BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

SANITARY DISTRICT OF DECATUR,	)	
	)	
Petitioner,	)	
	)	
v.	)	PCB 14-111
	)	(Variance – Water)
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY,	)	
	)	
Respondent.	)	

NOTICE OF FILING

TO: Mr. John T. Therriault
Clerk of the Board
Illinois Pollution Control Board
100 W. Randolph Street
Suite 11-500
Chicago, Illinois 60601
(VIA ELECTRONIC MAIL)

Carol Webb, Esq.
Hearing Officer
Illinois Pollution Control Board
1021 North Grand Avenue East
Post Office Box
(VIA FIRST CLASS MAIL)

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Illinois Pollution Control Board the **PETITIONER'S MOTION TO SUPPLEMENT PETITION FOR EXTENSION OF VARIANCE**, a copy of which is herewith served upon you.

Respectfully submitted,

SANITARY DISTRICT OF DECATUR,

Dated: March 11, 2014

By: /s/Katherine D. Hodge
Katherine D. Hodge

Katherine D. Hodge
Ethan S. Pressly
HODGE DWYER & DRIVER
3150 Roland Avenue
Post Office Box 5776
Springfield, Illinois 62705-5776
(217) 523-4900

CERTIFICATE OF SERVICE

I, Katherine D. Hodge, the undersigned, hereby certify that I have served the attached PETITIONER'S MOTION TO SUPPLEMENT PETITION FOR EXTENSION OF VARIANCE, upon:

Mr. John T. Therriault
Clerk of the Board
Illinois Pollution Control Board
100 West Randolph Street, Suite 11-500
Chicago, Illinois 60601

via electronic mail on March 11, 2014; and upon:

Division of Legal Counsel
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Post Office Box 19276
Springfield, Illinois 62794-9276

Carol Webb, Esq.
Hearing Officer
Illinois Pollution Control Board
1021 North Grand Avenue East
Post Office Box 19276
Springfield, Illinois 62794-9276

Division Chief of Environmental Enforcement
Office of the Attorney General
69 West Washington Street
Chicago, Illinois 60602

Office of Legal Services
IL Department of Natural Resources
One Natural Resources Way
Springfield, IL 62702-1271

depositing said documents in the United States Mail, postage prepaid, in Springfield, Illinois, on March 11, 2014.

/s/Katherine D. Hodge
Katherine D. Hodge

SDOD:001/Fil/NOF-COS – Motion to Supplement

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

SANITARY DISTRICT OF DECATUR,	)	
	)	
Petitioner,	)	
	)	
v.	)	PCB 14-111
	)	(Variance - Water)
ILLINOIS ENVIRONMENTAL	)	
PROTECTION AGENCY,	)	
	)	
Respondent.	)	

PETITIONER'S MOTION TO SUPPLEMENT
PETITION FOR EXTENSION OF VARIANCE

NOW COMES Petitioner, SANITARY DISTRICT OF DECATUR ("District"), by and through its attorneys, HODGE DWYER & DRIVER, and hereby moves to supplement its Petition for Review before the Illinois Pollution Control Board ("Board") with the full and complete December 29, 2010 and June 29, 2011 interim reports, which were included as Exhibits C and D, in the District's Petition for Review filed with the Board on February 21, 2014. In support of its Motion, the District states as follows:

1. On January 7, 2010, the Board issued the District a variance from the Board's water quality standards for nickel and zinc, 35 Ill. Admin. Code §§ 302.208(e) and 304.105, for its wastewater treatment facility located in Decatur, Illinois.

2. On February 21, 2014, the District timely filed a Petition for Extension of the Variance ("Petition for Extension") from the Board's water quality standards for nickel. In support of certain statements in its Petition for Extension, the District filed the December 29, 2010 and June 29, 2011 interim reports previously submitted to the Illinois Environmental Protection Agency. Petition for Extension, Exhibit C and Exhibit D.

3. The December 29, 2010 Interim Report references an investigation report conducted by Archer Daniels Midland ("ADM"), which was inadvertently omitted from the inclusion of Exhibit C in the District's Petition for Extension . Exhibit C, at 3. This motion to supplement, corrects this omission.

4. The full and complete December 29, 2010 Interim Report along with ADM's investigation report, which is included as originally attached, is now submitted as Exhibit J.

5. The District also submitted ADM's June 2011 investigation report with its June 29, 2011 Interim Report to the Illinois Environmental Protection Agency. *See*, Exhibit D. ADM's June 2011 investigation report is included as Exhibit K. Please note that the date on the June 2011 ADM investigation report corresponds with when the report was mailed to the offices of HODGE DWYER & DRIVER.

6. Because the Record is incomplete, the District requests that it be supplemented with the exhibits attached hereto, in order to make available to the Board all documents relevant to this matter.

WHEREFORE Petitioner, SANITARY DISTRICT OF DECATUR, for the above-stated reasons, respectfully prays that the Board grant this Motion to Supplement

Petition for Review, and that the Board award SANITARY DISTRICT OF DECATUR all other relief just and proper in the premises.

Respectfully submitted,

SANITARY DISTRICT OF DECATUR
Petitioner,

Dated: March 11, 2014

By: /s/ Katherine D. Hodge
Katherine D. Hodge

Katherine D. Hodge
Ethan S. Pressly
HODGE DWYER & DRIVER
3150 Roland Avenue
Post Office Box 5776
Springfield, Illinois 62705-5776
(217) 523-4900

F:\SDOD-001\Filings\Petition for Extension of Variance (02.2014)\Motion to Supplement Record

EXHIBIT J

Interim Report
December 29, 2010

Sanitary District of Decatur
501 DIPPER LANE • DECATUR, ILLINOIS 62522 • 217/422-6931 • FAX: 217/423-8171

December 29, 2010

Illinois Environmental Protection Agency
Attn.: Michael S. Garretson
Bureau of Water Compliance Assurance Section, MC #19
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Re: NPDES Permit IL0028321
IPCB Order PCB 09-125
Interim Report

Dear Mr. Garretson:

Enclosed is the Interim Report regarding compliance with nickel and zinc limits required by Special Condition 18 of the Sanitary District of Decatur's NPDES Permit and the Pollution Control Board Order in PCB 09-125.

Please contact me at 422-6931 ext. 214 or at timk@sdd.dst.il.us if you have any questions regarding this report.

Sincerely,

Timothy R. Kluge, P.E.
Technical Director

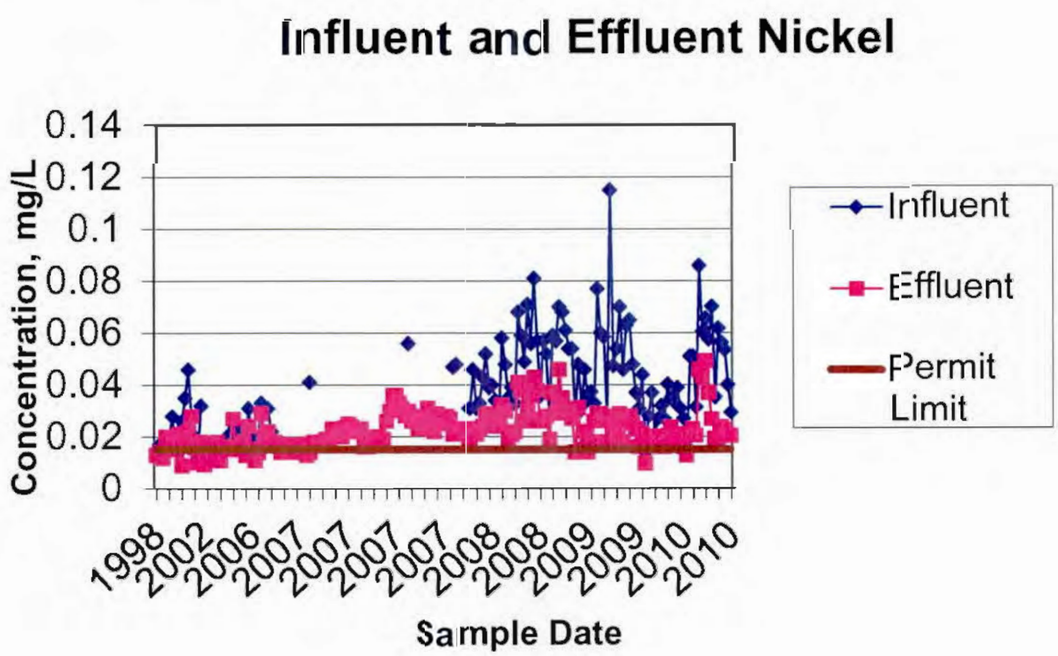
Sanitary District of Decatur
Nickel and Zinc Limits
December 2010 Interim Report

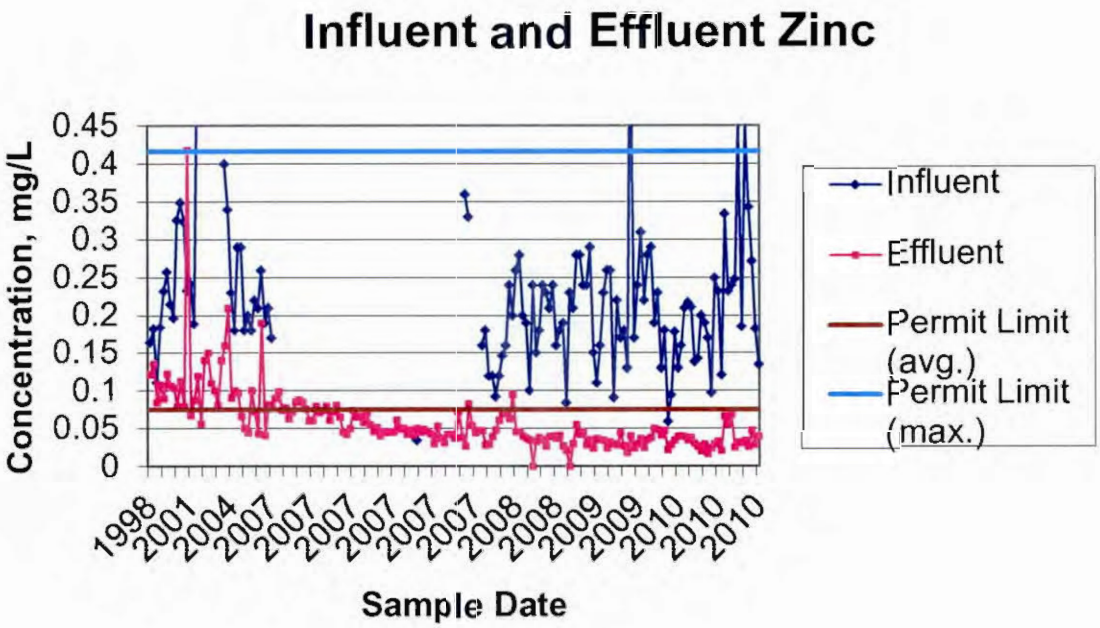
The modified NPDES permit for the Sanitary District of Decatur that became effective July 1, 2009 contains limits for nickel and zinc and a one-year compliance schedule extension for meeting the limits. Special Condition 17 requires that an interim progress report be submitted to Illinois EPA by January 1, 2011.

On January 7, 2010 the Illinois Pollution Control Board granted a variance to the District allowing additional time to comply with final permit limits (PCB 09-125). The final compliance date contained in the Board Order is July 1, 2014. The District's NPDES Permit has not yet been modified to incorporate the variance. The Board Order also requires that an interim progress report be submitted by January 1, 2011 and lists a number of other activities and investigations that are to be completed. This report is submitted to meet both the permit and variance requirements.

Plant Influent and Effluent Sampling

Ongoing influent and effluent sampling for nickel and zinc continues at a frequency of twice monthly. An updated summary of influent and effluent values is shown below. Past data shows that the plant effluent is not able to consistently meet the current nickel permit limit. Zinc concentrations remain below the permit limit.





Receiving Stream Sampling

Upstream and downstream sampling continues at a twice monthly frequency to provide a more complete picture of nickel and zinc in the Sangamon River. One upstream and four downstream sampling sites are being monitored. All upstream and downstream zinc results during the past year have been below the Illinois water quality standard. Downstream nickel concentrations during the relatively dry fall weather in 2010 reflected effluent concentrations with minimal upstream dilution available. A summary of 2010 river monitoring data is attached.

Pretreatment Ordinance Limits

The District's pretreatment ordinance was amended in October 2009 as noted in previous reports.

Stream Flow-Based Compliance Options

The District continues investigation of flow-based permit limits, to take advantage of upstream flow for mixing when it is available. This concept could potentially allow a savings in treatment facility operating costs when the upstream flow is sufficient to meet water quality standards after mixing with treatment plant effluent. A USGS flow gaging station is located about two miles upstream of the District's discharge point, and provides near- real time flow information. We are currently developing a proposal that would establish three to four tiers of limits based on ranges of upstream flow, providing an administratively straightforward way to define and evaluate permit compliance. Informal discussions with Illinois EPA personnel have indicated that the concept of flow-based limits could be considered. We expect to have a proposal for presentation to Illinois EPA early in 2011, to be followed at a later time with a permit modification request.

Water Quality Standard Investigations

The District is continuing to investigate approaches to a water quality standard adjustment including the biotic ligand model (BLM) and use of the water effect ratio. Additional river sampling was conducted during low flow conditions later this summer to verify stream concentrations. On December 9, discussions were initiated with U.S. EPA and Illinois EPA on the reaction to a bioavailability approach. Personnel from U.S. EPA indicated that they would like to review published information on the nickel BLM and a follow-up call is anticipated in early January 2011. The District anticipates preparation of a petition for a site-specific nickel standard to occur in the first half of 2011.

The District has also been notified by Illinois EPA of a possible revision of the zinc water quality standard, based on an error discovered in the derivation of the current standard. We are currently evaluating the impact of this possible change on the District's zinc pretreatment ordinance limit.

Industrial Source Sampling and Investigations

Sampling of the major industries (ADM and Tate & Lyle) for metals continues at a frequency of twice monthly and other industries discharging metals are sampled quarterly. Sample results obtained from the major industries within the past year are attached.

The District's operating permit issued to ADM was modified on November 18, 2009 and again on June 17, 2010 to reflect the new limits and provide a compliance schedule for meeting the limits. Final local limits will be effective upon expiration of the District's variance.

Both major industries formerly utilized zinc as part of their cooling tower treatment programs, and both have eliminated or greatly reduced zinc in their towers. At this time, both industries are meeting the zinc pretreatment limit. ADM is continuing to investigate the possible impact of the zinc limit on their planned wasting of solids from their pretreatment system to the District's collection system.

The discharge from ADM is by far the most significant industrial source of nickel. ADM has been very active in seeking treatment technology for nickel removal, involving plant management and research department personnel in addition to environmental compliance and legal staff. The District's pretreatment permit requires semi-annual reports of ADM's investigations, and a copy of the most recent report is attached. The report includes status updates on the specific treatment technologies required to be investigated. District staff met with ADM on December 22, 2010 to review the information in the report.

Additional Pretreatment Limit Investigations

Pretreatment ordinance limits adopted in 2009 were adopted as total (rather than soluble) limits based on review of soluble/insoluble data. Refinement of pretreatment limits is an ongoing process and will depend on final permit limits as well as treatment technologies that might be employed by industrial users. The required determination of soluble/insoluble vs. total limits will be updated as part of the final compliance plan submitted to the Agency.

Compliance Plan

In summary, the District's proposed compliance plan includes ongoing work as required by the Board Order granting the District's variance. The District will continue to proceed in accordance with the schedule in the Order with efforts in three areas:

1. Continuing to work with ADM to investigate nickel removal technologies, and to determine a sludge wasting plan that will minimize zinc discharges. The Order lists ten technologies that are to be investigated by December 31, 2010, and the summary documents work on all ten as required.

2. Conducting additional discussions with Illinois EPA permit personnel regarding variable permit limits based on the amount of flow available in the Sangamon River. As noted above, Illinois EPA has been receptive to this concept. Additional evaluations are underway to possibly extend the concept to other parameters. The District plans to submit a comprehensive proposal to Illinois EPA during the first half of 2011.

3. Conducting additional discussions with Illinois EPA and U.S. EPA standards personnel regarding justification for a site-specific water quality standard for nickel, based on bioavailability. As noted above, development of a petition for the Pollution Control Board is planned in the first half of 2011.

SDD Major Industrial Nickel and Zinc Results				
	ADM Point A	ADM Point A	ADM Point D	ADM Point D
Sample	Nickel, Tot	Zinc, Tot	Nickel, Tot	Zinc, Tot
Date	mg/L	mg/L	mg/L	mg/L
12/1/2009	0.0899	0.291	0.079	0.213
12/7/2009	0.0899	0.358	0.0948	0.325
1/11/2010	0.0825	0.362	0.0693	0.254
1/27/2010	0.08	0.475	0.0824	0.383
2/1/2010	0.0907	0.506	0.0949	0.435
2/8/2010	0.0921	0.375	0.112	0.378
3/8/2010	0.0824	0.329	0.0897	0.203
3/15/2010	0.0621	0.522	0.11	0.303
4/5/2010	0.0649	0.441	0.107	0.309
4/12/2010	0.106	0.593	0.119	0.374
5/3/2010	0.0654	0.386	0.0958	0.258
5/10/2010	0.0551	0.333	0.0774	0.189
6/1/2010	0.0813	0.488	0.12	0.441
6/14/2010	0.0826	0.453	0.104	0.345
7/8/2010	0.148	0.54	0.283	1.07
7/12/2010	0.144	0.528	0.193	0.514
8/2/2010	0.125	0.457	0.172	0.446
8/9/2010	0.126	0.44	0.184	0.474
9/1/2010	0.0766	0.465	0.122	0.469
9/20/2010	0.0744	0.442	0.121	0.649
10/4/2010	0.0781	0.461	0.0938	0.369
10/14/2010	0.162	1.18	0.179	1.18
11/8/2010	0.0524	0.24	0.0646	0.208
11/23/2010	0.13	0.665	0.122	0.413
SDD Ordinance Limit (Avg.)	0.0365	0.45		
SDD Ordinance Limit (Max.)	0.15	1.7		

SDD Major Industrial Nickel and Zinc Results				
	T&L Point A	T&L Point A	T&L Point C	T&L Point C
Sample	Nickel, Tot	Zinc, Tot	Nickel, Tot	Zinc, Tot
Date	mg/L	mg/L	mg/L	mg/L
12/1/2009	0.0046	0.0901	0.00233	0.0646
12/7/2009	0.00381	0.081	0.00898	0.118
1/11/2010	0.00307	0.0429	0.00598	0.453
1/25/2010	0.00286	0.0637	0.0041	0.0941
2/1/2010	0.00392	0.112	0.00353	0.232
2/8/2010	0.00171	0.0294	0.00205	0.109
3/8/2010	0.00565	0.0752	0.00633	0.13
3/15/2010	0.00356	0.0606	0.00455	0.168
4/5/2010	0.00265	0.0354	0.00294	0.198
4/12/2010	0.0128	0.188	0.00489	0.579
5/3/2010	0.00339	0.0817	0.00479	0.234
5/10/2010	0.00429	0.107	0.00839	0.388
6/1/2010	0.00673	0.0769	0.0076	0.222
6/21/2010	0.00449	0.0586	0.0131	0.411
7/6/2010	0.00604	0.0479	0.00485	0.263
7/12/2010	0.00776	0.111	0.017	0.427
8/2/2010	0.0051	0.0608	0.00402	0.19
8/9/2010	0.00473	0.0302	0.00529	0.36
9/1/2010	0.00564	0.071	0.0117	0.394
9/14/2010	0.00644	0.0492	0.00706	0.149
10/4/2010	0.00785	0.0425	0.00475	0.18
10/12/2010	0.0309	0.428	0.00476	0.218
11/8/2010	0.00801	0.0512	0.00266	0.0705
11/22/2010	0.00901	0.125	0.00589	0.141
SDD Ordinance Limit (Avg.)	0.0365	0.45		
SDD Ordinance Limit (Max.)	0.15	1.7		

