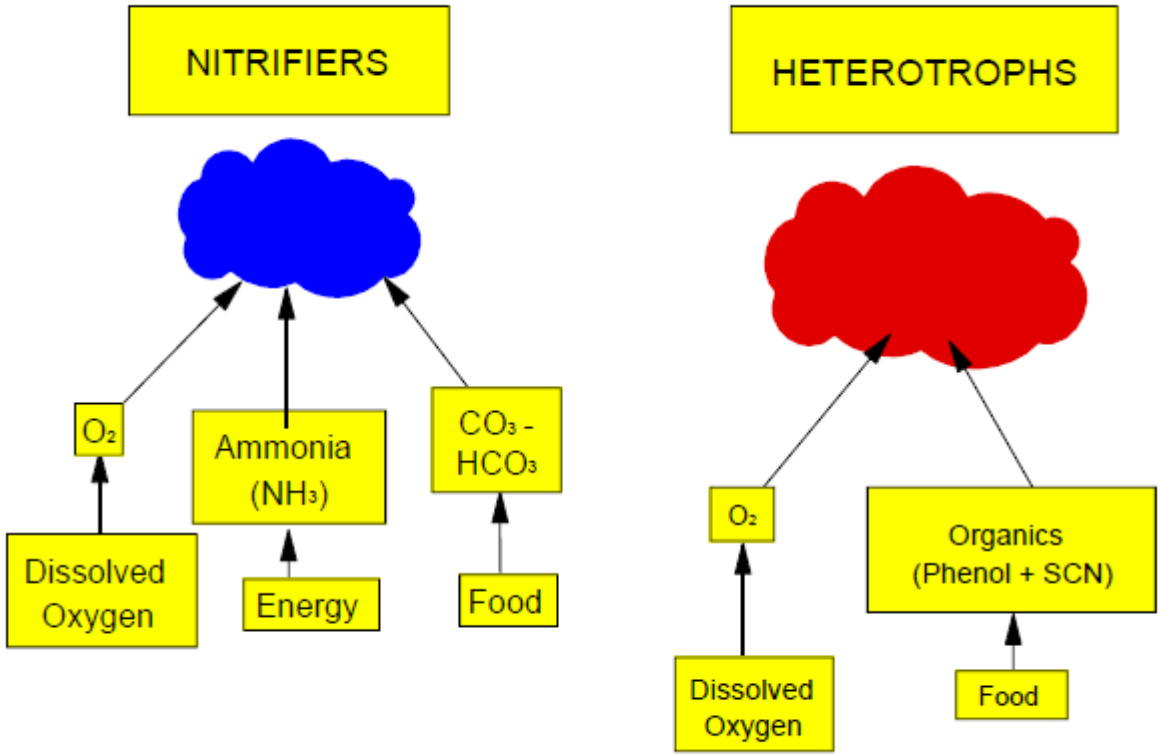
AIS – Activated Sludge Treatment

- What does Biomass Do?