Sanitary District of Decatur
Nickel and Zinc River Data 2010

Sample Date	Plant Final Effluent Nickel mg/L	River Up-stream Nickel mg/L	River 100 yds Down stream Nickel mg/L	River 600 yds Down-stream Nickel mg/L	River Rock Springs Bridge Nickel mg/L	River Wyckle's Road Nickel mg/L	River Lincoln H'stead Nickel mg/L	Plant Final Effluent Zinc mg/L	River Up-stream Zinc mg/L	River 100 yds Down stream Zinc mg/L	River 600 yds Down-stream Zinc mg/L	River Rock Springs Bridge Zinc mg/L	River Wyckle's Road Zinc mg/L	River Lincoln H'stead Zinc mg/L
1/14/10	0.0202	<0.00131	0.00374	0.00407	0.00331		0.00318	0.0393	<0.00660	0.0102	0.0108	0.00839		0.0112
1/28/10	0.0160	0.00205	0.00253	0.00240	0.00209		0.00237	0.0399	0.0129	0.0130	0.0121	0.0135		0.0138
2/11/10	0.0204	<0.00131	0.00462	0.00357	0.00277		0.00253	0.0344	<0.00660	0.0119	0.00980	0.0108		0.00710
2/18/10	0.0304	<0.00131	0.00527	0.00468	0.00398		0.00351	0.0377	0.00696	0.0103	0.0103	0.00777		0.00819
3/4/10	0.0235	<0.00131	0.00376	0.00332	0.00242		0.00240	0.0304	0.00667	0.00918	0.00851	0.00746		0.00895
3/18/10	0.0194	0.00133	0.00232	0.00199	0.00165		0.00200	0.0260	0.00781	0.00966	0.00953	0.00801		0.0107
4/15/10	0.0208	<0.00131	0.00290	0.00279	0.00237		0.00281	0.0204	<0.00660	0.00758	0.00867	<0.00660		0.00761
4/29/10	0.0173	<0.00131	0.00186	0.00201	0.00175		0.00222	0.0290	0.00776	0.00676	0.00833	<0.00660		0.00902
5/13/10	0.0127	0.00137	0.00195	0.00244	0.00174		0.00229	0.0244	0.00762	0.00767	0.00791	0.00821		0.0112
5/27/10	0.0211	<0.00131	0.00388	0.00284	0.00226		0.00259	0.0293	0.00765	0.00875	0.00763	0.00697		0.00982
6/10/10	0.0229	0.00205	0.00298	0.00241	0.00217		0.00291	0.0328	0.0108	0.0106	0.00988	0.0105		0.0145
6/24/10	0.0205	0.00262	0.00620	0.00386	0.00311		0.00345	0.0212	0.0144	0.0137	0.0125	0.0142		0.0148
7/8/10	0.0458	<0.00131	0.00637	0.00713	0.00540		0.00571	0.0662	<0.00660	0.0148	0.0175	0.0155		0.0121
7/29/10	0.0433	0.00190	0.00744	0.00600	0.00580		0.00600	0.0564	0.00909	0.0132	0.0122	0.0123		0.0248
8/12/10	0.0493	0.00157	0.0367	0.0353	0.0327		0.0338	0.0681	0.0130	0.0578	0.0529	0.0480		0.0601
8/26/10	0.0370	0.0025	0.0319	0.0320	0.0294		0.0211	0.0253	0.0130	0.0255	0.0246	0.0221		0.0121
9/9/10	0.0269	<0.00131	0.0203	0.0197	0.0166		0.0119	0.0314	<0.00660	0.0219	0.0209	0.0257		0.0218
9/23/10	0.0192	0.00186	0.0136	0.0132	0.00915		0.0108	0.0309	0.0119	0.0590	0.0249	0.0188		0.0162
10/14/10	0.0182	0.00251	0.0176	0.0182	0.0149	0.0152		0.0335	0.00827	0.0335	0.0317	0.0259	0.0303	
10/28/10	0.0238	0.00135	0.0209	0.0212	0.0158	0.0157		0.0261	<0.00660	0.0316	0.0232	0.0179	0.0190	
11/04/10	0.0227	0.00146	0.0222	0.0223	0.0193	0.0193		0.0474	<0.00660	0.0440	0.0421	0.0367	0.0354	
11/18/10	0.0207	0.00131	0.0191	0.0189	0.0164	0.0170		0.0287	<0.00660	0.0271	0.0274	0.0245	0.0238	
12/02/10	0.0203	0.00180	0.0027	0.00217	0.00217	0.00186		0.0396	<0.00660	0.00702	0.00745	0.00779	<0.00660	

Bridge at Wyckle's Road closed for repair August 2009.

indicates that effluent or river/creek sample's concentration violates water quality standards monthly average

To:	Illinois Environmental Protection Agency Decatur Sanitary District
From:	ADM Decatur WWTP
CC:	ADM Corn Processing, ADM Oilseeds Processing, ADM JRRRC
Date:	December 22, 2010
Re:	Status Report Compliance Strategy for 2009-2010 for Decatur Sanitary District and ADM Decatur WWTP for waste treatment.

Table of Contents

ADM Research and Decatur Corn Processing have been actively pursuing technologies to sequester Nickel (Ni) and remove it from the effluent stream. Enclosed is an update report on the progress ADM has made since the update issued on June 30, 2010.

1 Background

Nickel and Zinc are present in effluent leaving the ADM Decatur Complex Waste Water plant. New Limits are proposed which will reduce the discharge limits to 0.0365 ppm for Nickel and 0.35 ppm for Zinc. Of the two metals, nickel is more difficult to remove from the effluent. During August- November 2010, a 7 week monitoring study of Nickel containing streams in the plant was performed on the ADM Decatur facility. The concentration and total quantity coming from the various waste water treatment plant influents are shown in Tables 1 and 2.

Table -1 TOTAL NICKEL LOAD, BY PLANT

	Flow, MGD	Avg lbs / day	Avg ppm	% Total (by weight)	
East Plant	2.006	3.72	0.22	54.3%	Note: EP Condensate Ni concentration is multiplied ~4 times in Cooling Towers
Corn Plant	4.791	1.58	0.040	23.2%	
Polyol	0.037	0.77	2.5	11.2%	
Glycol	0.064	0.06	0.11	0.8%	
Biochem	1.487	0.35	0.028	5.1%	
West Plant	0.839	0.35	0.050	5.1%	Note: WP Ni concentration is multiplied ~4 times in Cooling Towers
Co-gen	0.123	0.02	0.019	0.3%	
Avg / Total	9.345	6.84	0.088		

The majority of nickel found in ADM effluent water originates in the corn and soybeans being processed at the facility. During the processing, the metals are released and enter the processing water which eventually ends up at the wastewater treatment plant.

As reported in the June 30, 2010 update, 24 technologies were investigated to control nickel in the ADM Decatur facility effluent. The current update focuses on technologies that we have developed to the next level of scale up/ testing. Technologies that are no longer being actively pursued will not be discussed. Soluble nickel, which is the focus of this report, originates mainly in the East Plant (1.0 kg/day) and Corn Plant refinery (0.71kg/day). The soluble nickel in the West Plant effluent is is relatively low, but presents an unusual problem because it is cycled approximately 4 times in the Corn Plant cooling towers. This presents nickel concentration issues in the non-High Salt waste. The main hurdles with soluble nickel removal are its already low concentration relative to other metals (Ca, Mg) and that it appears to be tightly bound as a complex. The major process flows with metal concentrations are shown in Tables 1 and 2.

No. of Weeks of Data		Table 2 WEEKLY COMPLEX LOADS TO WWTP – CONCENTRATION							
			Daily Avg ppm	Daily Avg ppm	Daily Avg ppm	Daily Avg ppm	Daily Avg ppm	Daily Avg ppm	Daily Avg ppm
7		Flow, MGD	Total Nickel	Soluble Nickel	Total Zinc	Soluble Zinc	Total P	Soluble P	Chloride
	High Salt EQ TK	5.930	0.17	0.14	0.46	0.34	72	56	909
	Low Salt EQ TK	4.525	0.015	0.014	0.056	0.038	4.8	4.5	55
	Avg Complex ppm to WWTP	10.455	0.106	0.087	0.288	0.210	42.8	33.7	540
	TO WWTP by PLANT		0.037 max	0.037 max					500 max
7	CORN PLANT	4.791	0.040	0.041	0.27	0.27	23	24	791
7	EAST PLANT	2.006	0.22	0.18	1.07	0.86	104	74	430
7	POLYOL	0.037	2.52	2.62	0.046	0.043	0.3	0.2	1,431
7	GLYCOL	0.064	0.106	0.107	0.78	0.91	61	73	1,167
7	WEST PLANT	0.839	0.050	0.039	0.095	0.074	5	5	81
7	BIOCHEM	1.487	0.028	0.028	0.30	0.32	52	56	830
7	COGEN	0.123	0.019	0.017	0.046	0.032	0.5	0.5	3,368
		9.345	↓						
		BALANCE OF FLOW IS BIOCHEM CONDENSATE, STORM WATER, THREONINE & TRUCK WASH.							

			0.037 max						500 max
			Daily Avg ppm	Daily Avg ppm	Daily Avg ppm	Daily Avg ppm	Daily Avg ppm	Daily Avg ppm	Daily Avg ppm
	TO WWTP by STREAM	Flow, MGD	Total Nickel	Soluble Nickel	Total Zinc	Soluble Zinc	Total P	Soluble P	Chloride
	Corn Plant Refinery	1.242	0.132	0.137	0.79	0.80	26	27	2,697
	Corn Plant Feed House	0.547	0.009	0.009	0.092	0.073	42	45	262
	Corn Plant High pH to FH	0.127	0.002	0.002	0.012	0.003	307	317	1,403
	Corn Plant Low Salt	2.876	0.008	0.008	0.09	0.09	6	6	41
	East Plant 12"	1.337	0.259	0.212	1.28	1.05	121	88	501
	East Plant 8"	0.400	0.209	0.164	1.04	0.80	110	72	463
	East Plant Condensate	0.269	0.056	0.056	0.057	0.045	10	10	26
	Polyol	0.037	2.524	2.619	0.046	0.043	0.3	0.2	1,431
	Glycol	0.064	0.106	0.107	0.78	0.91	61	73	1,167
	West Plant	0.839	0.050	0.039	0.095	0.074	5	5	81
	Biochem High Salt	1.487	0.028	0.028	0.30	0.32	52	56	830

		Cogen	**0.123**	**0.019**	**0.017**	**0.046**	**0.032**	**0.5**	**0.5**	**3,368**	

Information summarized below discusses the various technologies/companies that have been investigated. Some of the technologies have been tried using ADM process discharge samples and in a number of cases chemical usage and treatment costs have been estimated.

2 Deliverables

2.1 Nickel- Proprietary Precipitation Process

We have reported on 6 proprietary precipitation technologies we were pursuing as part of our June 30, 2010 update. However, due to ongoing challenges involving dosage and regeneration we have suspended this work.

2.2 Nickel- Chemical Precipitation Process Using Carbamates or Organic Sulfides

2.2.1 Chemtreat

Chemtreat P-8007L is a polymeric based Dimethyldithiocarbamate. Onsite tests with Chemtreat are reported below. Using a 100ppm dosage and a 5 minute mixing time, it reduced the soluble Nickel concentration to below 35 ppb. We have also identified that the addition of Ferrous Sulfate subsequent to the addition of P-8007L reduced its dosage required for application.

Sample	First Product Added	Dose (PPM)	Mix Time (Min.)	2nd Product Added	Dose (PPM)	Mix Time (Min.)	**Ni (mg/Kg)**	**% Ni removal**	Zn (mg/Kg)	P (mg/Kg)
1	**Raw Water**						**0.078**	0.0%	**0.047**	**61.5**
2	**Filtered Raw Water**						**0.067**	**13.7%**	**0.029**	**55.9**
3	**P-8007L**	25	5	Ferrous	50	5	**0.046**	**40.8%**	0.030	56.2
4	**P-8007L**	50	5	Ferrous	50	5	**0.038**	**51.1%**	0.024	51.8
5	**P-8007L**	100	5	Ferrous	80	5	**0.038**	**51.9%**	0.018	51.2
6	**P-8007L**	200	5	Ferrous	100	5	**0.032**	**59.3%**	0.019	48.0
12	**P-8007L**	200	30	Ferrous	100	5	**0.031**	**60.5%**	0.056	48.2
14	**P-8007L**	100	30	Ferrous	100	5	**0.029**	**63.3%**	0.059	46.7

2.2.1.1 Technical Feasibility

Current treatment protocol does not require pH modification. However the precipitant is recovered through a very tight filter (0.45microns). We are working to setup a trial to determine optimum dosage of their precipitant and suitable recovery mechanism.

2.2.1.2 Capital and Operation Costs
Chemtreat estimates costs for P8007L at about [redacted]$/lb.

2.2.1.3 Reliability
We have reproduced some of Chemtreat's work internally and plan to conduct a pilot trial with their material.

2.2.2 Hydrite
We tested Hydrite Chemicals, polymeric DTC product on our DAF effluent and DAF influent streams. One product, "1742" showed reduction in soluble nickel at a 100ppm dosage.

Sample Name	Ni	% Nickel Reduction
	mg/kg	
11-12 DAF Eff Raw	0.079	
DAF 1740 'as is' pH @ 100ppm, 4 hrs w/ acid kill	Bad data	
DAF 1750 'as is' pH @ 100ppm, 4 hrs w/ acid kill	0.074	6%
DAF 1752 'as is' pH @ 100ppm, 4 hrs w/ acid kill	0.045	43%
DAF 1742 'as is' pH @ 100ppm, 4 hrs w/ acid kill	0.031	61%
DAF 1740 6 pH @ 100ppm, 4 hrs w/ acid kill	0.03	62%
DAF 1750 6 pH @ 100ppm, 4 hrs w/ acid kill	0.072	9%
DAF 1752 6 pH @ 100ppm, 4 hrs w/ acid kill	0.037	53%
DAF 1742 6 pH @ 100ppm, 4 hrs w/ acid kill	0.029	63%

2.2.2.1 Technical Feasibility
No pH treatment is required but this is a new product launched by the manufacturer. All the required approvals are still being pursued.

2.2.2.2 Capital and Operation Costs
Hydrite estimates costs at about $[redacted] per lb.

2.2.2.3 Reliability
We have seen good reproducibility with different feed samples. We plan to conduct a pilot trial with this chemical.

2.2.3 Kroff 9011
We have identified a polyethylene imine based DTC chemistry from Kroff. In both in-house and external laboratory testing the Nickel concentration was reduced to a desirable level.

Testing at Kroff						Final	Slow	Settling		
Test	Adjusted		Formulation	Dosage	Mix Time	Adjusted	Mix Time	Time	Ni	NI
#	pH	pH	#	(ppm)	(minutes)	pH	(minutes)	(Min)	(ppb)	(% reduction)
1		8.34	Raw Influent						71	
2		8.34	Filtered Raw Influent						34	
3		8.34	KR-B9011	10	45	8.34	1.5	0	11	68%
4		8.34	KR-B9011	20	45	8.34	1.5	0	9	74%
5		8.34	KR-B9011	40	45	8.34	1.5	0	0	100%
6		8.34	KR-B9011	80	45	8.34	1.5	0	0	100%
KR-B9011 w/ pH adjustment using 50% H_2SO_4 to 6.03 and Filtered through 0.2 µ filter										
7	lime	6.03	KR-B9011	10	45	6.03	1.5	0	21	38%
8	lime	6.03	KR-B9011	20	45	6.03	1.5	0	11	68%
9	lime	6.03	KR-B9011	40	45	6.03	1.5	0	5	85%
10	lime	6.03	KR-B9011	80	45	6.03	1.5	0	0	100%
KR-B9011 w/ pH adjustment using 50% H_2SO_4 to 4.02 and Filtered through 0.2 µ filter										
11	lime	4.02	KR-B9011	10	45	4.02	1.5	0	14	59%
12	lime	4.02	KR-B9011	20	45	4.02	1.5	0	30	12%
13	lime	4.02	KR-B9011	40	45	4.02	1.5	0	3	91%
14	lime	4.02	KR-B9011	80	45	4.02	1.5	0	4	88%

In House Testing	Ni	Ca	% Nickel Reduction
	mg/kg	mg/kg	
9-9 DAF Eff Raw	0.118	46.2	
9-9 DAF Eff B9004, 200ppm, 5.5 pH, 4 hours	0.112	45.3	5%
9-9 DAF Eff B9004, 200ppm, 6.5 pH, 4 hours	0.109	43.6	8%
9-9 DAF Eff B9004, 200ppm, as is pH, 4 hours	0.111	44	6%
9-9 DAF Eff B9004, 200ppm, 8.5 pH, 4 hours	0.105	16.7	11%
9-9 DAF Eff B9011, 200ppm, 5.5 pH, 4 hours	0.057	44.8	52%
9-9 DAF Eff B9011, 200ppm, 6.5 pH, 4 hours	0.057	43.6	52%
9-9 DAF Eff B9011, 200ppm, as is pH, 4 hours	0.055	39.8	53%
9-9 DAF Eff B9011, 200ppm, 8.5 pH, 4 hours	0.058	17.8	51%
Sample Name	Ni		% Nickel Reduction
	mg/kg		
9-20 DAF Eff Raw	0.103		
6 Hours			
DAF Eff B9011 40ppm as is pH	0.061		41%
DAF Eff B9011 80ppm as is pH	0.055		47%
DAF Eff B9011 120ppm as is pH	0.051		50%
DAF Eff B9011 160ppm as is pH	0.049		52%

DAF Eff B9011 40ppm 6.5 pH	0.057		45%
DAF Eff B9011 80ppm 6.5 pH	0.045		56%
DAF Eff B9011 120ppm 6.5 pH	0.049		52%
DAF Eff B9011 160ppm 6.5 pH	0.047		54%

2.2.3.1 Technical Feasibility
No pH treatment is required but this is a new product launched by the manufacturer. All the required approvals are still being pursued.

2.2.3.2 Capital and Operation Costs
Kroff estimates costs at about $[redacted] per lb.

2.2.3.3 Reliability
We have seen good reproducibility with different feed samples. We plan to conduct a pilot trial with their material.

2.2.4 Hychem DP4
DP4 is a straight dimethyl dithiocarbamate and was one the first chemistries we found that worked for nickel reduction. However as it is a non-polymerized compound, post application neutralization with cuprous sulfate or ferrous sulfate is required. We ran tests with cuprous sulfate for neutralization. However, higher residual copper present in the waste water will be problematic with the copper limit proposed for the permit (monthly average of 0.434ppm with a 3ppm max daily).

	Soluble	Soluble	EPA 630	LCMS
	ppm Cu	ppm Ni	ppm as DP4	ppm as DP4
A - Raw DAF Effluent	0.01	0.082	nd	1.9
B - DAF Eff @ 6pH & 60ppm DP4, 4 hrs & filtered	0.05	0.043	17.6	9.5
K - DAF Eff @ 6pH & 60ppm DP4, 4 hrs & filtered	0.03	0.035	31.1	8.2
L - DAF Eff @ 6pH & 60ppm DP4, 4 hrs & filtered	0.01	0.033	41.5	12.1
H - DAF Eff @ 6pH for 4 hrs, +4ppm Cu then 2 hrs & filtered	2.44	0.068	nd	2.9
I - DAF Eff @ 6pH for 4 hrs, +7ppm Cu then 2 hrs & filtered	3.10	0.067	nd	1.6
J - DAF Eff @ 6pH for 4 hrs, +10ppm Cu then 2 hrs & filtered	2.36	0.061	nd	9.4
C - DAF Eff @ 6pH & 60ppm DP4, 4 hrs; + 2ppm Cu then 2 hrs & filtered	0.30	0.038	1.3	5.4
D - DAF Eff @ 6pH & 60ppm DP4, 4 hrs; + 4ppm Cu then 2 hrs & filtered	1.30	0.037	6.6	2.3
E - DAF Eff @ 6pH & 60ppm DP4, 4 hrs; + 7ppm Cu then 2 hrs & filtered	2.30	0.040	2.6	1.9
F - DAF Eff @ 6pH & 60ppm DP4, 4 hrs; + 10ppm Cu then 2 hrs & filtered	2.80	0.036	2.7	1.5

2.2.4.1 Technical Feasibility

A pH adjustment to 6.0 is required and will result in acid usage. However the required dosage is lower compared to other polymeric DTC chemistries. Also, post application neutralization with cuprous sulfate or ferrous sulfate is needed.

2.2.4.2 Capital and Operation Costs

DP4 is estimated at about $[redacted] per lb.

2.2.4.3 Reliability

We have seen good reproducibility with different feed samples. We have the longest in house testing history with this chemical. We will continue testing this chemistry in upcoming pilot trials.

2.2.5 Nalmet (Nalco)

Recently we have started using a new chemistry from Nalco that is a polymeric version of DTC in a combination of Nalmet with a DTC based flocculent (N 1689/7728). We observed a 55% reduction in soluble nickel.