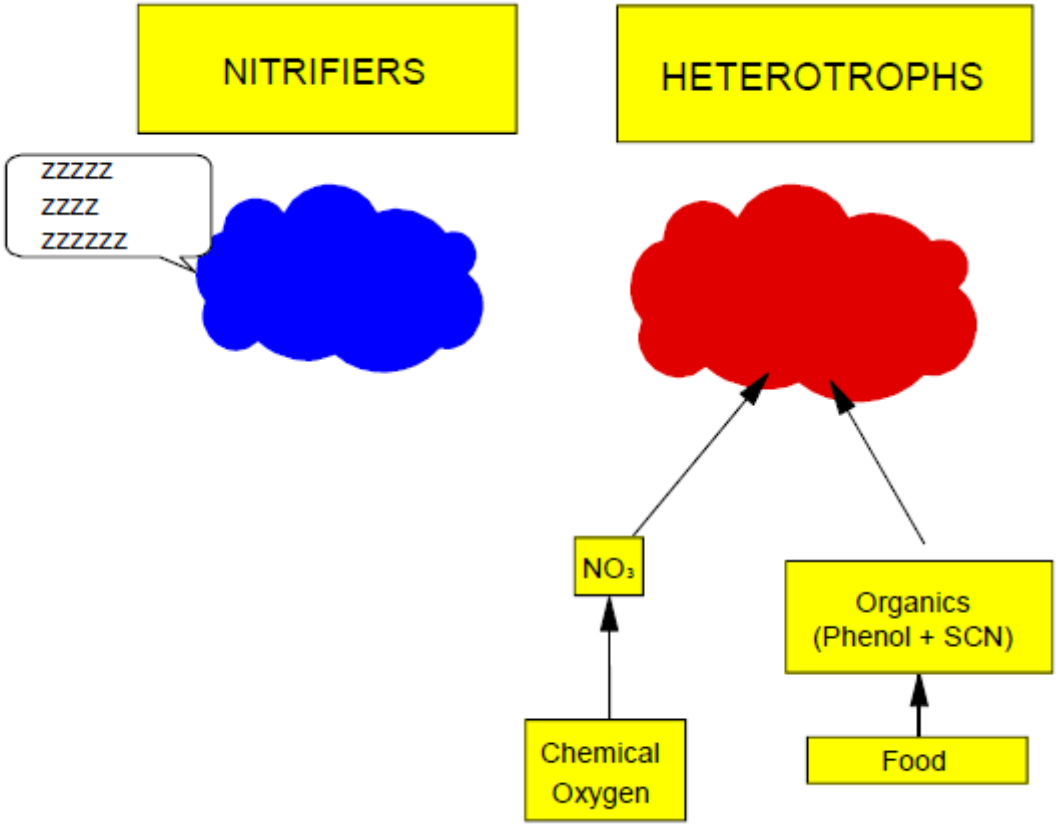
AIS – Activated Sludge Treatment

- What does Biomass Do – Aerobic



AIS – Activated Sludge Treatment

- What does Biomass Do – Anoxic



AIS – Activated Sludge Treatment

- What does Biomass Do – Bio Organisms

Microbes	Respiratory Environment	Action	Measured Result
Heterotrophs	Anoxic	Denitrification and organic / degradation	Nitrate removal and COD removal
Heterotrophs	Aerobic	Organic polishing	COD removal
Nitrifiers	Anoxic	No action	None
Nitrifiers	Aerobic	Nitrification	Ammonia removal

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AIS – Activated Sludge Treatment

- What does Biomass Do – Nitrification and Denitrification

FORMS OF NITROGEN

- Free Ammonia = NH_3 (Toxic to Bugs)
- Fixed Ammonia = NH_4^+ (Food for Bugs)
- Total Ammonia = $NH_3 + NH_4$ (as Ammonia-N)
- Organic Nitrogen (e.g. SCN) (Part of TCN – By-Law)
- Total Kjeldhel Nitrogen (TKN) = Total Ammonia + Organic Nitrogen (TKN – By-Law)
- Inorganic Nitrogen (e.g. Nitrate (NO_3-N) and Nitrite (NO_2-N)

AIS – Activated Sludge Treatment

- What does Biomass Do – Treatment of Organics

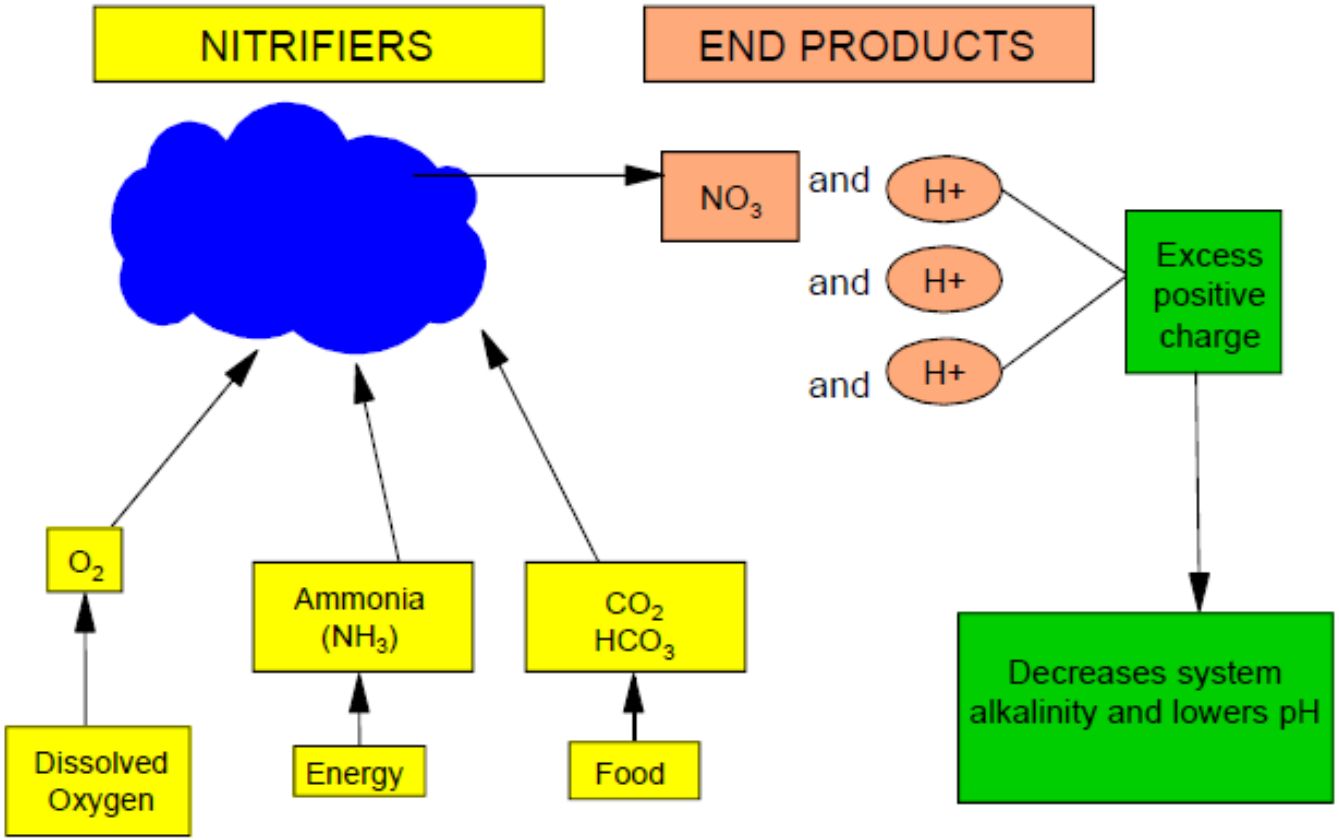
$$\text{Degradable Organics} + O_2 \Rightarrow CO_2 + H_2O + \text{New Bugs}$$