				ADM DAF Effluent					
		DAF Effluent Received on 11/11/10 (Sample refrigerated until testing)						As Received pH : 7.62	
		Testing conducted on 11/15/10-11/16/10							
Sample #	pH adjust	Nalmet	Mixing min	Flocculant	Mixing Min	Settling	Filtration	Residual Ni ppb	% Ni Removal
Control	As recd							80	
81	As recd	50 ppm N1689	30	2 ppm N7768	1+1		0.45 um syringe	45	44
82	As recd	100 ppm N1689	30	2 ppm N7768	1+1		0.45 um syringe	45	44
83	As recd	200 ppm N1689	30	2 ppm N7768	1+1		0.45 um syringe	40	50
84	As recd	400 ppm N1689	30	2 ppm N7768	1+1		0.45 um syringe	35	56
85	As recd	30 ppm TX15029SQ	30	2 ppm N7768	1+1		0.45 um syringe	30	63
86	As recd	60 ppm TX15029SQ	30	2 ppm N7768	1+1		0.45 um syringe	40	50
87	As recd	120 ppm TX15029SQ	30	2 ppm N7768	1+1		0.45 um syringe	40	50
88	As recd	240 ppm TX15029SQ	30	2 ppm N7768	1+1		0.45 um syringe	40	50
89	9					Overnight	0.45 um Syringe	70	13
90	#89 Supt	50 ppm N1689	30	2 ppm N7768	1+1		0.45 um Syringe	45	44
91	#89 Supt	200 ppm N1689	30	2 ppm N7768	1+1		0.45 um Syringe	35	56
92	#89 Supt	30 ppm TX15029SQ	30	2 ppm N7768	1+1		0.45 um Syringe	45	44
93	#89 Supt	120 ppm TX15029SQ	30	2 ppm N7768	1+1		0.45 um Syringe	45	44
94	As recd						100 kDa PES UF	55	31

2.2.5.1 Technical Feasibility

No pH adjustment is needed and a very short mixing time is possible. We have recently started working with this chemistry and have multiple data points.

2.2.5.2 Capital and Operation Costs

Costs are estimated at $[redacted] per lb (N1689/N7768)

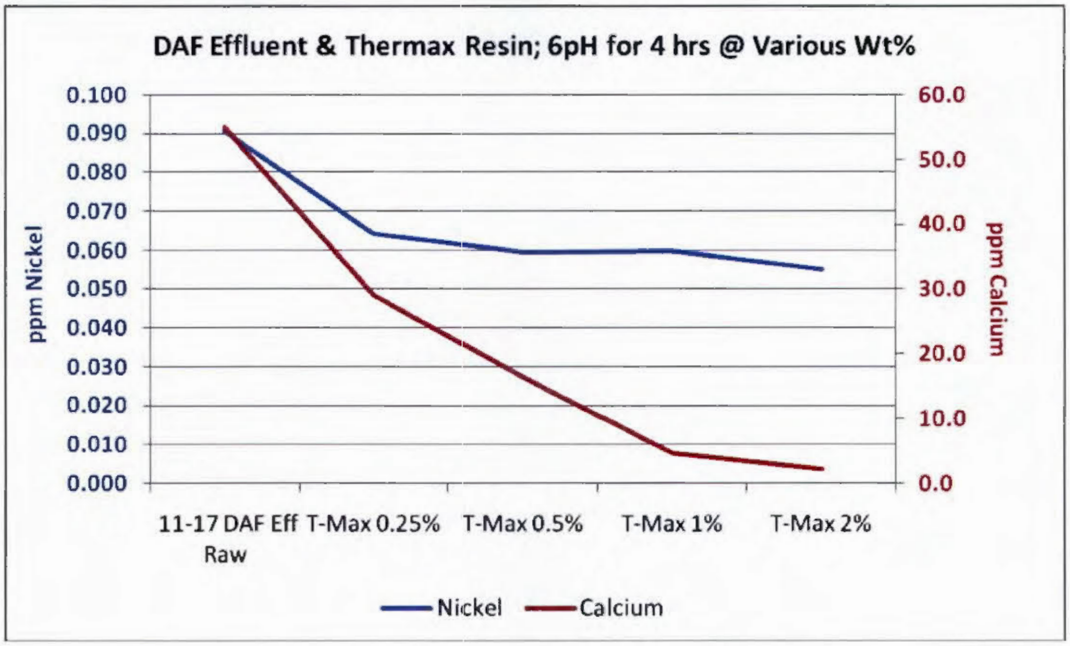
2.2.5.3 Reliability

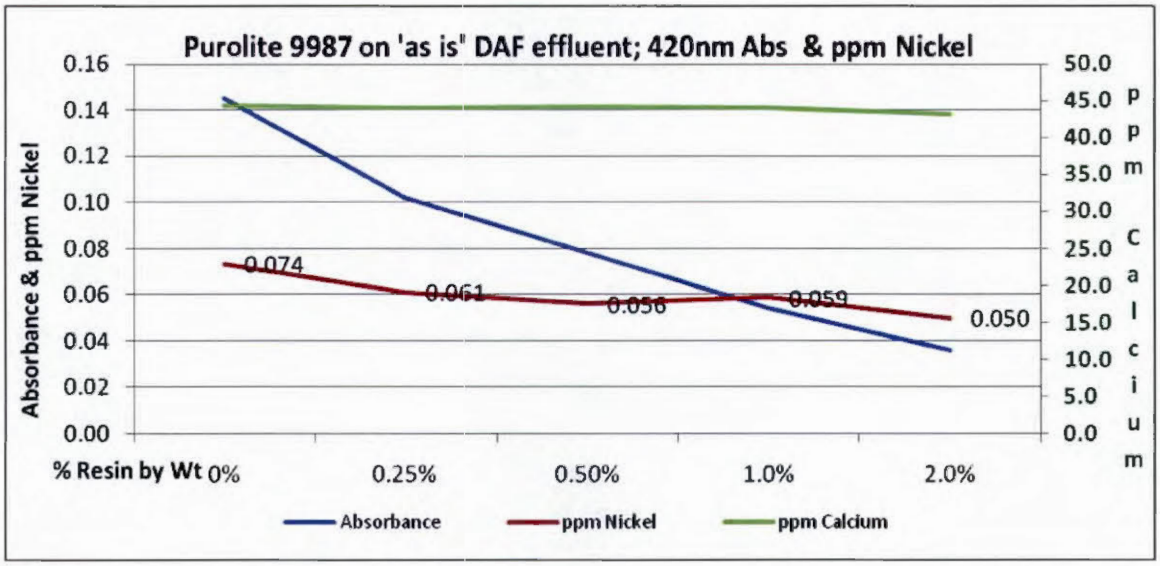
It is too early to determine the reliability. We will be testing this chemistry in upcoming pilot trials.

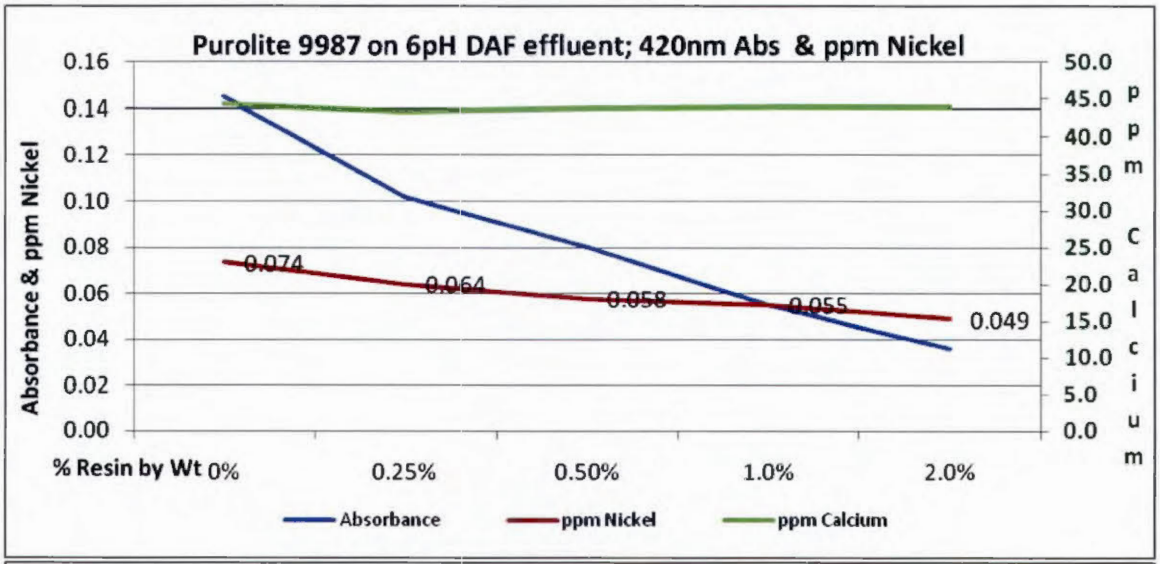
2.3 Nickel- Ion Exchange Resin

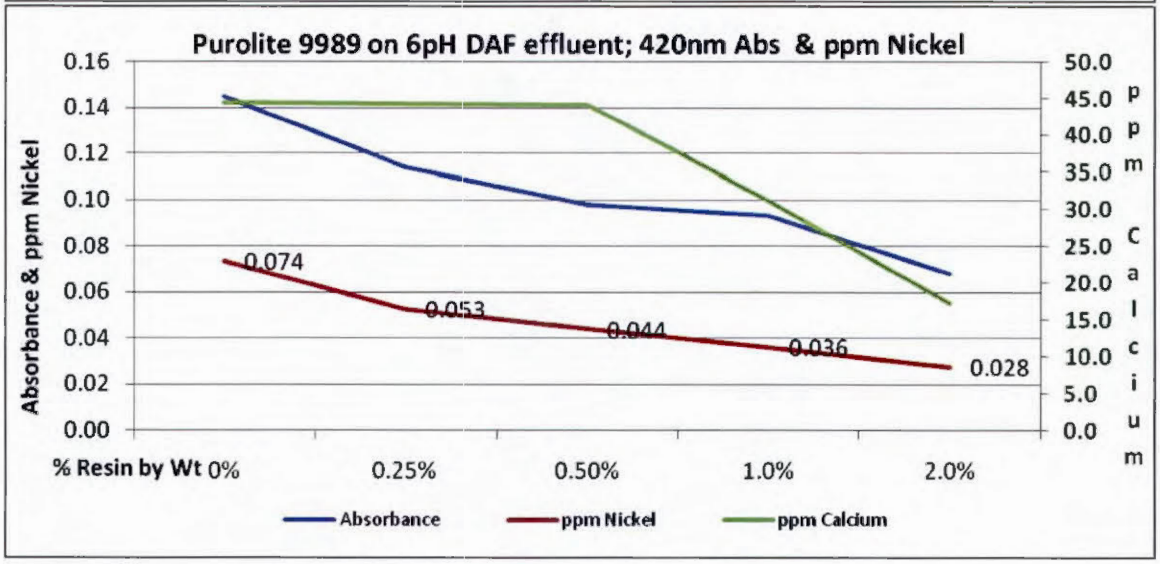
2.3.1 Purolite

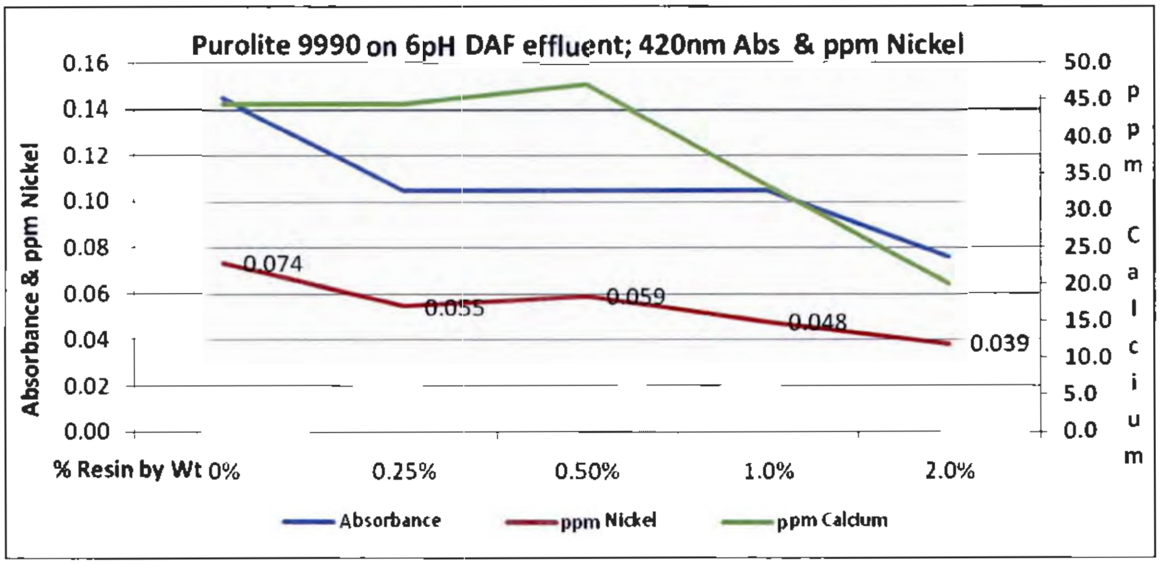
Several additional chelating resins have been identified that reduce nickel concentration below 35 ppb in the DAF effluent. Bench testing suggested several opportunities to use resins in a CSEP[tm] type configuration. However, resin loading on DAF effluent is very high and requires frequent regenerations. We have done extensive work with Purolite.






Purolite 9987 on 6pH DAF effluent; 420nm Abs & ppm Nickel
Absorbance & ppm Nickel
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
ppm Calcium
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.074
0.064
0.058
0.055
0.049
% Resin by Wt 0%
0.25%
0.50%
1.0%
2.0%
Absorbance
ppm Nickel
ppm Calcium


Purolite 9989 on 6pH DAF effluent; 420nm Abs & ppm Nickel
Absorbance & ppm Nickel
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
ppm Calcium
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.074
0.053
0.044
0.036
0.028
% Resin by Wt 0%
0.25%
0.50%
1.0%
2.0%
Absorbance
ppm Nickel
ppm Calcium



Used CSEP vessels probably can be procured for this project, however on a 5,000,000 gallon daily flow, about 43,500 lbs per day of sodium hydroxide and 28,556 lbs per day of Sulfuric acid are required in regeneration chemicals.

2.3.1.1 Technical Feasibility

At 5 million gals/day effluent flow rate and 0.5% w/w resin dosage, ADM would need to regenerate about 4700 cubic feet daily. A carousel unit with 30 cells and a 15 minute contact time (20 cells in parallel service and 10 cells in regeneration) would give a 7.5 hour rotation and require 50 cubic feet of resin per cell. Each cell would be regenerated 3.2 times per day. The service flow rate for 4 ft bed depths would be about 14 gpm/sq ft in each cell. Regeneration would be countercurrent using acid and caustic.

2.3.1.2 Capital and Operating costs.

Total capex is estimated at about $4,000,000. Used CSEP vessels probably can be procured for this project, however on a 5,000,000 gallon daily flow about 43,500 lbs per day of sodium hydroxide and 28,556 lbs per day of Sulfuric acid are required in regeneration chemicals. Resin cost is $[redacted]/cf.
The resin process will lose adsorbent capacity over time. Cycle testing to determine its optimum resin life will need to be conducted.

2.4 Nickel and Zinc- Soybean Process Stream Alternative.

We continue to evaluate this stream. However results from our 30 day trial suggest that this may not results in any significant changes to our WWTP effluent. The percent of nickel which precipitates as nickel sulfide apparently increased considerably.

2.5 Nickel and Zinc- BioProducts Process Stream Alternative

While initial indications where there was high Ni in this stream, subsequent evaluation has determined this is not correct. Removal of this stream would reduce Ni slightly, maybe 3-5% at best. Corrosivity studies have been done and came out OK, so it could be stored and shipped safely. More corrosivity studies showed some increase (on aluminum) due to ISEP waste but not a significant increase. The fertilizer material, w/o ISEP, is also corrosive to aluminum.

2.6 Nickel and Zinc- WWTP Sludge Removal System

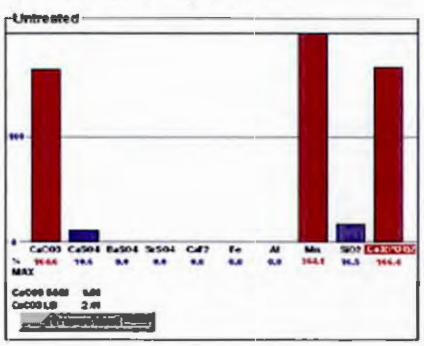
We have investigated this process and believe the process would require a centrifuge followed by sludge drying. The dried sludge would likely be disposed of either by incineration or landfill, depending on environmental permitting. We have done preliminary testing and have most of the data available for a proposal. Our sludge inventory has barely changed from 2009-2010.

2.7 Nickel and Zinc- Reverse Osmosis

At present, ADM is not pursuing the use of UF/NF/RO or combinations thereof for treating DAF effluent. Nalco performed solubility parameters for the different minerals present in the Decatur waste water to determine the tendency to form "scale" on membranes. Due to high incoming phosphorous concentration in the waste water (close to 150 ppm), there is a high probability to form calcium phosphate scale. Under certain circumstances, adjusting pH to reduce the scaling is possible, but to obtain high permeate recoveries; a phosphate removal system would have to be implemented. Nalco's study was preceded by actual pilot work by Separation Technologies, which found severe scaling on the membrane surfaces.

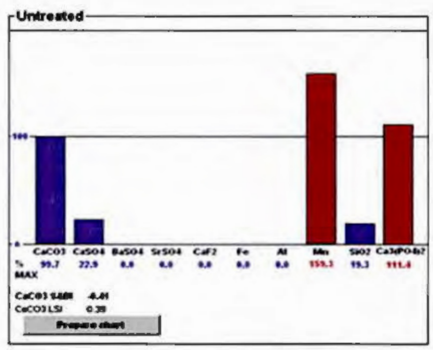
2.7.1.1 Technical Feasibility

Test with 80% recovery in RO, without use of Antiscalant, showed three different types of scaling are expected. This is shown in the following graphs.



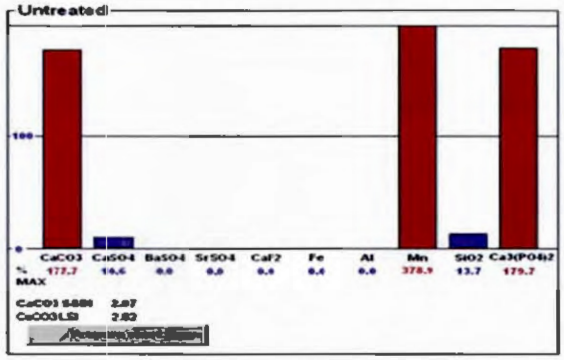
UNTREATED WITH ANY ANTISCALANT

80% Recovery, Feed pH : 7.6



UNTREATED WITH ANY ANTISCALANT

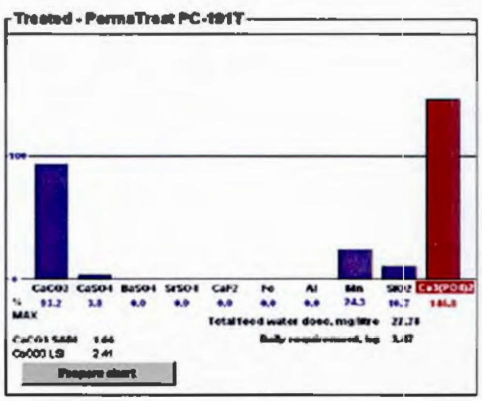
80% Recovery, Feed pH : 6.0



UNTREATED WITH ANY ANTISCALANT

80% Recovery, Feed pH : 8.0

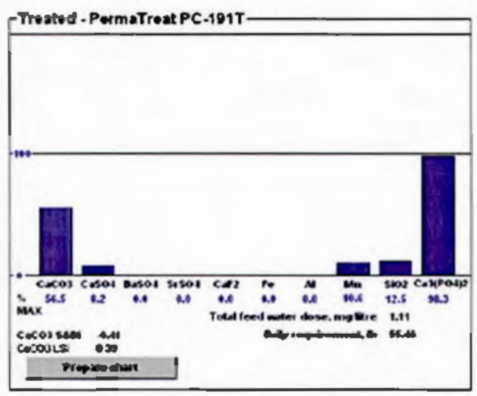
With close to 150 ppm phosphate in DAF effluent, an antiscalant alone cannot control calcium phosphate. About 1.5 moles of calcium per mole of phosphate is required to be precipitated to reduce the scaling. This would require about 2,835 lbs of calcium hydroxide daily to reduce phosphate to below 8 ppm in order to prevent membrane scaling.



TREATED WITH PC-191T ANTISCALANT

80% Recovery, Feed pH : 7.6
Feed Phosphate: 150 ppm

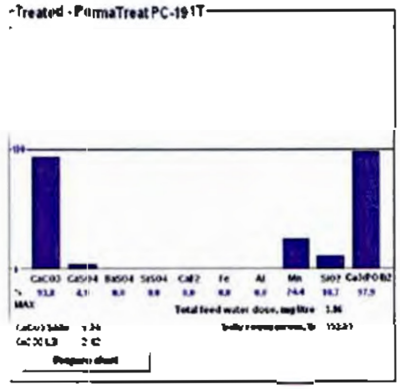
Ca Phosphate still above Saturation



TREATED WITH PC-191T ANTISCALANT

80% Recovery, Feed pH : 6.0
Feed Phosphate: 150 ppm

If DAF effluent phosphorous levels are reduced to 6-8 ppm using a mixture of chemical precipitation and anaerobic performance modification, antiscalant alone will allow for >80% recovery in RO with scaling.