ORGANICS REMOVAL

- Oxygen is consumed (Blowers Supply O_2)
- New sludge (Bugs) is generated
- Settable and and floatable organics (O&G – By-Law) are consumed by the bacteria or will be removed with the waste sludge

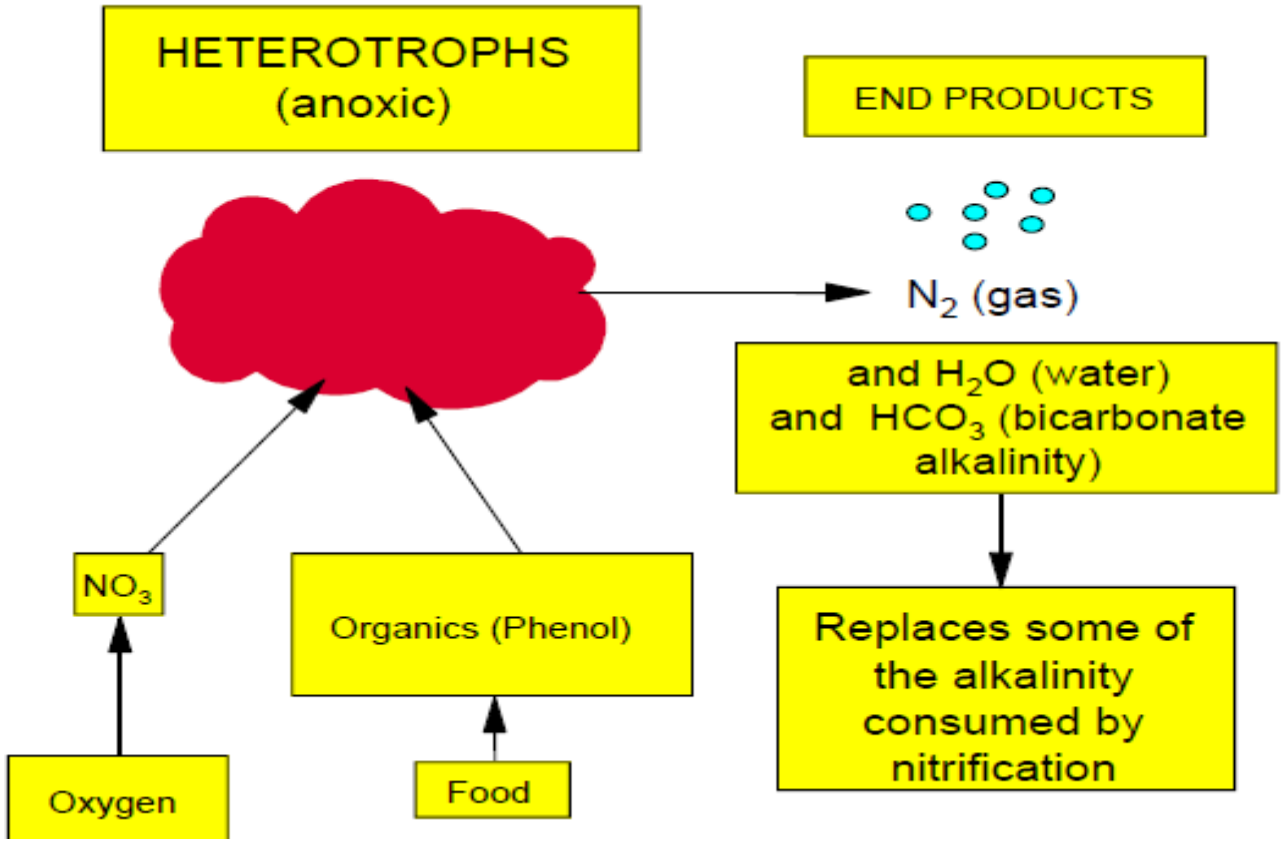
AIS – Activated Sludge Treatment

- What does Biomass Do – Nitrification = Alkalinity Consumption.



AIS – Activated Sludge Treatment

- What does Biomass Do – COD Reduction + Alkalinity Replaced.



AIS – Activated Sludge Treatment

- What does Biomass Do – Oxygen use.
- Dissolved oxygen (DO) is required to metabolize ammonia and the organic material.
- Without it, full treatment is not possible
- Lack of oxygen will result in septic conditions that can inhibit beneficial bacterial growth and reduce treatment efficiencies.
- Oxygen dissolves as the blowers bubble air through the system.

AIS – Activated Sludge Treatment

- What does Biomass Do – Chemicals

- Magnesium hydroxide:
  - Alkalinity and PH control
  - Added in the aeration zone
  - Manual addition is possible
- Defoamer:
  - Controls foaming
  - Added to the aeration zone
  - Added as required
- Polymer:
  - Enhances sludge settling
  - Added to the clarifier feed channel