TREATED WITH PC-191T ANTISCALANT

80% Recovery, Feed pH : 7.8
Feed Phosphate: 8 ppm

2.8 Nickel and Zinc- Sludge (WWTP organism cell wall rupture)

A pulsating electric field that destroyed the cell walls of the bacteria was evaluated to stop the carryover of sludge to lower the concentrations in the sludge discharged. This was based on the idea that the filaments we were fighting were aerobic and being constantly seeded from the aeration system. The technology actually adds BOD to the reactors and creates more gas. This is not viable since we realized the filaments are anaerobic and like high F/M ratios.

2.9 Nickel and Zinc- Sludge Sales

ADM has provided samples to a fish food company that inquired about its use for a protein source on a new product. It has been concluded that the sludge from Decatur WWTP will not be used. It is unlikely that a viable outlet is available for sale of the sludge.

3 Review Ceased for Technologies

We have temporarily stopped testing on the following to allow us to focus on the promising applications.

- Procorp
- Crystal clear technologies
- Eagle Picher
- Vivenano
- Filtration Energy Solutions
- GE's DTC
- Siemens / Plymouth Technologies: While the sample did reduce nickel to below 11ppb it also removed almost all of Mg, Ca and P in the waste water. We have not been able to bring them in for in-house testing as well.

EXHIBIT K

ADM Status Report
July 6, 2011

To: Illinois Environmental Protection Agency
Decatur Sanitary District

From: ADM Decatur WWTP

CC: ADM Corn Processing, ADM Oilseeds Processing, ADM JRRRC

Date: July 6, 2011

Re: Status Report Compliance Strategy for 2010-2011 for Decatur Sanitary District and ADM Decatur WWTP for waste treatment.

ADM

Table of Contents

ADM Research and Decatur Corn Processing have been actively pursuing technologies to sequester Nickel (Ni) and remove it from the effluent stream. Enclosed is an update report on the progress ADM has made since the update issued on December 22, 2010.

1 Background

Nickel and Zinc are present in effluent leaving the ADM Decatur Complex Waste Water plant. New effluent limits are proposed which will reduce the discharge limits to 0.0365 ppm for Nickel and 0.35 ppm for Zinc. Of the two metals, nickel is more difficult to remove from the effluent. During August- November 2010, a 7-week monitoring study of Nickel-containing streams in the plant was performed on the ADM Decatur facility. The concentration and total quantity coming from the various waste water treatment plant influents are shown in Table 1.

Table -1 TOTAL NICKEL LOAD, BY PLANT

	Flow, MGD	Avg lbs / day	Avg ppm	% Total (by weight)	
East Plant	2.006	3.72	0.22	54.3%	Note: EP Condensate Ni concentration is multiplied ~4 times in Cooling Towers
Corn Plant	4.791	1.58	0.040	23.2%	
Polyol	0.037	0.77	2.5	11.2%	
Glycol	0.064	0.06	0.11	0.8%	
Biochem	1.487	0.35	0.028	5.1%	
West Plant	0.839	0.35	0.050	5.1%	Note: WP Ni concentration is multiplied ~4 times in Cooling Towers
Co-gen	0.123	0.02	0.019	0.3%	
Avg / Total	9.345	6.84	0.088		

The majority of nickel found in ADM effluent water originates in the corn and soybeans being processed at the facility. During the processing, the metals are released and enter the processing water which eventually ends up at the wastewater treatment plant.

ADM has been monitoring soluble Nickel at the Damon and Front stations continuously (see Figures 1&2). In the past 9 months there has been a decline in Nickel from about 120 ppb to about 60 ppb. Additionally, it has been found that there is a significant reduction in Total Nickel using Diatomaceous Earth (~0.25u) vs. 5u filtering . This seems to point to insoluble nickel that is very small and which would not be removed by metal precipitants. In addition, as discussed below, we are investigating other opportunities for processing the Soy Molasses stream to remove its nickel load from the WWTP.

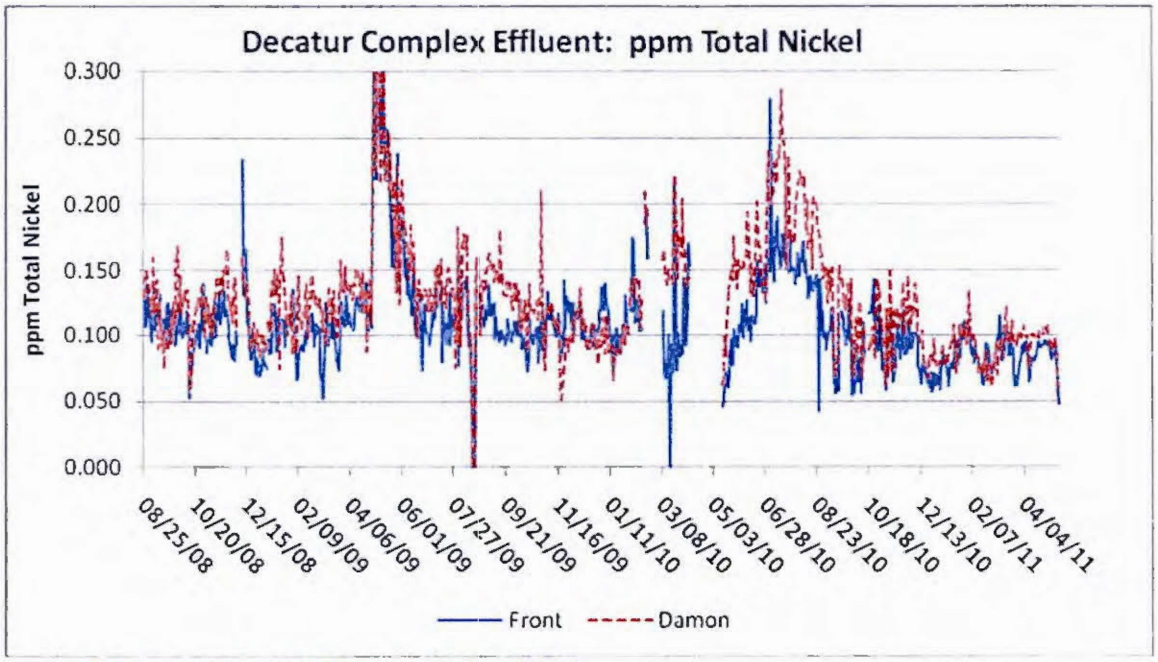


Figure 1 Decatur Complex Effluent- Total Nickel

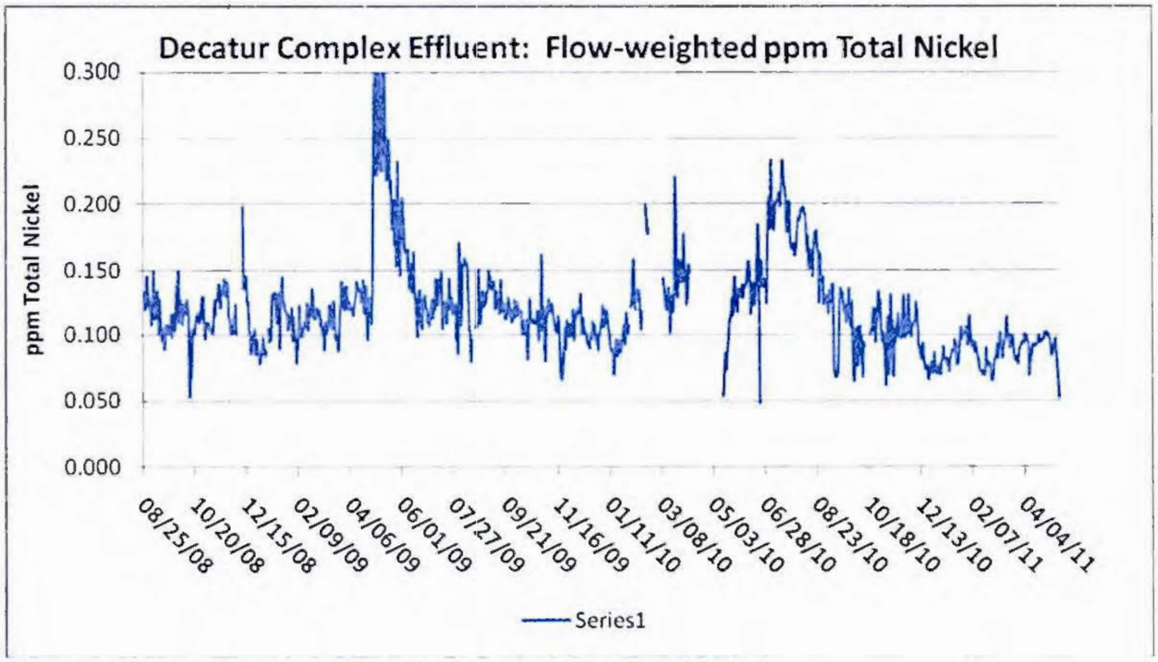


Figure 2 Decatur Complex Effluent- Flow-weighted total Nickel

As reported in the June 30, 2010 update, 24 technologies were investigated to control nickel in the ADM Decatur facility effluent. Since then, three additional technologies have been evaluated and 4 additional metal removal chemistries are being pursued in the laboratory. The current update focuses on technologies that have developed to the next level of scale up/ testing. Technologies that are no longer being actively pursued will not be discussed. Soluble nickel, which is the focus of this report, originates mainly in the East Plant and Corn Plant refinery. The soluble nickel in the West Plant effluent is relatively low, but presents an unusual problem because it is reused approximately four times in the Corn Plant cooling towers (Table 2). This results in potential nickel concentration issues in the non-High Salt waste. The main hurdles with soluble nickel removal are its already low concentration relative to other metals (Ca, Mg) and that it appears to be tightly bound as a complex.

		Table 2 WEEKLY COMPLEX LOADS TO WWTP – CONCENTRATION (August – November 2010)							
No. of Weeks of Data			Daily Avg ppm	Daily Avg ppm	Daily Avg ppm	Daily Avg ppm	Daily Avg ppm	Daily Avg ppm	Daily Avg ppm
7		Flow, MGD	Total Nickel	Soluble Nickel	Total Zinc	Soluble Zinc	Total P	Soluble P	Chloride
	High Salt EQ TK	5.930	0.17	0.14	0.46	0.34	72	56	909
	Low Salt EQ TK	4.525	0.015	0.014	0.056	0.038	4.8	4.5	55
	Avg Complex ppm to WWTP	10.455	0.106	0.087	0.288	0.210	42.8	33.7	540
	TO WWTP by PLANT		0.037 max	0.037 max					500 max
7	CORN PLANT	4.791	0.040	0.041	0.27	0.27	23	24	791
7	EAST PLANT	2.006	0.22	0.18	1.07	0.86	104	74	430
7	POLYOL	0.037	2.52	2.62	0.046	0.043	0.3	0.2	1,431
7	GLYCOL	0.064	0.106	0.107	0.78	0.91	61	73	1,167
7	WEST PLANT	0.839	0.050	0.039	0.095	0.074	5	5	81
7	BIOCHEM	1.487	0.028	0.028	0.30	0.32	52	56	830
7	COGEN	0.123	0.019	0.017	0.046	0.032	0.5	0.5	3,368
		9.345							
		BALANCE OF FLOW IS BIOCHEM CONDENSATE, STORM WATER, THREONINE & TRUCK WASH.							

As reported in the December 23, 2010 update, ADM is piloting 7 chemistries that have been identified as suitable for next stage of testing. We have also since last month identified two additional chemistries we would like to pilot. Since early this year, the Decatur plant has run a Nickel removal pilot plant. The results for four of the chemistries tested thus far are shown below and the additional trials will be reported on in the next submittal. Figure 3 is a picture of the pilot plant and Figure 4 is a pilot DE clarifier we are testing to remove the precipitated nickel complex . There are 4 separate mixing tanks of 100 gallons each, using the Decatur plant DAF effluent as feed, with the respective chemistries at various dosages (10-200ppm) and a combination of residence times (1-4 hrs). One of the setups was modified to allow for a change in pH, and testing of the chemistry at a reduced pH is currently being piloted. ADM also performed a Hazop review prior to the startup of the pilot plant which was shared in the past with the SDD, and a copy is provided in Appendix A at the end of this report.

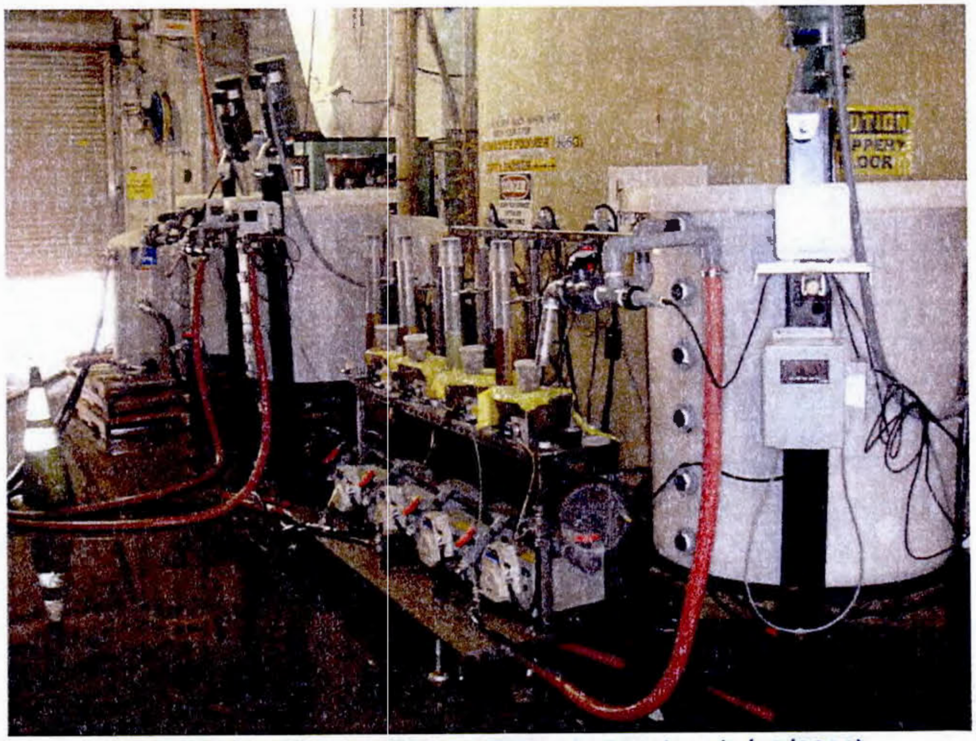


Figure 3 ADM Decatur Nickel Removal pilot plant (5/13/2011)

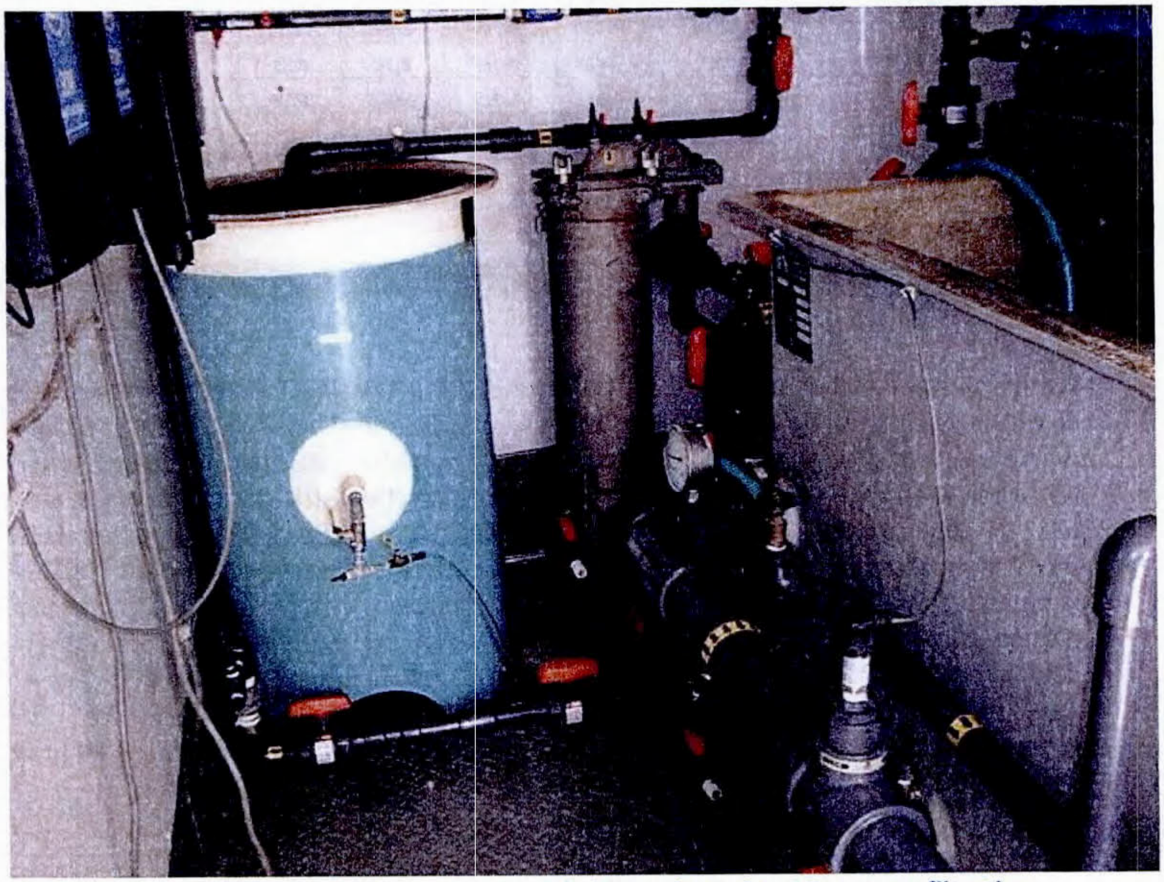


Figure 4 Removal of precipitated polymer nickel complex using DE precoat filtration.

Pilot testing protocol:

- 4 mixing tanks; initially 100 gallons liquid level in each
- Different product to be tested in each tank (current, Nalment, Kroff, Hychem, Hydrite).

- Feed flows, chemical dosages and agitation can be optimized independently in each tank .
- Ability to adjust residence time in each tank to 0.5-4 hrs, through the adjustment of feed flow and tank liquid level
- Ni Precipitant is added in-line in the influent flow and further mixed/reacted in tank.
- Precipitant dosages planned: 10-200 ppm
- Piloting will continue 7 days a week for next 4 months, but ICP sampling will generally be done only on Monday through Friday, 1 time per day.
- Treated samples from each tank will be filtered through diatomaceous earth (DE) in the lab and submitted to ADM's lab for ICP analysis.
- No flocculants will be used at this time after treatment with metal precipitant.
- pH is monitored in the feed tank but will not be adjusted initially. We have modified one tank for pH adjustment.
- The toxicity studies (by Riverbend Laboratories) on treated wastewater provided the desired Ni removal at current and peak Influent Ni levels.
- Secondary treatment such as DE/Clarifier/Sand filter will be implemented next month.

As required by the variance, a summary of the various control strategies is presented in Appendix B.

"By July 1, 2011 the District must complete the following tasks:

i. Compile various control strategies based on one or more of the feasible technologies. Develop flow diagrams depicting removal options, pros and cons, capital expenditures, and operating costs.

ii. Present findings to ADM division managers"

- **ADM / SDD Variance, p. 41.**

ADM has investigated toxicity information on its Mixed Liquor Suspended Solids using the chemicals outlined in section 2.1 below. The respirometer and nitrox testing results for those samples are provided in Appendix C (ADM MLSS) and Appendix D (SDD MLSS).

The various technologies/companies that have been investigated are summarized below. Some of the technologies have been tried using ADM process discharge samples, and in a number of cases chemical usage and treatment costs have been estimated.

2 Deliverables

2.1 Nickel- Proprietary Precipitation Process

As part of the June 30, 2010, update six proprietary precipitation technologies were discussed. However, due to ongoing challenges involving dosage and regeneration, this work has been suspended. Discussions were held with two additional manufacturers of proprietary precipitation technologies; however, both are startup companies, and there is uncertainty about their manufacturing capabilities to handle a large volume application. These may be revisited in the future if the primary technologies encounter problems during scale up.

2.2 Nickel- Chemical Precipitation Process Using Carbamates or Organic Sulfides

2.2.1 Chemtreat

Chemtreat P-8007L is a polymeric based Dimethyldithiocarbamate. Onsite tests with Chemtreat are reported below. Using a 100ppm dosage and a 5 minute mixing time, it reduced the soluble Nickel concentration to below 35 ppb (Table 3). It was also identified that the addition of Ferrous Sulfate subsequent to the addition of P-8007L reduced its dosage required for application.

Sample	First Product Added	Dose (PPM)	Mix Time (Min.)	2nd Product Added	Dose (PPM)	Mix Time (Min.)	Ni (mg/Kg)	% Ni removal	Zn (mg/Kg)	P (mg/Kg)
1	**Raw Water**						**0.078**	**0.0%**	**0.047**	**61.5**
2	**Filtered Raw Water**						**0.067**	**13.7%**	**0.029**	**55.9**
3	**P-8007L**	25	5	Ferrous	50	5	**0.046**	**40.8%**	0.030	56.2
4	**P-8007L**	50	5	Ferrous	50	5	**0.038**	**51.1%**	0.024	51.8
5	**P-8007L**	100	5	Ferrous	80	5	**0.038**	**51.9%**	0.018	51.2
6	**P-8007L**	200	5	Ferrous	100	5	**0.032**	**59.3%**	0.019	48.0
12	**P-8007L**	200	30	Ferrous	100	5	**0.031**	**60.5%**	0.056	48.2
14	**P-8007L**	100	30	Ferrous	100	5	**0.029**	**63.3%**	0.059	46.7

Table 3: Chemtreat P8007L testing on DAF effluent

2.2.1.1 Technical Feasibility

Current treatment protocol does not require pH modification. However the precipitant is recovered through a very tight filter (0.45microns). A trial is being planned to determine optimum dosage of their precipitant and suitable recovery mechanism.

2.2.1.2 Capital and Operation Costs

Chemtreat estimates costs for P8007L at about [redacted]$/lb.

2.2.1.3 Reliability

We have reproduced some of Chemtreat's work internally and are currently testing P8007L in our pilot plant.

2.2.2 Hydrite

Hydrite 1740 is currently being tested in the Pilot plant. A 41% average reduction in soluble nickel has been seen using the 1740.

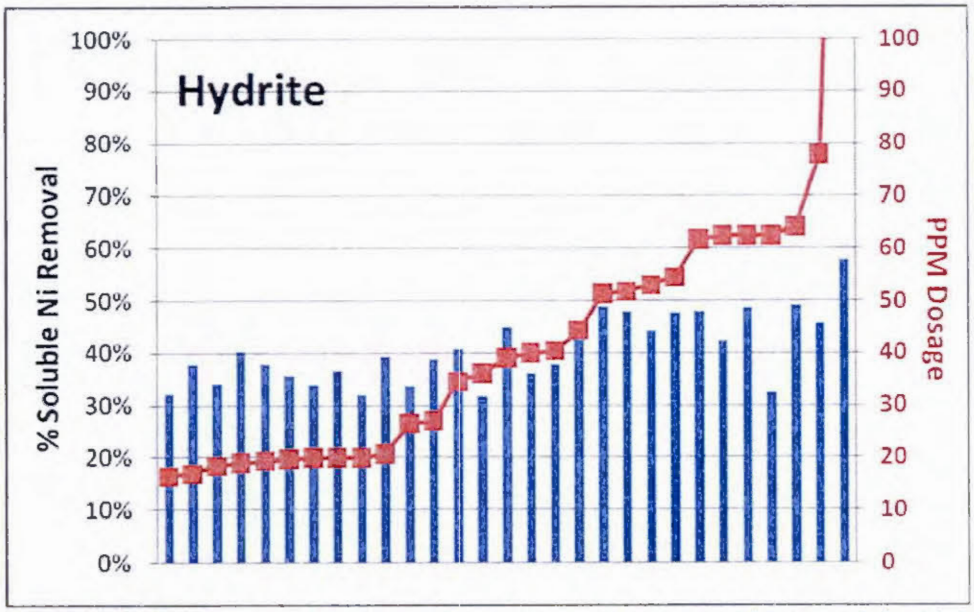


Figure 5 % Nickel removal (left scale) and ppm soluble nickel (right scale) with Hydrite 1740

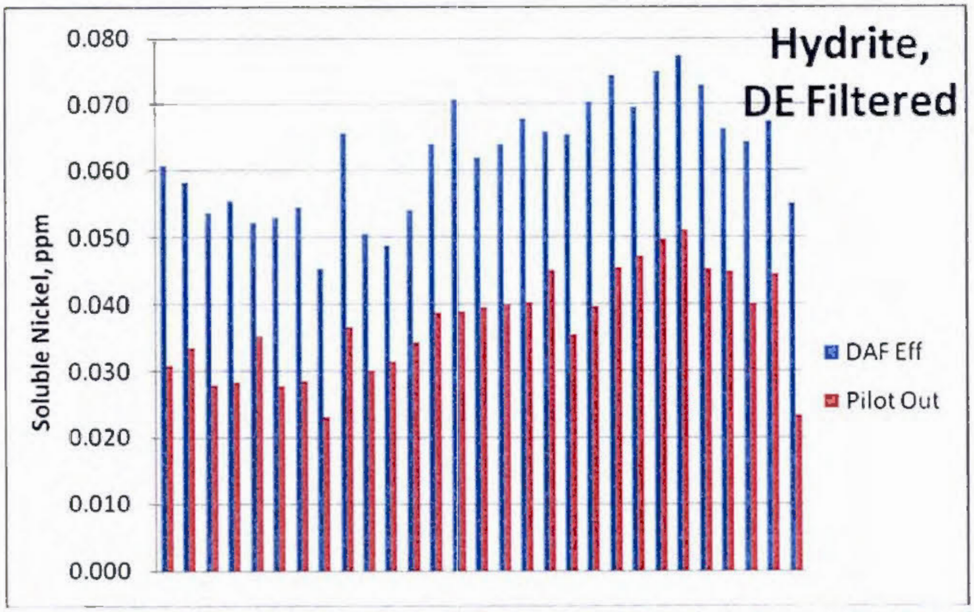


Figure 6 Effect of DE filtration on reduction in soluble nickel after application of 1742

2.2.2.1 Technical Feasibility

The product is approved for use in waste water systems. Nitratox and Respirometer testing were performed on the waste water at two different dosages of Kroff 9011 (20ppm and 200ppm) and no adverse effects were seen at either dosage. (See Appendix C)

2.2.2.2 Capital and Operation Costs

Hydrite estimates costs at about $[redacted] per lb.

2.2.2.3 Reliability

Good reproducibility was seen with different feed samples.

2.2.3 Kroff 9011

Kroff 9011 is being trialed at the Pilot plant. About a 41% average reduction in soluble nickel was seen using the Kroff 9011.

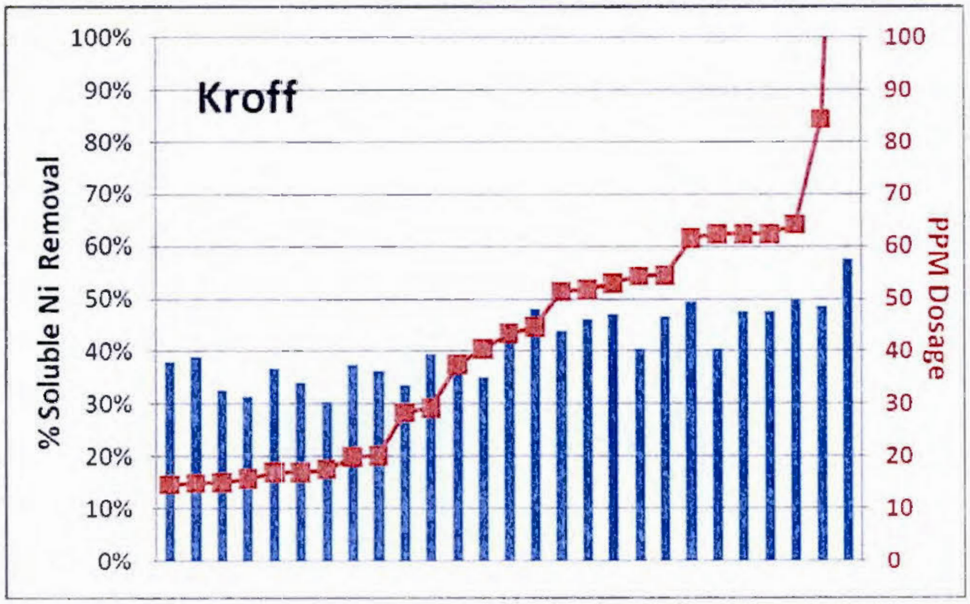


Figure 7% Nickel removal (left scale) and ppm soluble nickel (right scale) with Kroff 9011

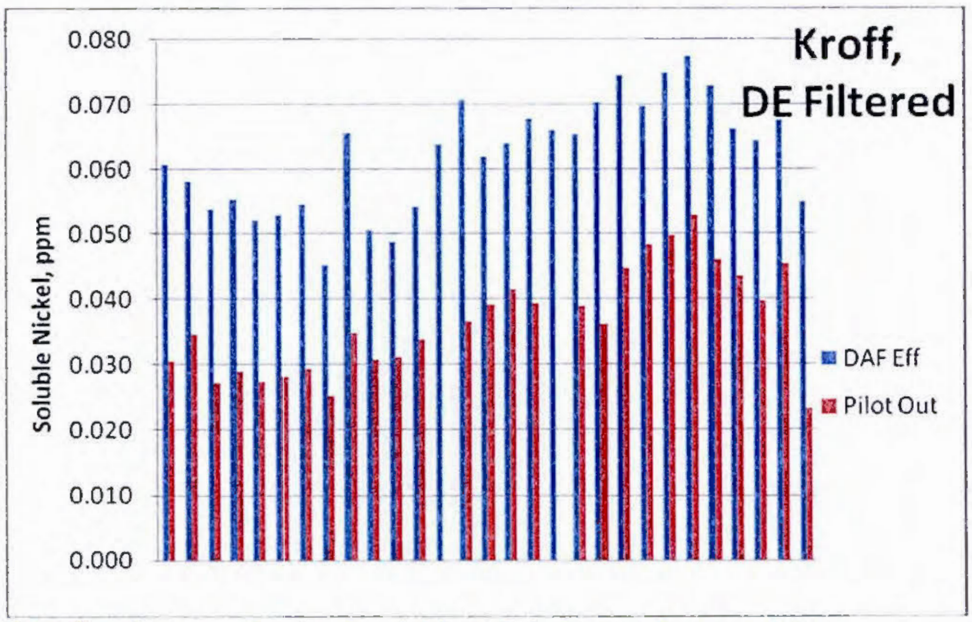


Figure 8 Effect of DE filtration on reduction in soluble nickel after application of 9011

2.2.3.1 Technical Feasibility

No pH adjustment is required. Product is approved for use in waste water systems.

2.2.3.2 Capital and Operation Costs

Kroff estimates costs at about $[redacted] per lb.

2.2.3.3 Reliability

There has been good reproducibility with different feed samples. Nitratox and Respirometer testing were performed on the waste water samples at two different dosages (20ppm and 200ppm) and no adverse effects were seen at either dosage. (See Appendix C)

2.2.4 Hychem DP4

DP4 is a straight dimethyl dithiocarbamate and was one the first chemistries we found that worked for nickel reduction. However as it is a non-polymerized compound, post application neutralization with cuprous sulfate or ferrous sulfate is required. Tests were ran with cuprous sulfate for neutralization. However, higher residual copper present in the waste water will be problematic with the copper limit proposed for the permit (monthly average of 0.434ppm with a 3ppm max daily). Hychem DP4 is currently being run in the pilot plant. Since the tests are running at "as-is" pH (~8.0) only about a 24% reduction in soluble nickel is being achieved. A pH control system has been installed on one of the reactors, and ADM is currently testing DP4 at pH 6.0, which was previously identified as optimum for this application.

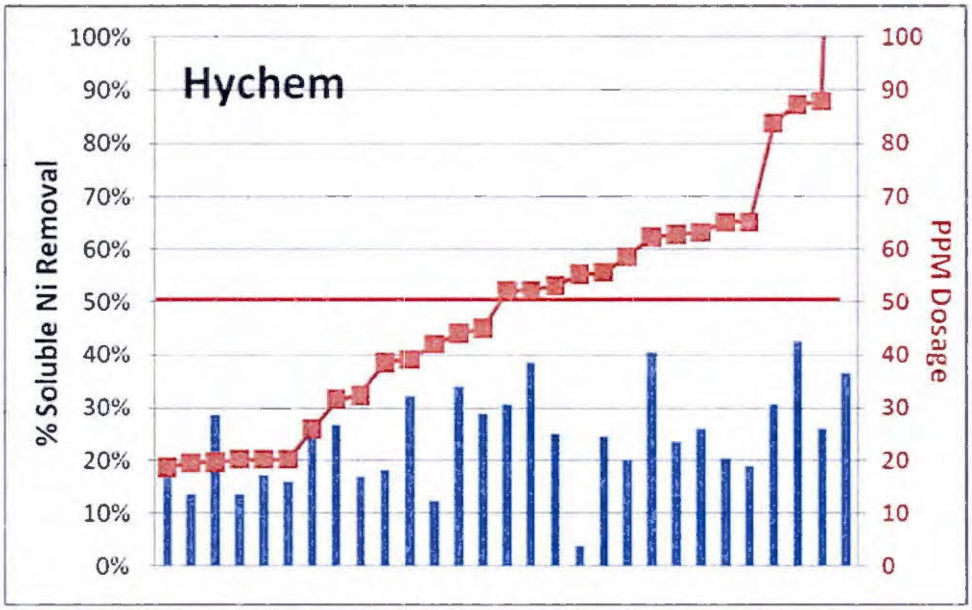


Figure 9 % Nickel removal (left scale) and ppm soluble nickel (right scale) with Hychem DP4

Figure 7

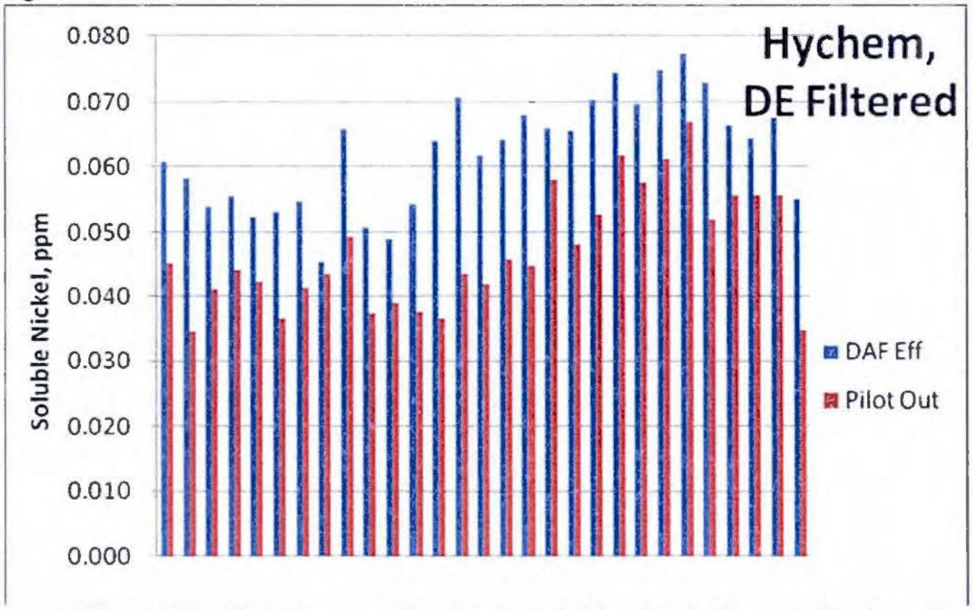


Figure 10 Effect of DE filtration on reduction in soluble nickel after application of DP4

2.2.4.1 Technical Feasibility

A pH adjustment to 6.0 is required and will result in acid usage. However the required dosage is lower compared to other polymeric DTC chemistries. Also, post application neutralization with cuprous sulfate or ferrous sulfate is needed.

2.2.4.2 Capital and Operation Costs

DP4 is estimated to cost about $[redacted] per lb.

2.2.4.3 Reliability

There has been good reproducibility with different feed samples, and ADM has tested this chemical in-house the longest. In addition to the "as-is" testing, this chemistry will be tested at pH 6.0 in the pilot trials. Nitratox and Respirometer testing were performed on the treated waste water at two different dosages of DP4 (20ppm and 200ppm) and no adverse effects were seen at either dosage. (See Appendix C)

2.2.5 Nalmet (Nalco)

As reported in December 23, 2010 work has been done with a new chemistry from NALCO. This chemistry has been piloted at the pilot plant and has resulted in a 48% reduction in soluble Nickel.

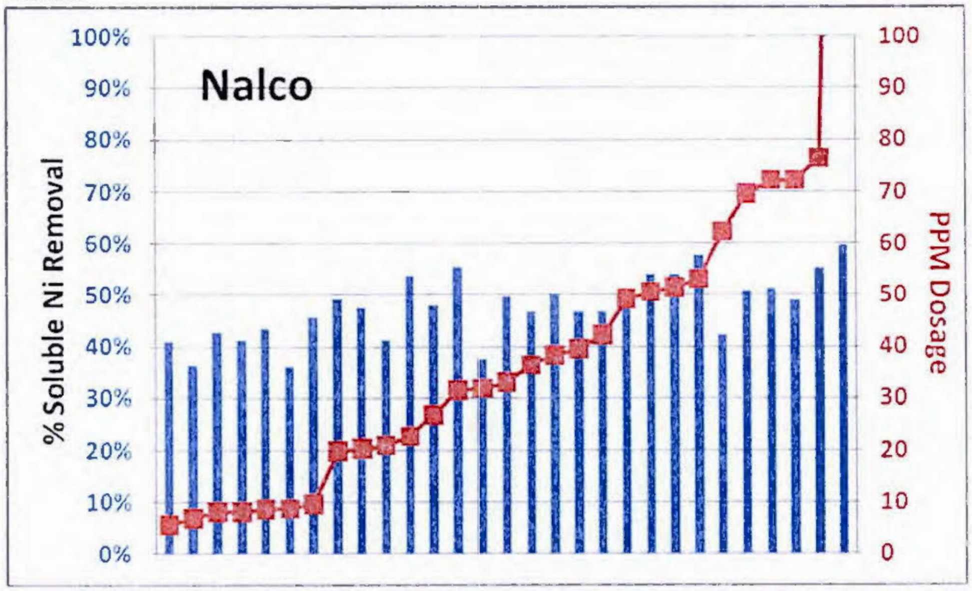


Figure 11 % Nickel removal (left scale) and ppm soluble nickel (right scale) with Nalmet

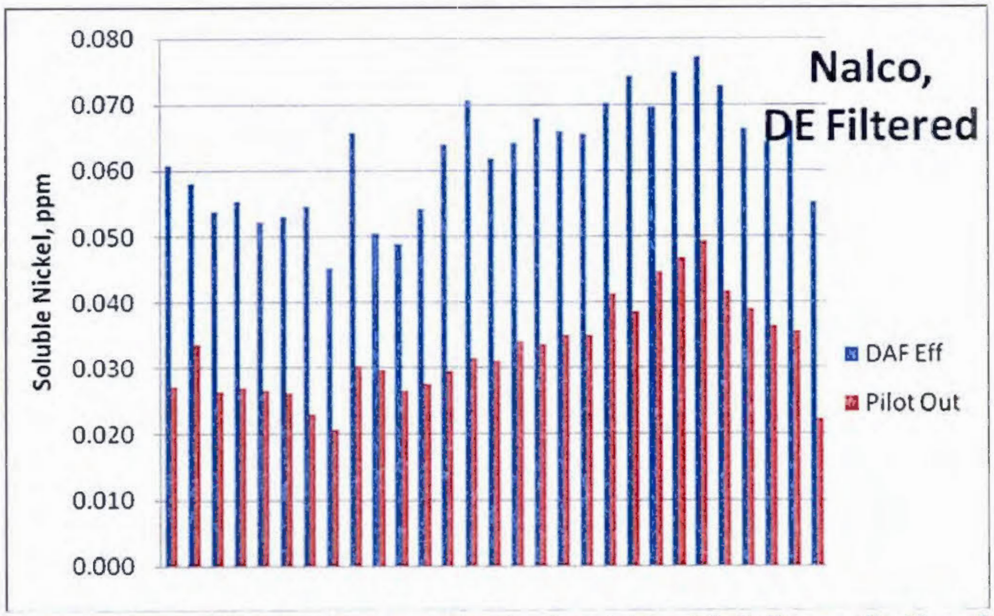


Figure 12 Effect of DE filtration on reduction in soluble nickel after application of Nalmet

2.2.5.1 Technical Feasibility

Nalmet is not a commercial product, and we are unsure of Nalco's plans to manufacture it commercially. No pH adjustment is needed and a very short mixing time is possible. The chemistry does produce a very small size floc, and it is expected to be challenging to remove the floc subsequent to nickel binding

2.2.5.2 Capital and Operation Costs

Costs are estimated at $[redacted] per lb (N1689/N7768).