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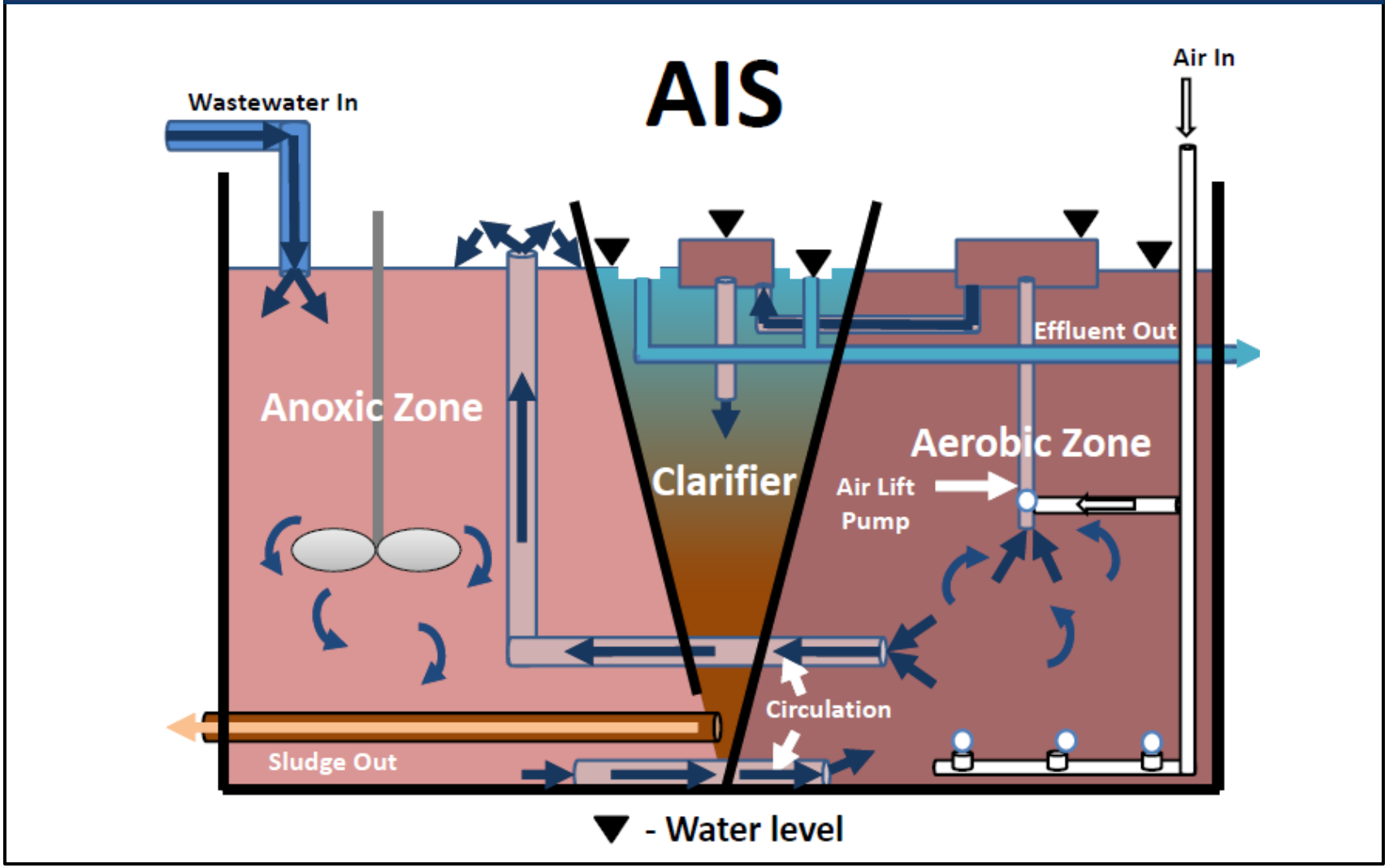
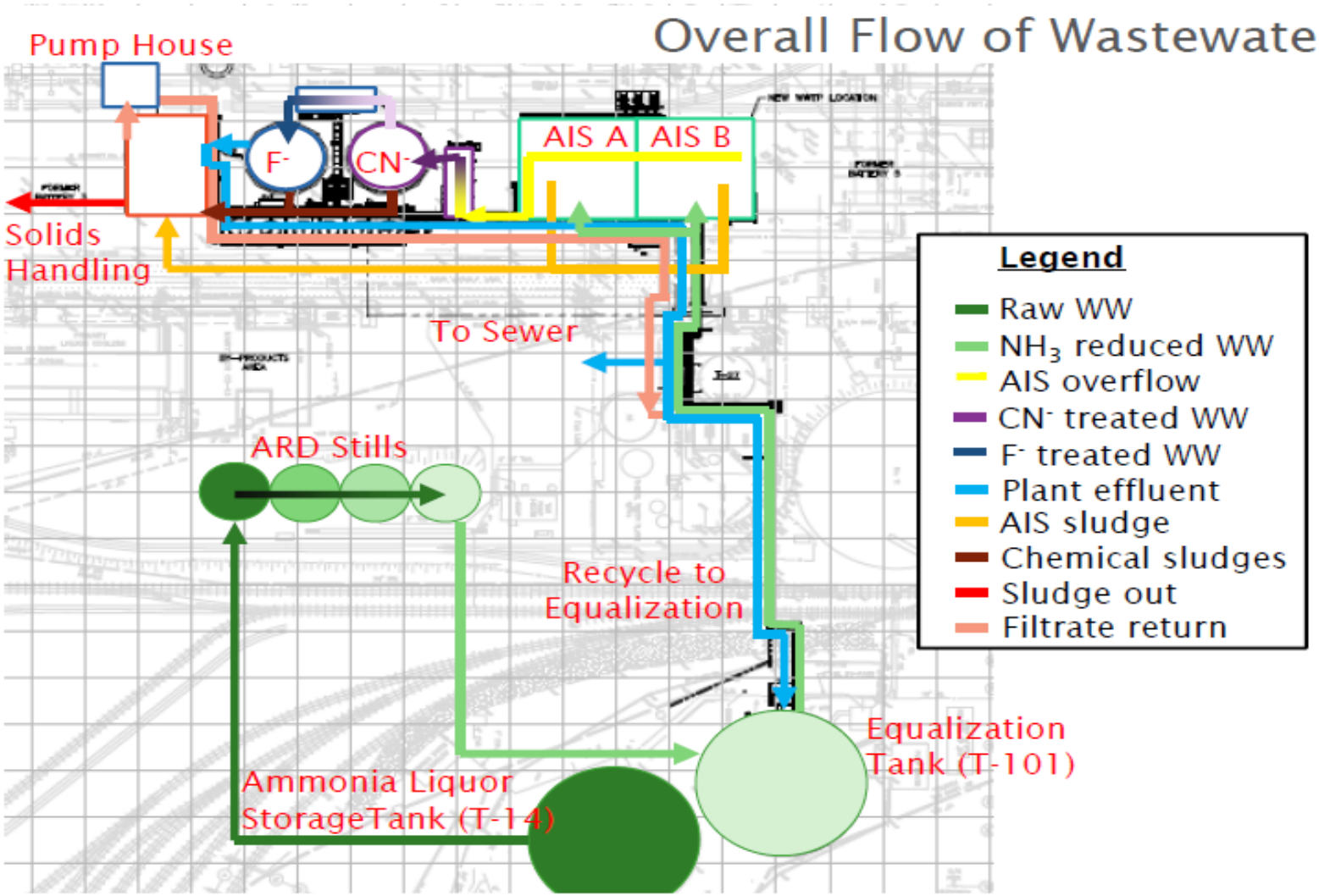
AIS – Activated Sludge Treatment