2.2.5.3 Reliability

There has been good reproducibility with different feed samples. Nitratox and Respirometer testing were performed on the treated waste water samples at two different dosages of Nalmet (20ppm and 200ppm) and no adverse affects were seen at either dosage. (See Appendix C)

2.3 Nickel- Ion Exchange Resin

2.3.1 Purolite

Several additional chelating resins have been identified that reduce nickel concentration below 35 ppb in the DAF effluent. Bench testing suggested several opportunities to use resins in a CSEP^{tm} type configuration. However, resin loading on DAF effluent is very high and requires frequent regenerations. ADM has done extensive work with Purolite.

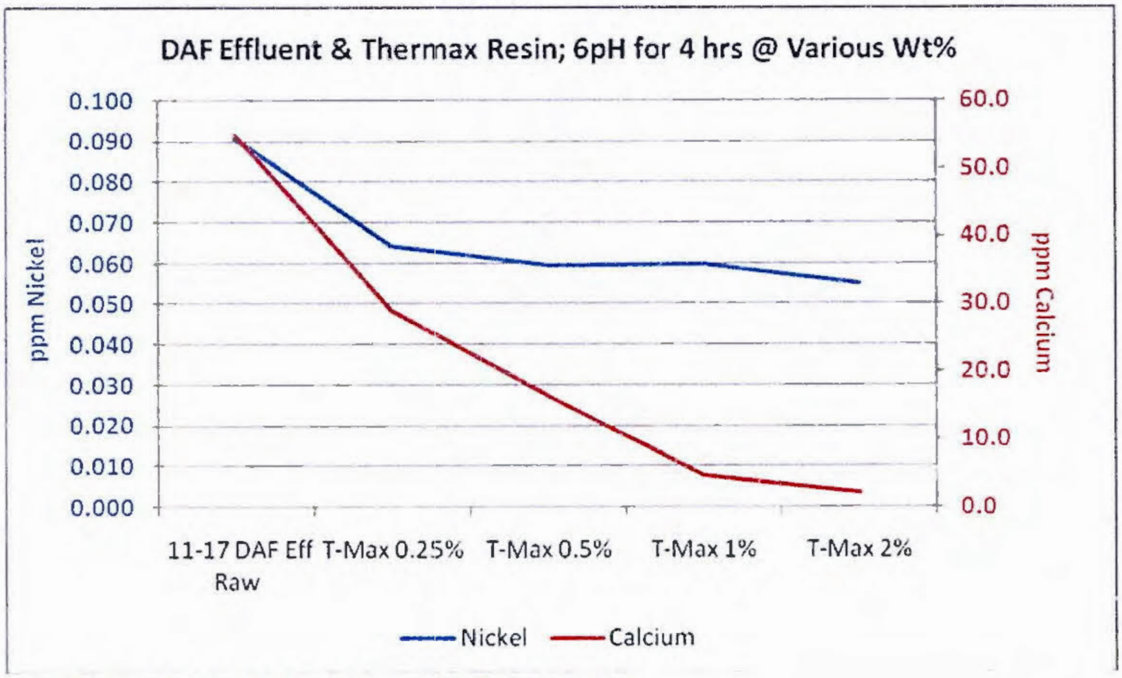


Figure 13 Reduction in soluble nickel with Thermax resin

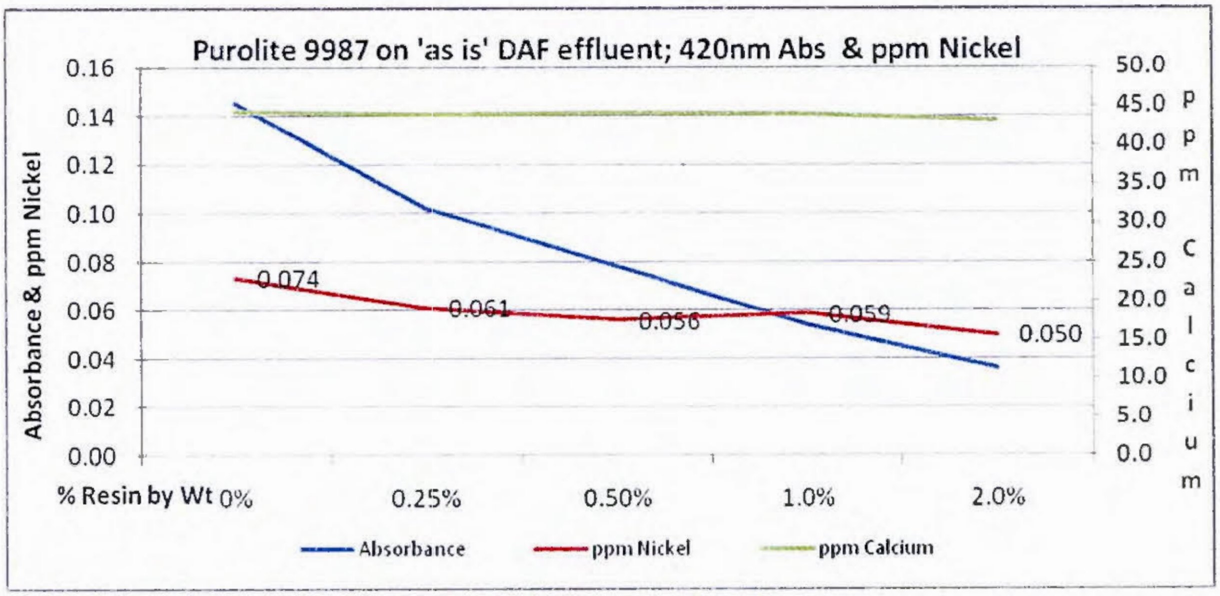


Figure 14 Reduction in soluble nickel with Purolite 9987 (as-is pH)

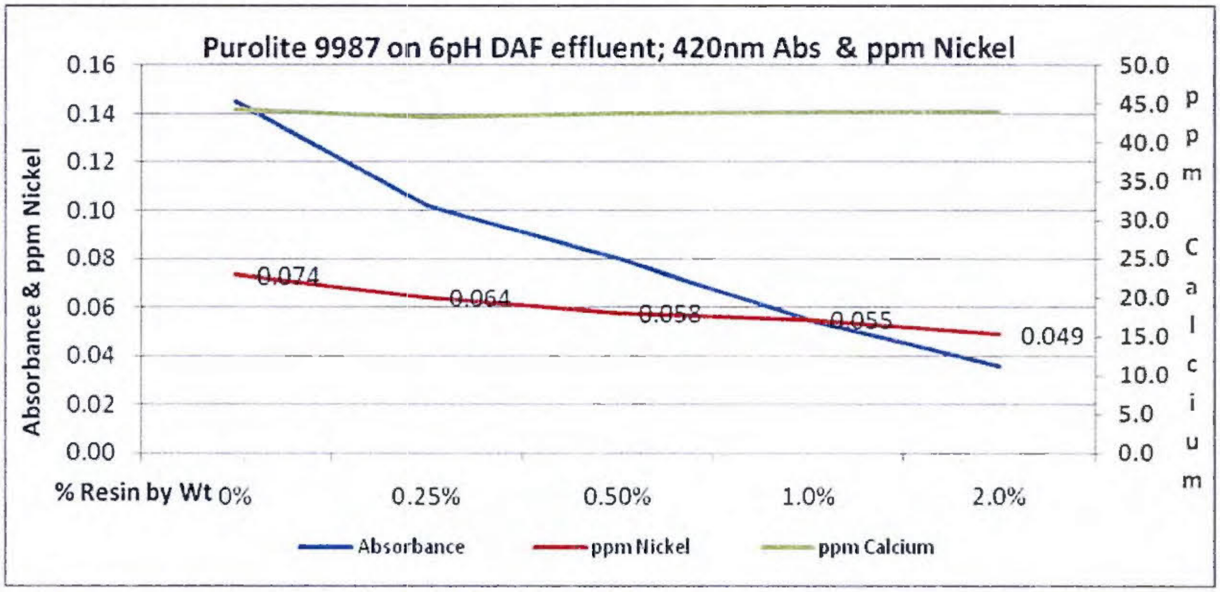


Figure 15 Reduction in soluble nickel with Purolite 9987 at pH 6.

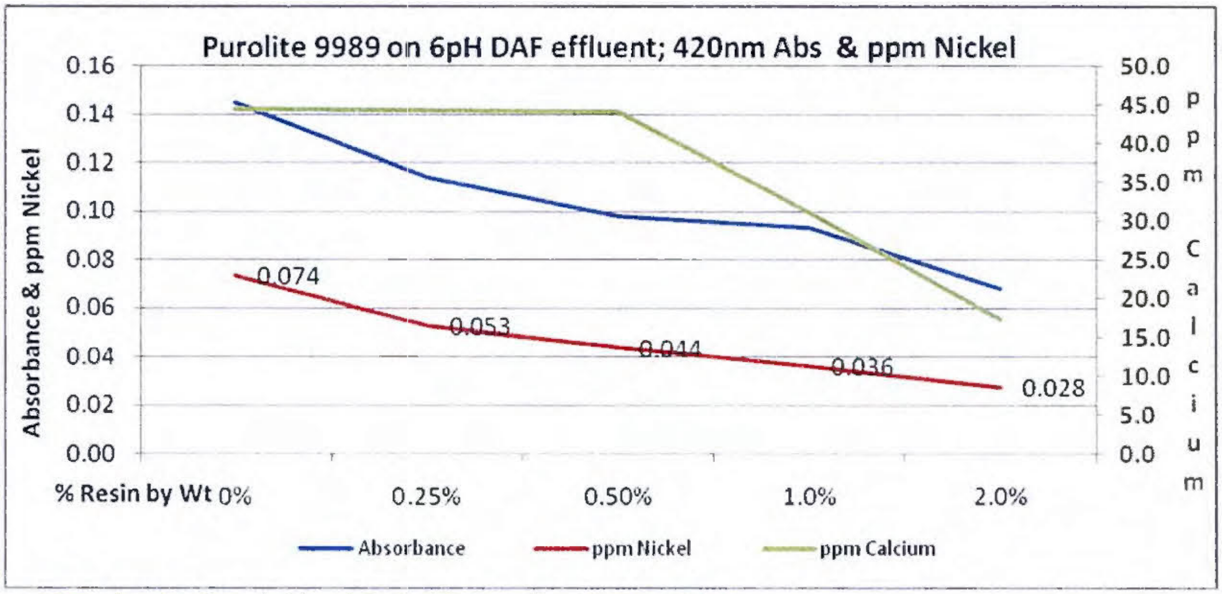


Figure 16 Reduction in soluble nickel with Purolite 9989 at pH 6.

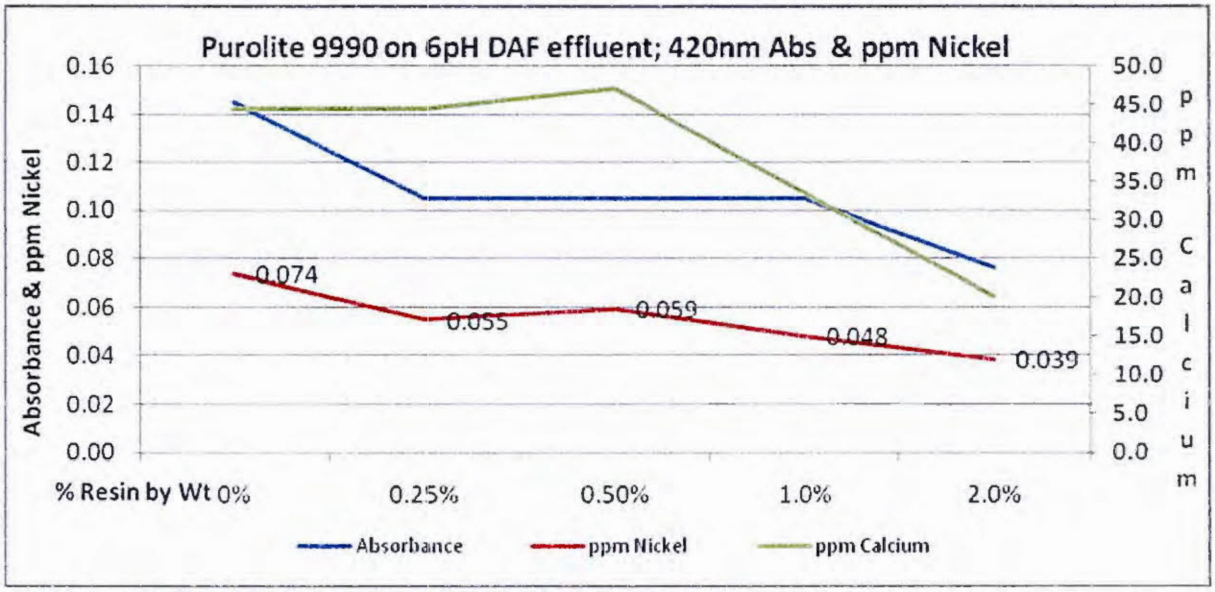


Figure 17 Reduction in soluble nickel with Purolite 9990 at pH 6.

Used CSEP vessels could probably be procured for this project, however on a 5,000,000 gallon daily flow, about 43,500 lbs per day of sodium hydroxide and 28,556 lbs per day of sulfuric acid are required in regeneration chemicals to capture 5 lbs of nickel per day.

2.3.1.1 Technical Feasibility

At 5 million gals/day effluent flow rate and 0.5% w/w resin dosage, ADM would need to regenerate about 4700 cubic feet daily. A carousel unit with 30 cells and a 15 minute contact time (20 cells in parallel service and 10 cells in regeneration) would give a 7.5 hour rotation and require 50 cubic feet of resin per cell. Each cell would be regenerated 3.2 times per day. The service flow rate for 4 ft bed depths would be about 14 gpm/sq ft in each cell. Regeneration would be countercurrent using acid and caustic. This option is not being pursued because of the uncertainty of a suitable disposal mechanism for the regeneration streams.

2.3.1.2 Capital and Operating costs.

The capital expenditure for this approach has been firmed up from the earlier report. It is estimated the system will cost about $[redacted] MM.

2.4 Nickel and Zinc- Soybean Process Stream Alternative.

Alternatives will be continued to be evaluated for this stream. We have interest in several companies for purchasing this particular stream for a de-nitrfication application in municipal waste treatment plants on the east coast.

2.5 Nickel and Zinc- BioProducts Process Stream Alternative

There have no updates from the report of December 23, 2010.

2.6 Nickel and Zinc- WWTP Sludge Removal System

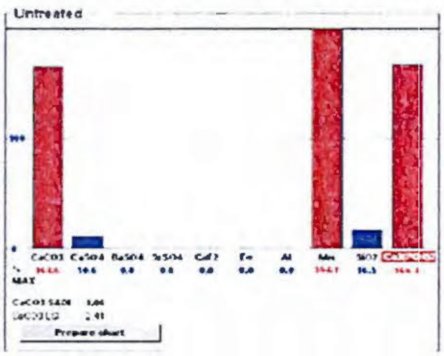
This process has been investigated, and there are no updates from the report of December 23, 2010.

2.7 Nickel and Zinc- Reverse Osmosis

At present, ADM is not pursuing the use of UF/NF/RO or combinations thereof for treating DAF effluent. Nalco performed solubility parameters for the different minerals present in the Decatur waste water to determine the tendency to form "scale" on membranes. Due to high incoming phosphorous concentration in the waste water (close to 150 ppm), there is a high probability to form calcium phosphate scale. Under certain circumstances, adjusting pH to reduce the scaling is possible, but a phosphate removal system would have to be implemented to obtain high permeate recoveries. Nalco's study was preceded by actual pilot work by Separation Technologies, which found severe scaling on the membrane surfaces.

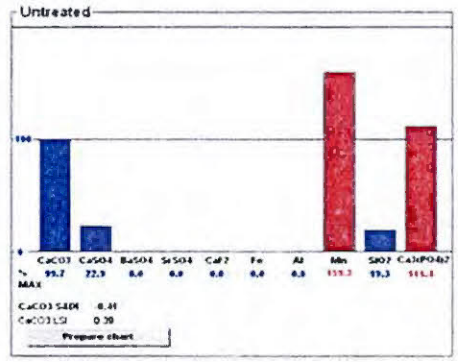
2.7.1 Technical Feasibility

Test with 80% recovery in RO, without use of Antiscalant, showed three different types of scaling are expected. This is shown in the following graphs.



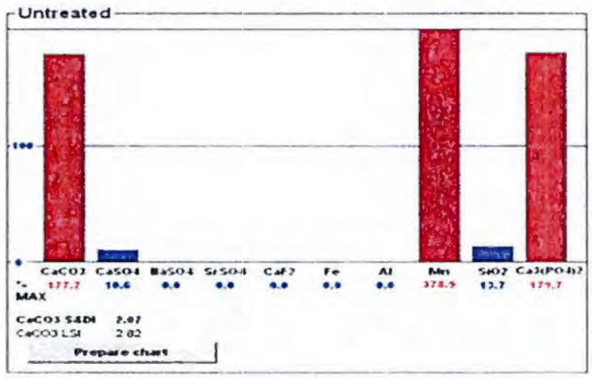
UNTREATED WITH ANY ANTISCALANT

80% Recovery, Feed pH : 7.6



UNTREATED WITH ANY ANTISCALANT

80% Recovery, Feed pH : 6.0

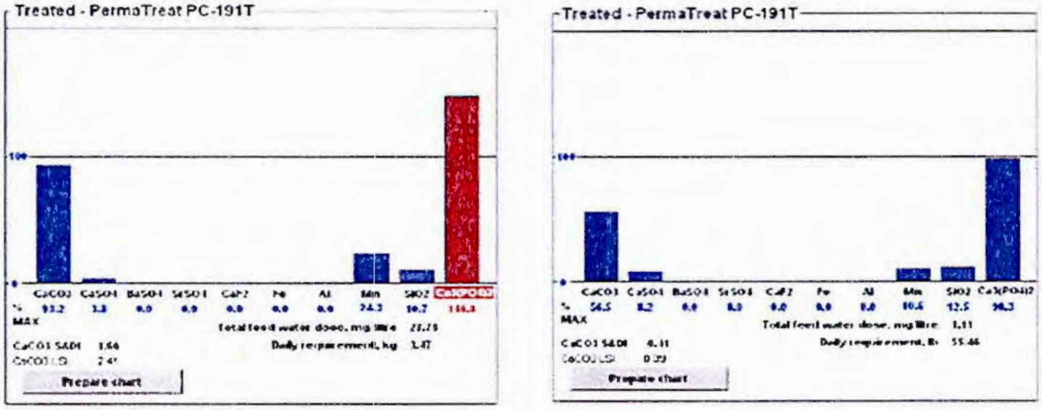


UNTREATED WITH ANY ANTISCALANT

80% Recovery, Feed pH : 8.0

Figure 18 Effect of pH on scaling of RO membranes with DAF effluent

With close to 150 ppm phosphate in DAF effluent, an antiscalant alone cannot control calcium phosphate. About 1.5 moles of calcium per mole of phosphate is required to be precipitated to reduce the scaling. This would require about 2,835 lbs of calcium hydroxide daily to reduce phosphate to below 8 ppm in order to prevent membrane scaling.



TREATED WITH PC-191T ANTISCALANT

80% Recovery, Feed pH : **7.6**
Feed Phosphate: **150 ppm**

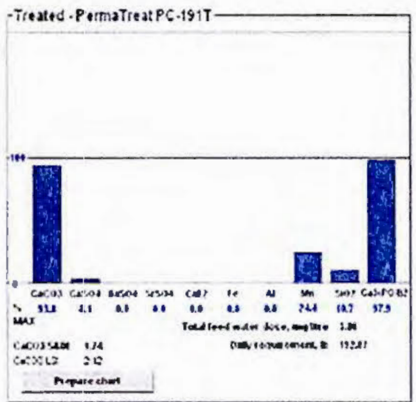
Ca Phosphate still above Saturation

TREATED WITH PC-191T ANTISCALANT

80% Recovery, Feed pH : 6.0
Feed Phosphate: **150 ppm**

Figure 19 Effect of antiscalant on phosphate precipitation for RO treatment of DAF effluent [5]

If DAF effluent phosphorous levels are reduced to 6-8 ppm using a mixture of chemical precipitation and anaerobic performance modification, antiscalant alone will allow for >80% recovery in RO with scaling.



TREATED WITH PC-191T ANTISCALANT

80% Recovery, Feed pH : **7.6**
Feed Phosphate: **8 ppm**

Figure 20 Effect of Phosphate removal on RO scaling

2.7.2 Capital and Operating costs.

We estimated capital for a UF/RO/Therrnal evaporation based approach for our 6MGD stream to be about $[redacted]MM. However, this capex was estimated based on 85% recovery in UF and 75% recovery in RO. As we've discussed here, the best cases of UF recovery we've seen are 60-70% and RO only about 30% due to scaling.

2.8 Nickel and Zinc- Sludge (WWTP organism cell wall rupture)

There are no updates from the report of December 23, 2010.

2.9 Nickel and Zinc- Sludge Sales

There are no updates from the report of December 23, 2010.

3 Review Ceased for Technologies

ADM has temporarily stopped testing on the following technologies to focus on more promising applications.