Stelco – Hamilton Works Waste Water Treatment Plant Flow



Chemical Treatment – Cyanide and Fluoride

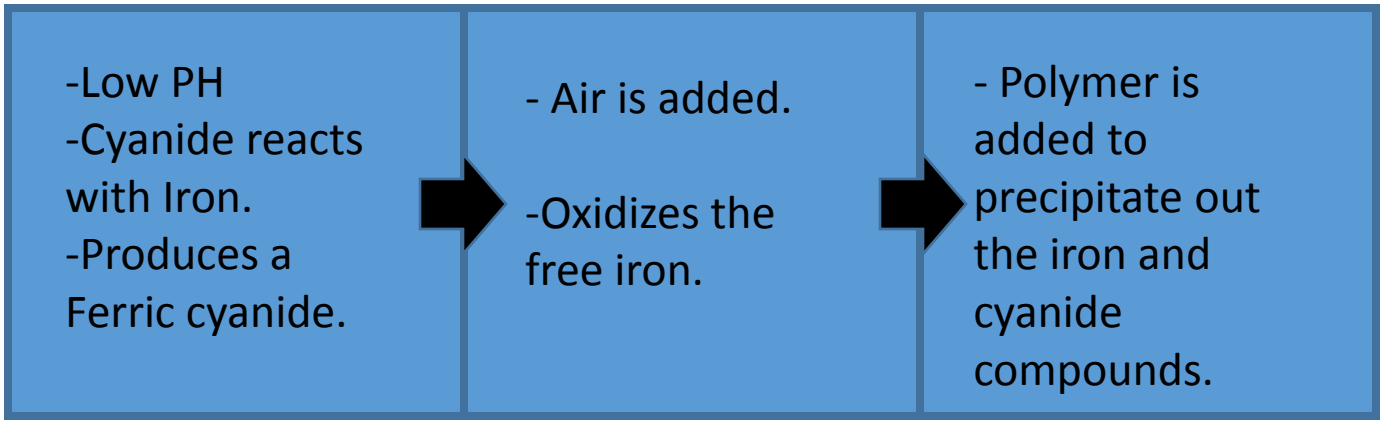
Definition of terms:

- Coagulation
  - Chemicals react with compounds in the waster water
  - Form complex compounds which precipitate
- Precipitation
  - Formation of a solid from solution
- Flocculation
  - Solid agglomeration into larger particles.

Chemical Treatment – Cyanide Treatment

How do we remove cyanide from our system?

- 3 mixing chambers – coagulation, oxidation, and flocculation.
- Coagulant is added in the first chamber with rapid mixing and PH adjustment.
- Air is added in the second chamber to oxidize the chemical compounds with PH adjustment.
- Polymer is added and slow air agitation are used in the third chamber for flocculation.