- Procorp Crystal clear technologies
- Eagle Picher
- Vivenano
- Filtration Energy Solutions
- GE's DTC
- Siemens / Plymouth Technologies: While the sample did reduce nickel to below 11ppb it also removed almost all of Mg, Ca and P in the waste water. ADM has not been able to bring them in for in-house testing as well.

4 Appendix A

Pilot Nickel Reduction Skid HAZOP report

Project No. 0000014

HAZOP Initial - Nickel Reduction from Waste Water Plant Trial Skid
This Hazop is intended for the pilot scale system only (with 100 gallon mix tanks) and its associated chemical volumes; it in no way reflects any process safety analysis of the resulting full scale system

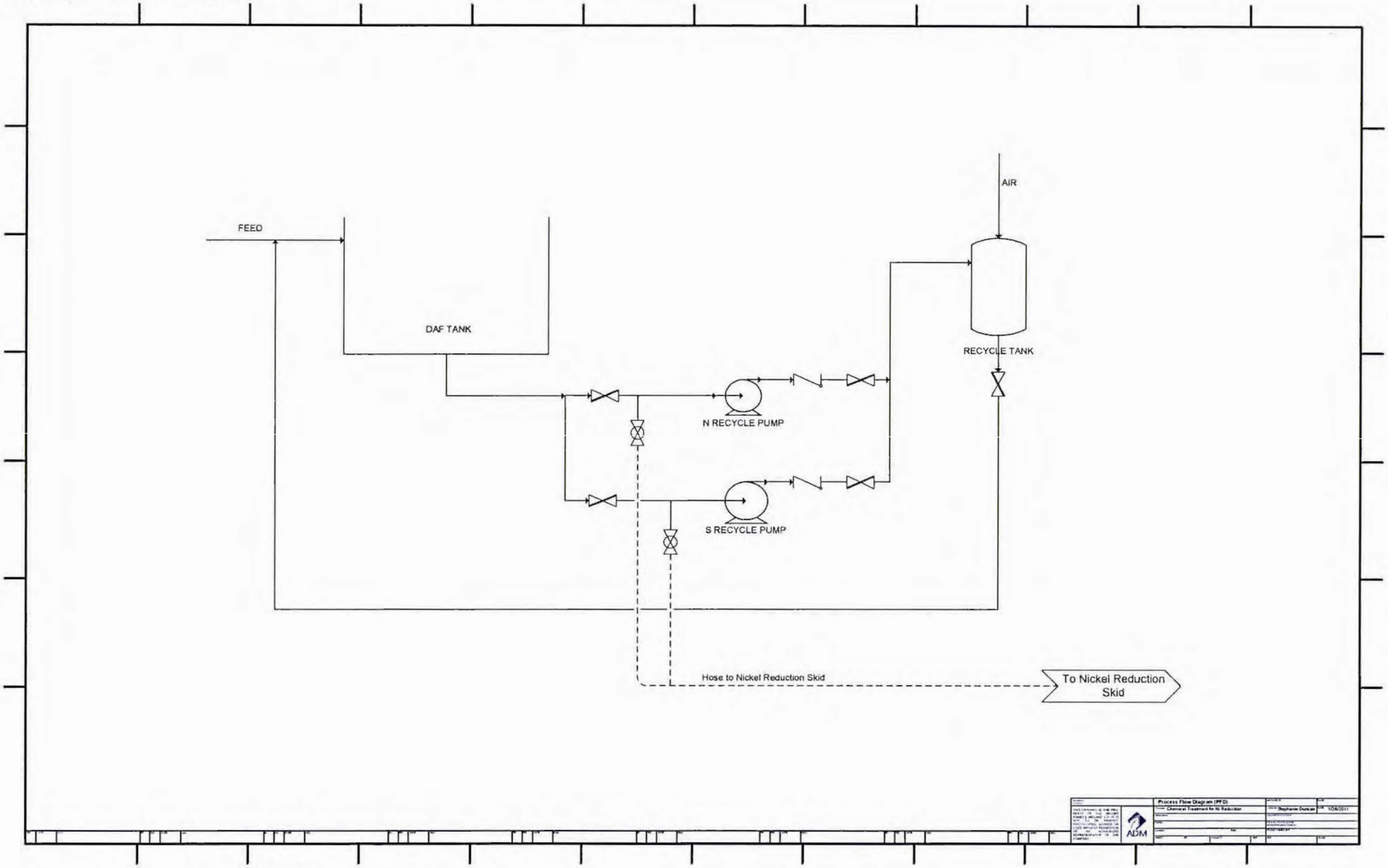
Leader: John Soper
Scribe: John Soper

Meeting Location: Stage Conference Room JRRRC
First Meeting: 01/21/2011

Site: Decatur
Plant: Decatur Waste Treatment Facility
Unit: Chemical Treatment Test Skid
System: Chemical Additives for Nickel Precipitation

January 2011

Drawing 1 Used in the Analysis



Drawing 2 Used in the Analysis

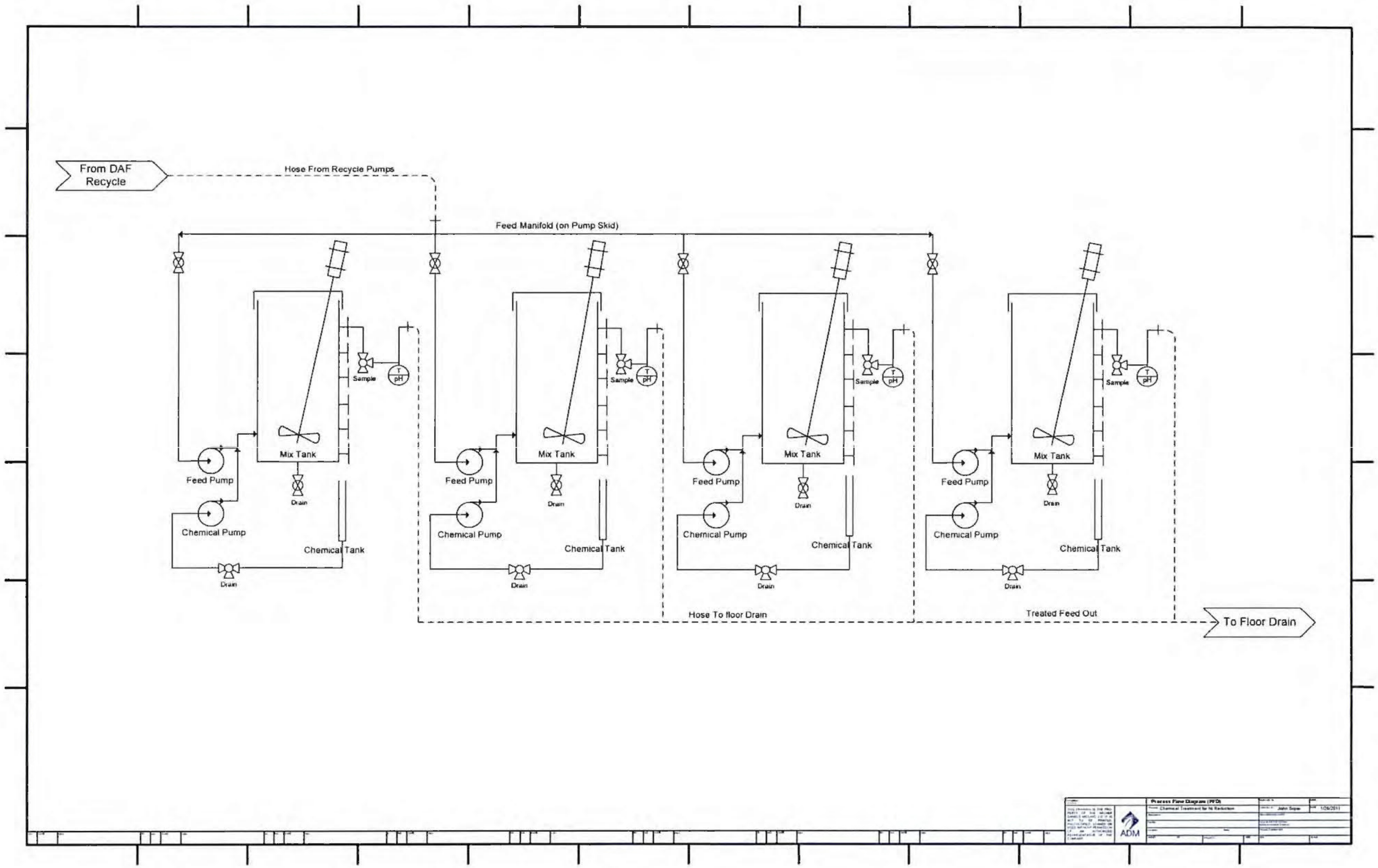

From DAF Recycle
Hose From Recycle Pumps
Feed Manifold (on Pump Skid)
Mix Tank
Feed Pump
Chemical Pump
Chemical Tank
Drain
Sample
T
pH
Hose To floor Drain
Treated Feed Out
To Floor Drain
Process Flow Diagram (PFD)
ADM

Table 1 Team Members

First Name	Last Name	Company	Job Title	Role
Stephanie	Duncan	ADM	Process Engineering	Engineer
John	Embleton	ADM	Safety & Health Specialist	Safety & Health
John	Feriozzi	ADM	Occupational Safety	Safety
Steven	Ison	ADM	Environmental Engineering	Environmental
Mahlon	Kaloupek	ADM	Process Engineering	Engineer
Rishi	Shukla	ADM	Process Development	Engineer
John	Soper	ADM	Process Development	Hazop Leader
Ken	Tague	ADM	Process Safety Specialist	Process Safety
Jeff	Ulozas	ADM	Process Technician	Maintenance

Table 2 Action Items

Type	No.	Action	Due Date	Status	Responsibility	References
Recommendation	1	Ensure that alarming is on pond pump station pumps Verified – run indication in use	2/8/11	Complete 1/26/11	Stephanie Duncan	1.1 High flow (Line/Pipe) — Plant Trial Skid
Recommendation	2	Determine pressure of feed stream to this system Feed will be the suction side of pumps diagramed in drawing 1.	2/8/11	2/11/11	Stephanie Duncan	1.2 Low/no flow (Line/Pipe) — Plant Trial Skid
Recommendation	3	Develop a standard operating procedure for system including proper personal protective equipment	Prior to skid Operation 2/25/11		Stephanie Duncan	1.2 Low/no flow (Line/Pipe) — Plant Trial Skid 1.18 High concentration of contaminants (Tank/Vessel) — Plant Trial Skid
Recommendation	4	Ensure that chemical addition valves are labelled	Prior to skid relocation 2/18/11		Jeff Ulozas	1.4 Misdirected flow (Line/Pipe) — Plant Trial Skid 1.9 Deviation during startup (Pump) — Plant Trial Skid 1.1D Deviation during shutdown (Pump) — Plant Trial Skid
Recommendation	5	Ensure that installation if using recycle water won't allow backflow into recycle system	2/18/11		Stephanie Duncan	1.7 Loss of containment (Line/Pipe) — Plant Trial Skid
Recommendation	6	Ensure that no chemicals are stored nearby that could be problematic (acids/bases) if mixed with these chemicals	Prior to skid Operation 2/25/11		Stephanie Duncan / Mahlon Kaloupek	1.8 Loss of containment (Pump) — Plant Trial Skid
Recommendation	7	Standard operating procedure to ensure proper placement of required plugs	Prior to skid Operation 2/25/11		Stephanie Duncan	1.20 Deviation during startup (Tank/Vessel) — Plant Trial Skid 1.21 Deviation during shutdown (Tank/Vessel) — Plant Trial Skid
Recommendation	8	Verify emergency lighting in building There is no emergency lighting in building – address in SOP	2/8/11	Complete 1/26/11	Stephanie Duncan	1.23 Loss of electric power (momentary or longer) (Utilities and services) — Plant Trial Skid
Recommendation	9	Update drawing to include recycle on feed side of treatment system as well as all valves and hose connections	1/31/11	Complete 1/26/11	John Soper	1.26 Loss of containment (Hose) — Plant Trial Skid
Recommendation	11	Standard operating procedure include hose/fitting inspections	Prior to skid Operation 2/25/11		Stephanie Duncan	1.29 Deviation during maintenance/sampling (Hose) — Plant Trial Skid
Recommendation	12	Ensure that there is a fire extinguisher in building Verified there is an extinguisher		Complete 1/25/11	Stephanie Duncan	1.7 Loss of containment (Line/Pipe) — Plant Trial Skid 1.8 Loss of containment (Pump) — Plant Trial Skid 1.19 Loss of containment (Tank/Vessel) — Plant Trial Skid

Table 3 List of Sections

No.	Type	Name	Description	Design Intent	Drawings
1	Line/Pipe, Pump, Tank/Vessel, Utilities and services, Hose, Other, Task Details Analysis	Plant Trial Skid	Chemical Addition System	Pump/transfer/holding	

Table 4 Safety Risk Matrix Used in Analysis

	S1 - Single first-aid injury	S2 - Single injury requiring physician's care	S3 - Single severe injury	S4 - Multiple severe injuries
L4 - Could occur on an annual basis (or more often)	C - Acceptable with control	N - Not desirable - Risk control measures to be introduced	U - Unacceptable	U - Unacceptable
L3 - Could occur several times during facility life	A - Acceptable - No risk control measures are needed	C - Acceptable with control	N - Not desirable - Risk control measures to be introduced	U - Unacceptable
L2 - Could occur once during facility life	A - Acceptable - No risk control measures are needed	A - Acceptable - No risk control measures are needed	C - Acceptable with control	N - Not desirable - Risk control measures to be introduced
L1 - Not expected to occur during facility life	A - Acceptable - No risk control measures are needed	A - Acceptable - No risk control measures are needed	A - Acceptable - No risk control measures are needed	A - Acceptable - No risk control measures are needed

Archer Daniels Midland	**Plant:** Decatur Waste Treatment Facility	**Site:** Decatur	**Unit:** Chemical Treatment Test Skid	**System:** Chemical Additives for Nickel Precipitation
Method: HAZOP	**Type:** Line/Pipe, Pump, Tank/Vessel, Utilities and services, Hose, Other, Task Details Analysis	**Design Intent:** Pump/transfer/holding		
Team Members: See Page 3 of this report				

No.: 14							Nickel Reduction Skid for WW Plant Trial		Plant Trial Skid
Item	**Deviation**	**Causes**	**Consequences**	**S**	**L**	**R**	**Safeguards**		**Action Items**
1.1	High flow (Line/Pipe)	High pressure upstream	Erosion - leads to loss of containment	S1	L3	A	Flow indication		Rec 1. Ensure that [illegible] both ends of process - pond pump station **Responsibility:** Stephanie Duncan
			High level downstream - no consequence of interest						
1.2	Low/no flow (Line/Pipe)	Closed valve High pressure downstream Low pressure upstream Plugged strainer Plugging due to solids buildup	No consequence of interest				Flow measure as part of SOP Proper personal protective equipment Standard operating procedure		Rec 2. Determine pressure of feed stream to this system **Responsibility:** Stephanie Duncan Rec 3. Develop a standard operating procedure for system including proper personal protective equipment **Responsibility:** Stephanie Duncan
1.3	Reverse flow (Line/Pipe)	High pressure downstream Low pressure upstream	Contaminants upstream - no consequence of interest						
1.4	Misdirected flow (Line/Pipe)	Operator error – valve misalignment Valve seat leakage	chemical running to floor - potential slip hazard	S1	L3	A	Labelling that specifies valve alignment Startup testing		Rec 4. Ensure that chemical addition valves are labelled **Responsibility:** Jeff Ulozas
1.5	High pressure (Line/Pipe)	Blocked flow High temperature	Loss of containment - slip hazard	S1	L3	A	Schedule 80 piping / high pressure (100+psi) tubing		
1.6	Low pressure (Line/Pipe)		No consequence of interest						
1.7	Loss of containment (Line/Pipe)	Corrosion/erosion External fire External impact Gasket, packing, or seal failure Improper maintenance Material defect Sample station valve leaking Vent or drain valve leaking High pressure (if the overpressure cause exceeds the equipment pressure rating)	Small release	S1	L1	A	Nondestructive inspection Fire extinguisher		Rec 5. Ensure that installation if using recycle water won't allow backflow into recycle system **Responsibility:** Stephanie Duncan Rec 12. Ensure that there is a fire extinguisher in building **Responsibility:** Stephanie Duncan
1.8	Loss of containment (Pump)	Corrosion/erosion External fire External impact Gasket, packing, or seal failure (e.g., due to vibration or loss of seal flush) Improper maintenance Material defect	Small release	S1	L1	A	Nondestructive inspection Operation/maintenance response as required, including isolation if needed Remote shutdown capability for the pump Fire extinguisher		Rec 6. Ensure that no chemicals are stored nearby that could be problematic (acids/bases) if mixed with these chemicals **Responsibility:** Stephanie Duncan / Mahlon Kaloupek Rec 12. Ensure that there is a fire extinguisher in building **Responsibility:** Stephanie Duncan
1.9	Deviation during startup (Pump)	valve missalignment	loss of containment	S1	L3	A	Standard operating procedure Personnel training chemical addition valves labelled		Rec 4. Ensure that chemical addition valves are labelled **Responsibility:** Jeff Ulozas
1.10	Deviation during shutdown (Pump)	Drain valve left open	Loss of containment see 1.09	S1	L3	A	Personnel training Standard operating procedure		Rec 4. Ensure that chemical addition valves are labelled **Responsibility:** Jeff Ulozas
1.11	Deviation during maintenance/sampling (Pump)	Valve opening to drain	Loss of containment - see 1.09	S1	L3	A	Personnel training Standard operating procedure		
1.12	High level (Tank/Vessel)	Low flow downstream Operator adding too much material	Tank overflows - loss of containment - see 1.09	S1	L3	A	Level indication Personnel training Standard operating procedure		
1.13	Low level (Tank/Vessel)	High flow downstream Low flow upstream Operator failing to add material when required	No consequence of interest				Level indication		
1.14	High temperature	High ambient temperature	No consequence of interest				Temperature indication		

No.: 14							Nickel Reduction Skid for WW Plant Trial	Plant Trial Skid
Item	**Deviation**	**Causes**	**Consequences**	**S**	**L**	**R**	**Safeguards**	**Action Items**
	(Tank/Vessel)	High temperature upstream						
1.15	Low temperature (Tank/Vessel)	Low ambient temperature	No consequence of interest				Temperature indication	
1.16	High pressure (Tank/Vessel)		Loss of containment (Not possible)				Tank is open to atmosphere	
1.17	Low pressure (Tank/Vessel)	Low temperature	No consequence of interest				Open top tank	
1.18	High concentration of contaminants (Tank/Vessel)	High concentration of contaminants upstream Leakage from other systems Operator error – valve misalignment Operator error in changing materials Upstream process upset Wrong raw material	undesired chemical interactions	S3	L1	A	Checklist that specifies valve alignment Standard operating procedure Operator training Personal protective equipment	Rec 3. Develop a standard operating procedure for system including proper personal protective equipment **Responsibility:** Stephanie Duncan
1.19	Loss of containment (Tank/Vessel)	Vent or drain valve leaking High pressure (if the overpressure cause exceeds the equipment pressure rating) Corrosion/erosion External fire External impact Gasket, packing, or seal failure Improper maintenance Material defect Sample station valve leaking	large release	S1	L3	A	Nondestructive inspection Operation/maintenance response as required, including isolation if needed Breaker protection on electrical components Awareness training of new system to peripheral personnel Proper personal protective equipment Standard operating procedure Fire Extinguisher	Rec 12. Ensure that there is a fire extinguisher in building **Responsibility:** Stephanie Duncan
			personnel exposure to liquid	S2	L2	A		
1.20	Deviation during startup (Tank/Vessel)	Valve left open Operator error Required plugs left out	Loss of containment - See 1.09	S1	L3	A	Standard operating procedure Personnel training	Rec 7. Standard operating procedure to ensure proper placement of required plugs **Responsibility:** Stephanie Duncan
1.21	Deviation during shutdown (Tank/Vessel)	Incorrect valve sequencing	Loss of containment - See 1.09	S1	L3	A	Standard operating procedure Personnel training	Rec 7. Standard operating procedure to ensure proper placement of required plugs **Responsibility:** Stephanie Duncan
1.22	Deviation during maintenance/sampling (Tank/Vessel)	Incorrect sampling Operator error	Loss of containment - See 1.09	S1	L3	A	Personal protective equipment Standard operating procedure Personnel training	
			Personnel exposure to chemicals	S1	L3	A		
1.23	Loss of electric power (momentary or longer) (Utilities and services)	Cable/bus severed Lightning strike Offsite utility power loss Overload Transformer fire Turbo generator trip Loss of high pressure steam	Loss of nighttime lighting	S1	L2	A	GFI requirement for electrical cords Personnel training	Rec 8. Verify emergency lighting in building **Responsibility:** Stephanie Duncan
			Loss of pond pumps causing backup into building	S1	L2	A		
			Potential electric shock hazard - if water backs up into building but building power is still on and extension cords are running across floor	S4	L1	A		
1.24	Inadequate drainage (Utilities and services)	Improper grade/slope Inadequate piping diameter Sand/gravel accumulation Sludge accumulation Pond pumps lose power	Water backing up into building See 1.23	S1	L2	A	Personnel training	
1.25	Loss of nighttime lighting (Utilities and services)	Loss of electric power (momentary or longer)	General trip/fall hazard	S2	L2	A	Emergency lights	
1.26	Loss of containment (Hose)	Corrosion/erosion Coupling failure/disconnection Defective and/or damaged hose External impact	Small release if off of overflow stream	S1	L3	A	Hose periodically tested or replaced Nondestructive inspection Personnel training Standard operating procedure	Rec 9. Update drawing to include recycle on feed side of treatment system as well as all valves and hose connections **Responsibility:** John Soper

No.: 14							Nickel Reduction Skid for WW Plant Trial	Plant Trial Skid
Item	Deviation	Causes	Consequences	S	L	R	Safeguards	Action Items
		Gasket, packing, or seal failure Improper maintenance						
			Large release if off of recycle pump	S1	L3	A		
1.27	Deviation during startup (Hose)	Hose disconnected from intended pipes	Loss of containment small release	S1	L3	A	Standard operating procedure Personnel training Proper personal protective equipment	
1.28	Deviation during shutdown (Hose)		Loss of containment - small release See 1.27	S1	L3	A	Standard operating procedure Personnel training Personal protective equipment	
1.29	Deviation during maintenance/sampling (Hose)		Loss of containment - small release See 1.27	S1	L3	A	Standard operating procedure Personnel training Proper personal protective equipment	Rec 11. Standard operating procedure include hose/fitting inspections **Responsibility: Stephanie Duncan**
			Personnel exposure to chemicals	S1	L2	A		
1.30	Human Factors		Personnel exposure	S1	L3	A	Standard operating procedure Operator training Limit personnel involved with handling chemicals Awareness training for peripheral personnel Simple procedures locally posted Proper personal protective equipment	

5 Appendix B

Summary of Various Control Strategies, based on one or more feasible technologies.