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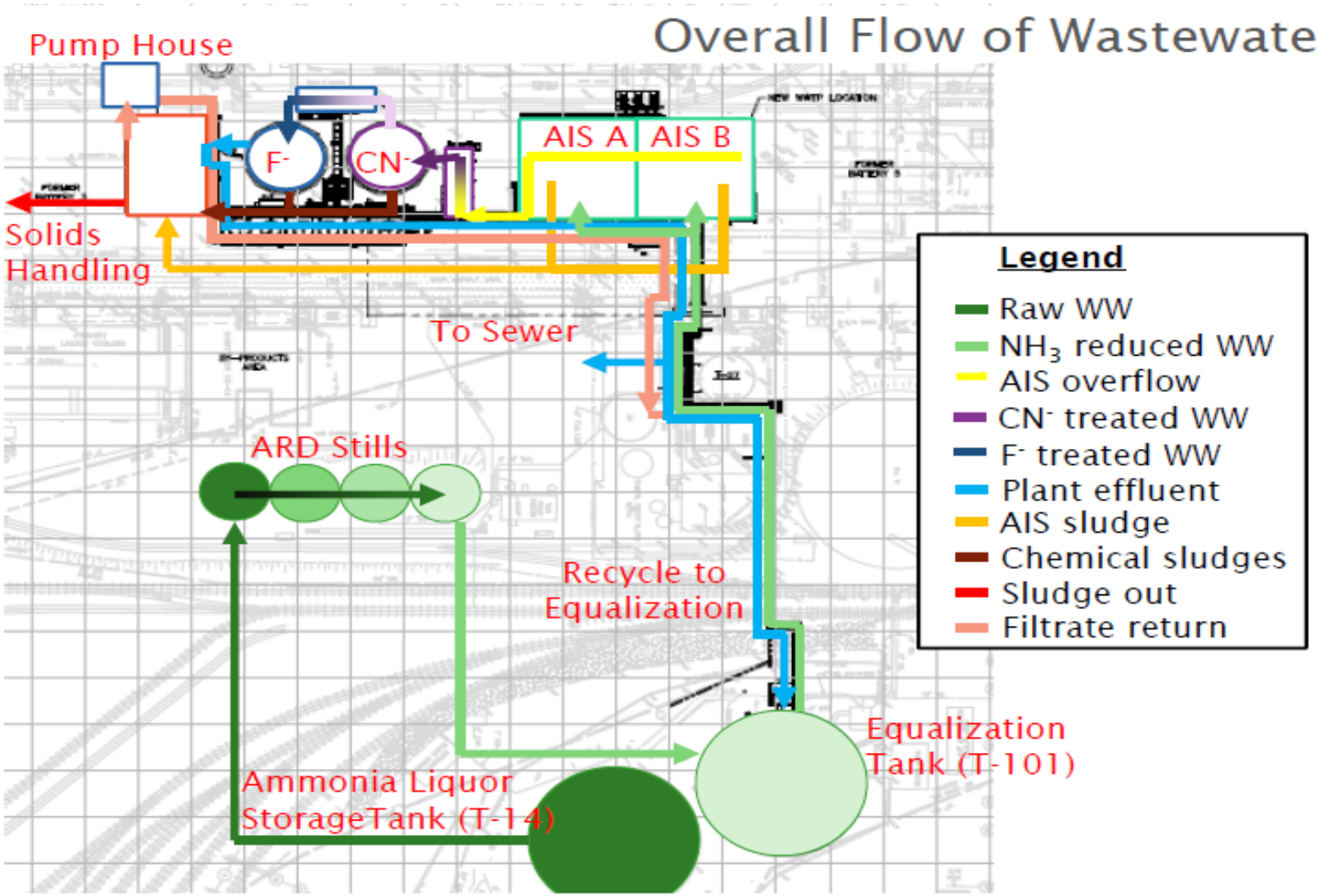
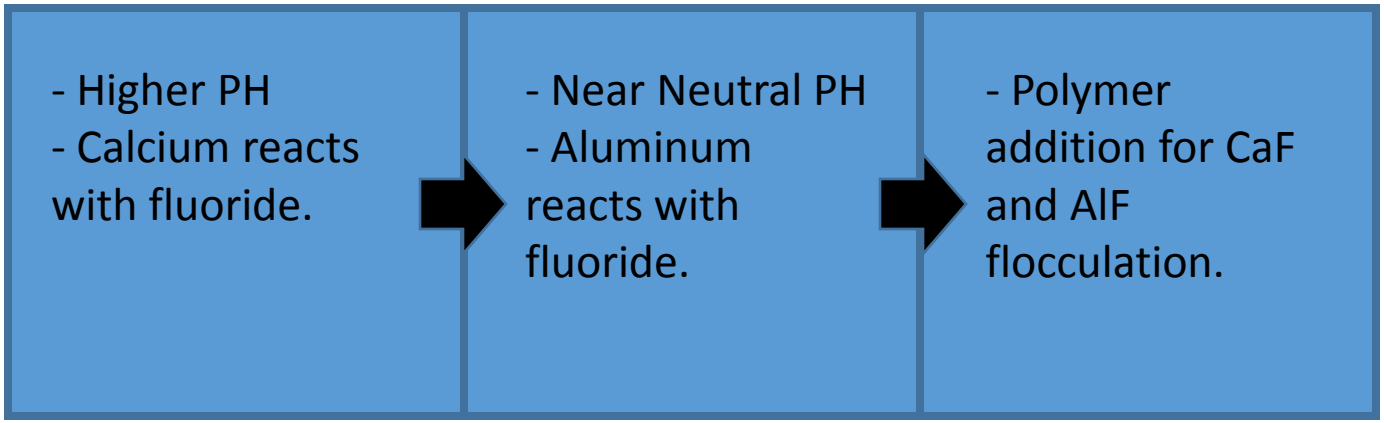
Stelco – Hamilton Works Waste Water Treatment Plant Flow



Chemical Treatment – Fluoride Treatment

How do we remove Fluoride from our system?

- 3 mixing chambers – Ca coagulation, Al coagulation, and flocculation.
- Coagulant (Ca) is added in the first chamber with rapid mixing and pH adjustment.
- Coagulant (Al) is added in the first chamber with rapid mixing and pH adjustment.
- Polymer is added and slow mechanical mixing are used in the third chamber for flocculation.



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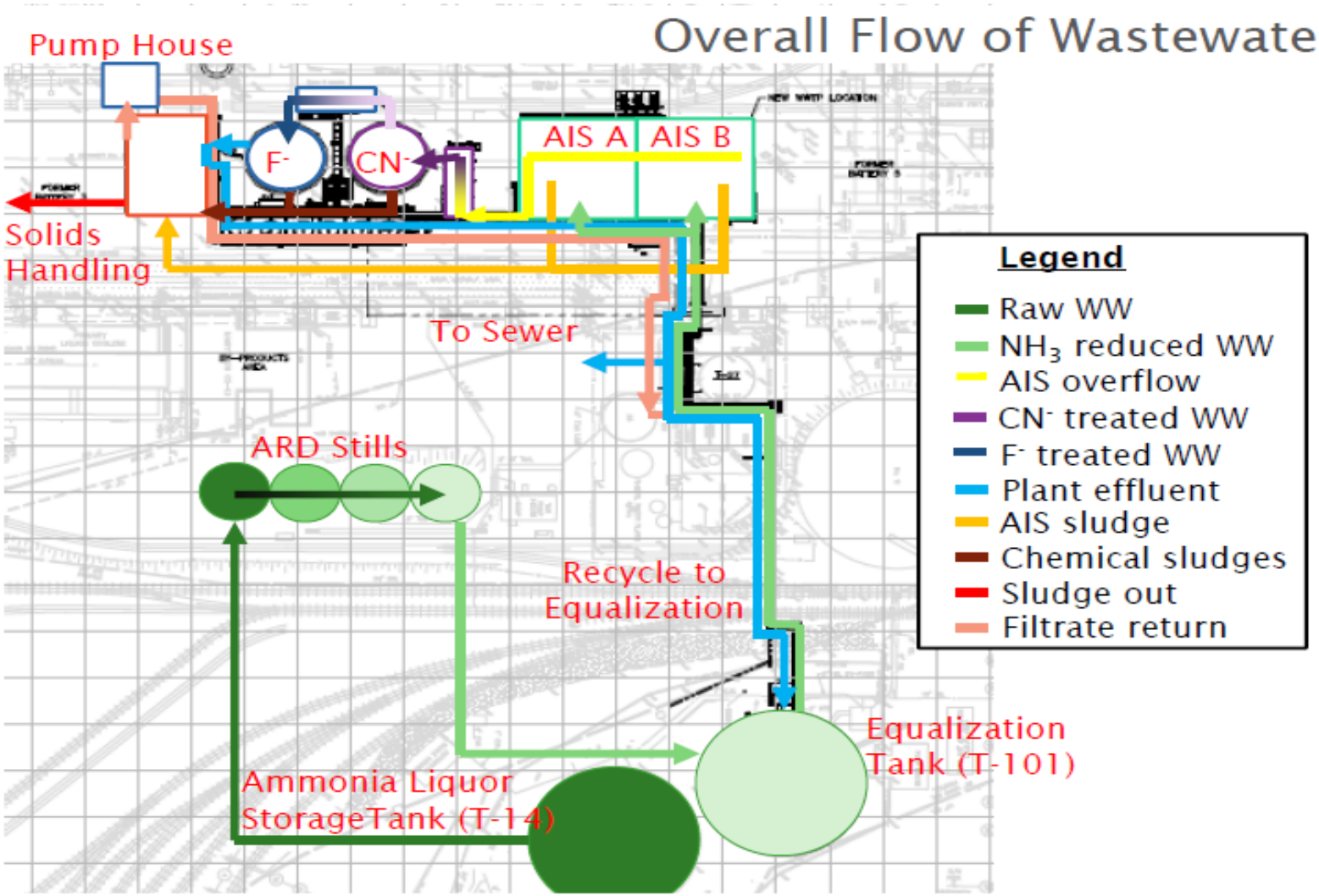
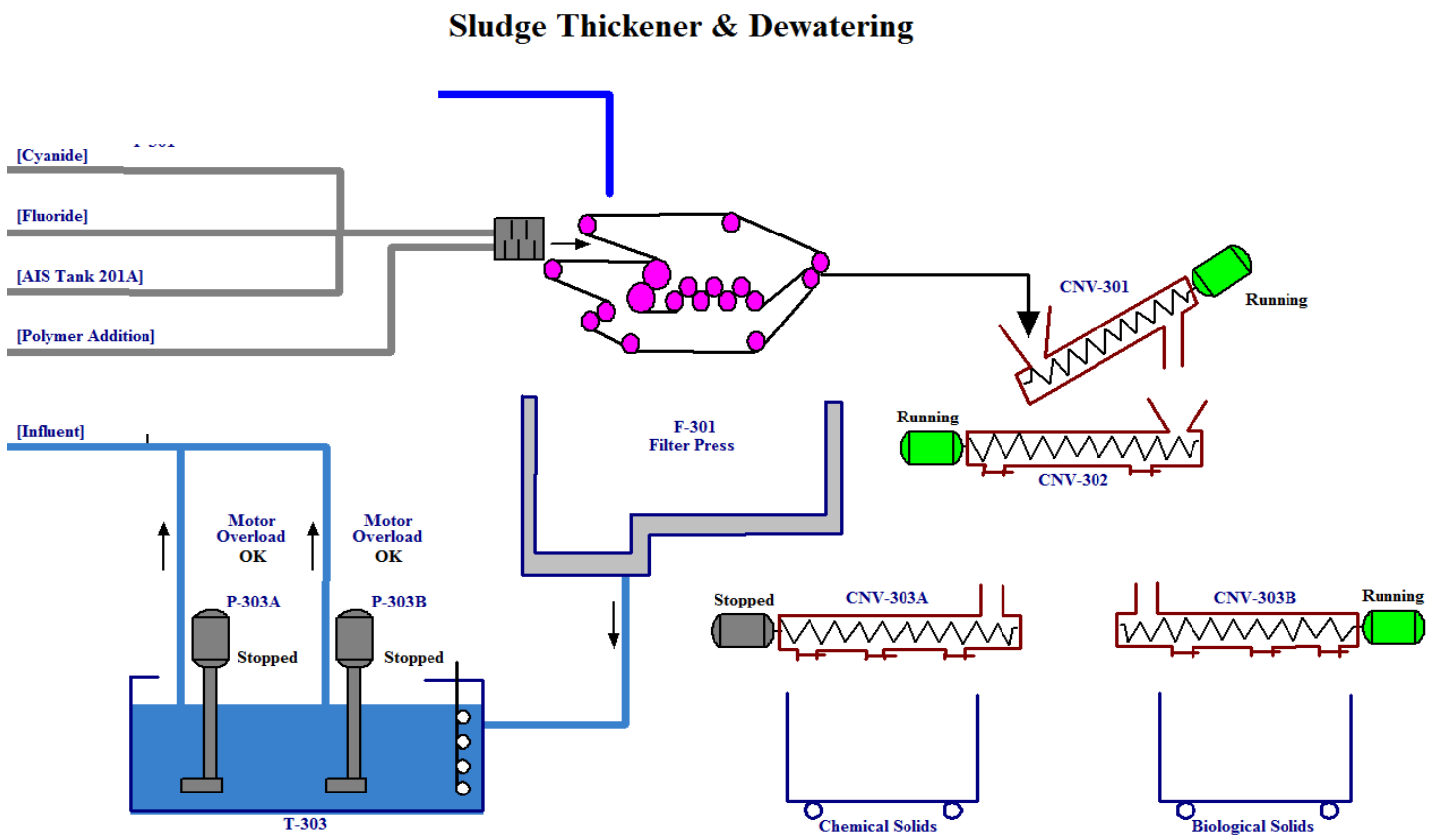


Chemical Treatment – Sludge DeWatering



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Thank You.

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Site-Specific Standard Order (Particulates): Performance Review – Daily

Date	Doors (% Leaks)	Lids (% Leaks)	Off-takes (% Leaks)
2015 Limits (July 2 start)	54%	2%	NA
2016 Limits	32%	2%	NA
2017-2019 Limits	**10%**	**2%**	**5%**
2020 Limits	5%	1%	4%
Jan-May 2017 Range (Average)	**0 – 3.66% (0.08%)**	**0 – 0.74% (0.07%)**	**0 – 3.8% (0.25%)**

Daily Measurements Performed YTD

- All weekdays, except for holidays
- 5 Saturdays
- 2 Sundays

Jan – May 2017 Operational Adjustments

- None required – in compliance with 2017 limits

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Site-Specific Standard Order (Particulates): Performance Review – 30 Day Rolling Averages

Date	Doors (% Leaks)	Lids (% Leaks)	Off-takes (% Leaks)	Charging (sec) (log avg)
2015 Limits (July 2 start)	38%	0.8%	25%	12 sec
2016 Limits	22.5%	0.8%	15%	12 s
2017-2019 Limits	**7%**	**0.8%**	**4.2%**	**12 s**
2020 Limits	4%	0.4%	2.5%	12 s
Jan – May 2017 Range (Average)	**0 – 0.34% (0.08%)**	**0.03 – 0.12% (0.07%)**	**0.12 – 0.42% (0.24%)**	**1.99 – 4.58 s (2.74 s)**

Jan – May 2017 Performance

- In compliance with 2017 limits

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Site-Specific Standard Order (Particulates): Performance Review – Daily Observations – Pushing Emissions

Date	Pushing Emission (opacity %)
2015 Limit (July 2 start)	≥ 50%
2016 – 2018	**≥ 50%**
2019	≥ 40%
2020	≥ 30%
Jan – May 2017 Range (Average)	**0 – 18.33 % (1.03 %)**

Jan – May 2017 Operational Adjustments

- None required – in compliance with 2016-2018 limit

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Site-Specific Standard Order (Particulates): Performance Review – Additional Items

- Community Complaint:
  - June 15, 2017
  - Visible emission from coke underfiring stack
- Stelco Review:
  - No charging or pushing activities at the coke ovens during the reported timeframe
  - No opacity exceedence during the reported timeframe
    - Instantaneous opacity and 6-minute average opacity were ~3%
- Next Steps:
  - Stelco to work with MOECC to gather any additional details available related to the reported visible emission for cause analysis and any corrective actions that may be required

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Site-Specific Standard Order (Particulates): Performance Review – Additional Items

- Ministry of Environment and Climate Change to provide verbal comments

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