By July 1, 2011 the District must complete the following tasks:

i. Compile various control strategies based on one or more of the feasible technologies. Develop flow diagrams depicting removal options, pros and cons, capital expenditures, and operating costs.

ii. Present findings to ADM division managers.

As part of our variance permit we have complied various control strategies on the 7 feasible technologies identified and developed flow diagrams, capital expenditures and operating costs for installation of chemical treatment and subsequent removal of the precipitated nickel sludge. The findings were presented to ADM Division Managers at a quarterly update on June 1, 2011. A redacted summary of these options is presented below.

In this section we've tried to explain chemical costs (section 5.1) and capex for these options (section 5.2).

5.1 Chemical Costs

5.1.1 Chemical Costs- Straight DTC

Straight Dimethyldithiocarbamate (NO SLUDGE WASTING, ALL TSS in DAF FILTERED OUT)
[redacted]

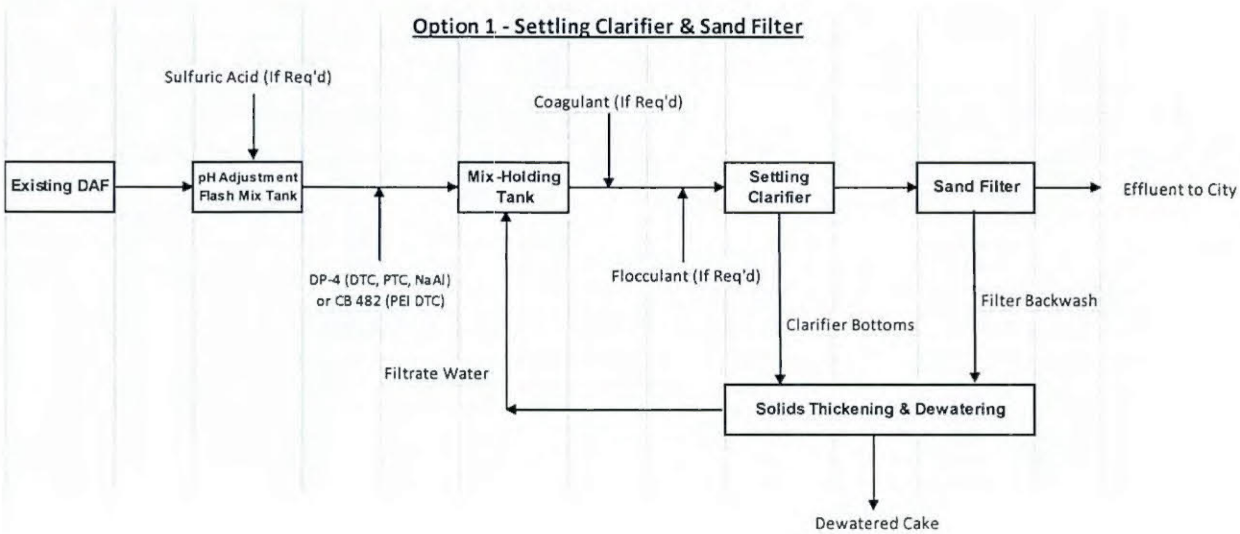
5.1.2 Chemical Costs- Polymeric DTC

Polymerized Carbamate-imine (NO SLUDGE WASTING, ALL TSS in DAF FILTERED OUT)

[redacted]

5.2 Capital Costs

5.2.1 Option 1- Settling Clarifier and Sand Filter

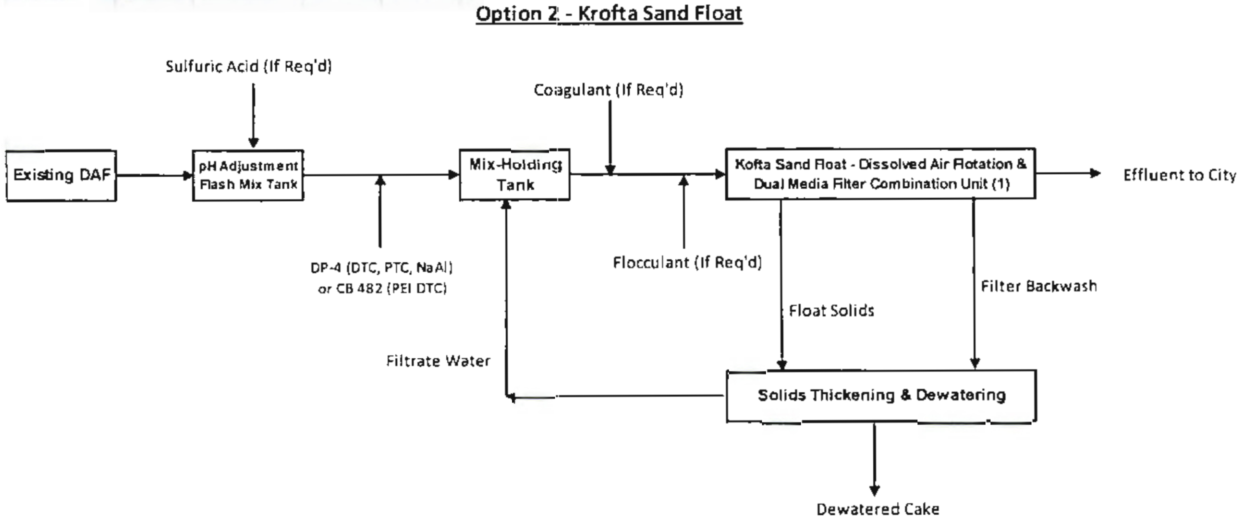


Economic Evaluation

[redacted]

Account	MH	Wage Rate	Labor Cost	Matl Cost	Total Cost	Percentages
[redacted]						

5.2.2 Option 2- Krofta Sand Float

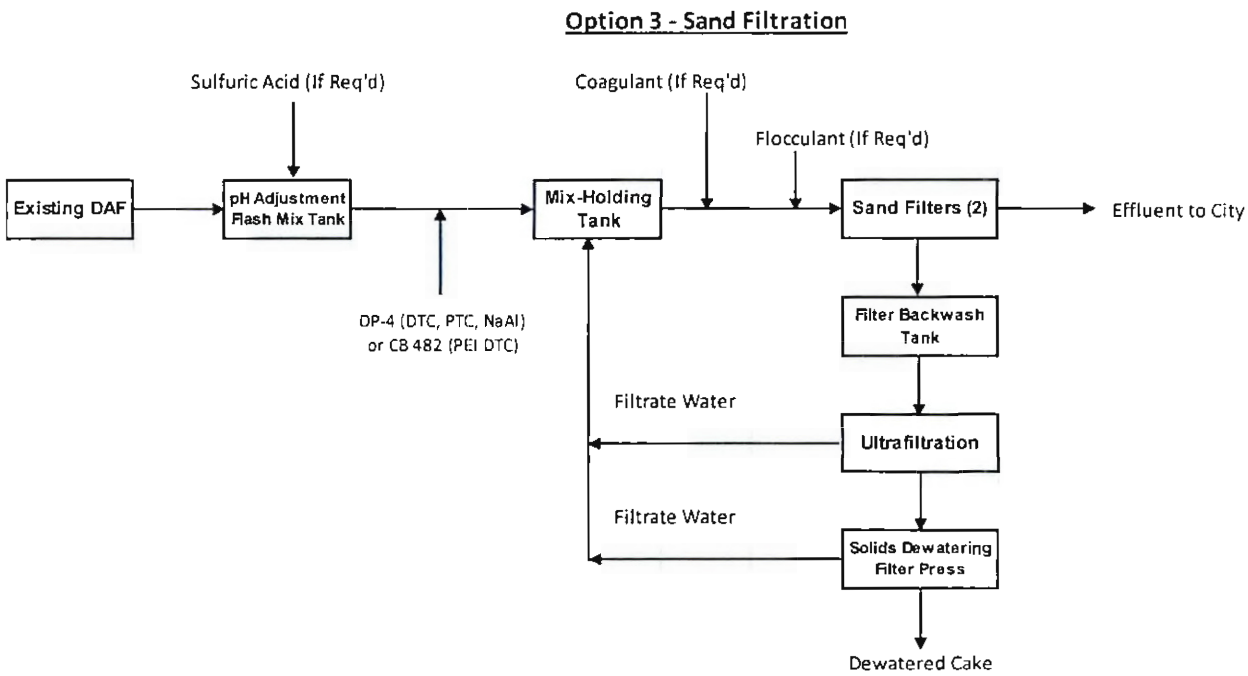


Aspen ICARUS

[redacted]

Account	MH	Wage Rate	Labor Cost	Matl Cost	Total Cost	Percentages
[redacted]						

5.2.3 Option 3- Sand Filter



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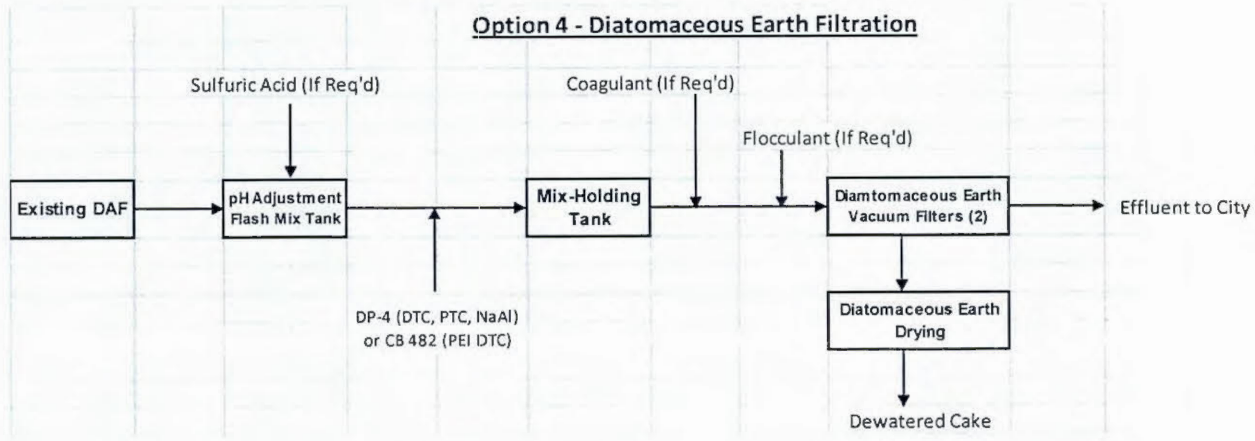
[redacted]

Account	MH	Wage Rate	Labor Cost	Matl Cost	Total Cost	Percentages
[redacted]						

5.2.4 Option 4- DE Filtration with precipitation

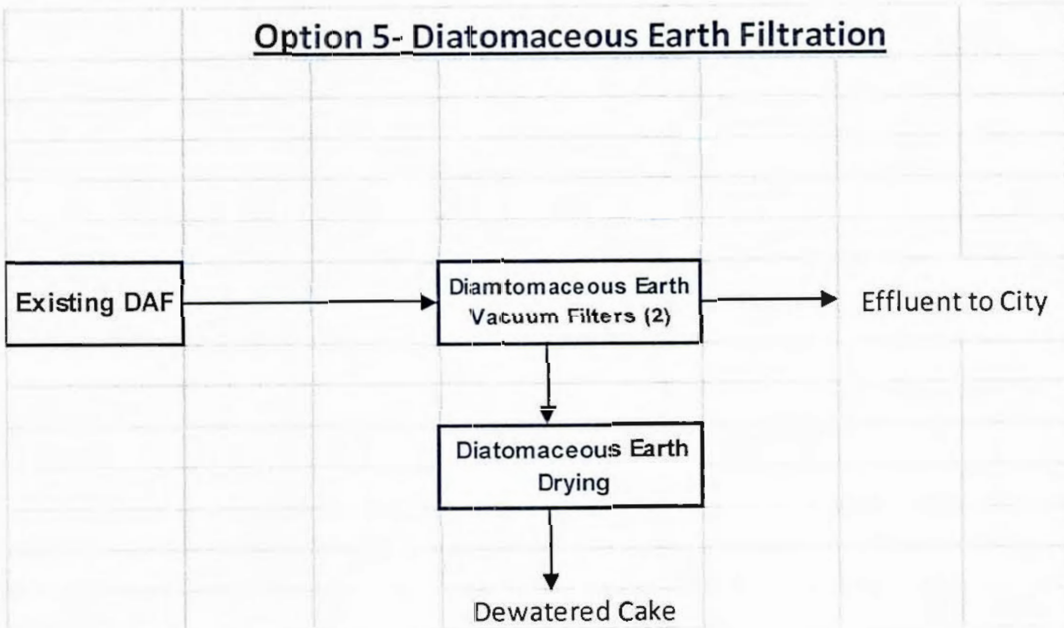


Aspen ICARUS

[redacted]

Account	MH	Wage Rate	Labor Cost	Matl Cost	Total Cost	Percentages
[redacted]						

5.2.5 Option 5- DE Filtration alone

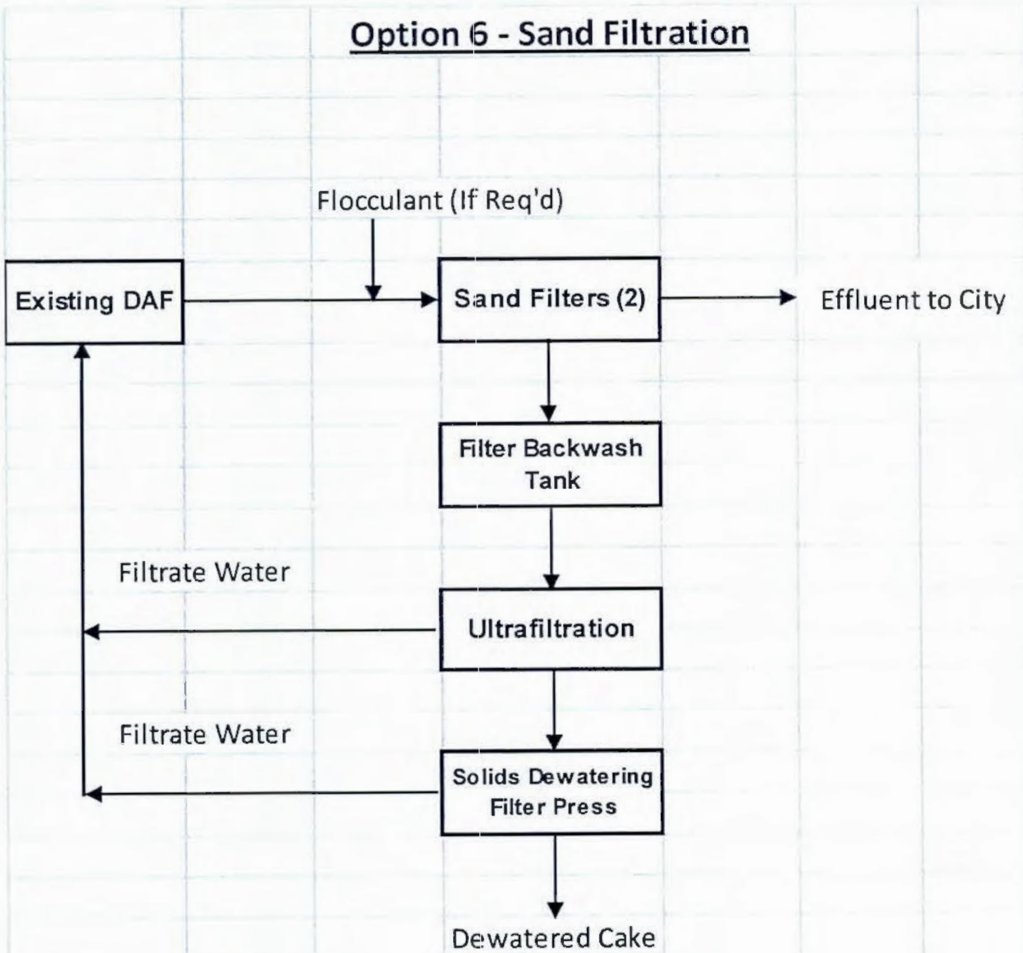


Aspen ICARUS

[redacted]

Account	MH	Wage Rate	Labor Cost	Matl Cost	Total Cost	Percentages
[redacted]						

5.2.6 Option 6- Sand Filtration alone



Aspen ICARUS

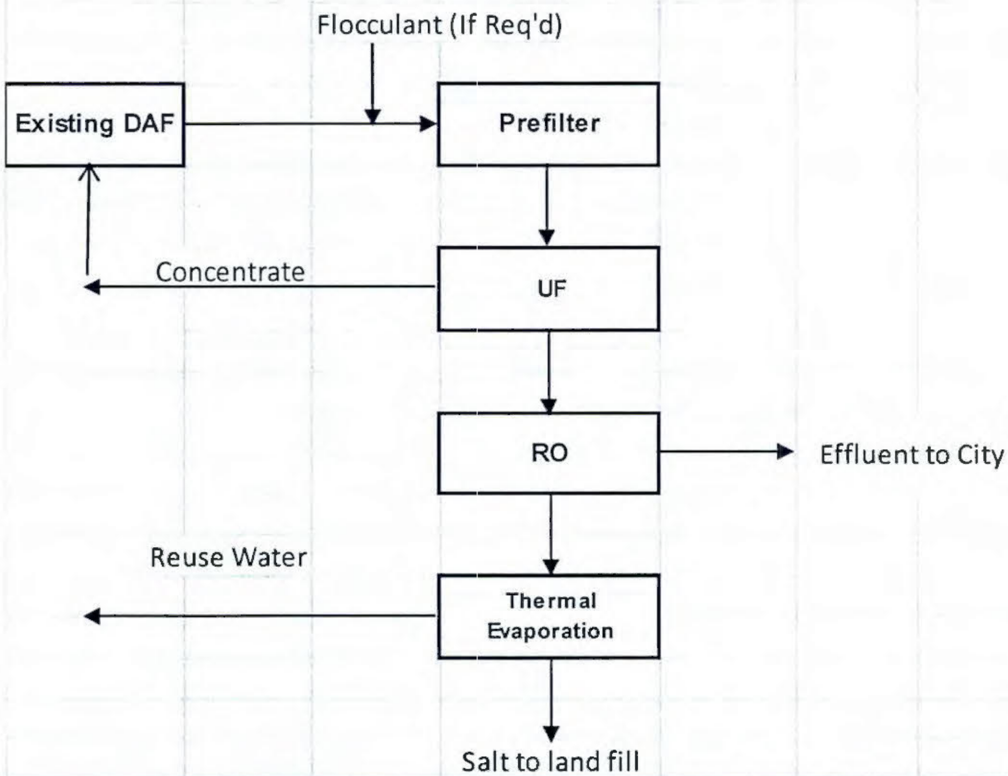
Aspen ICARUS

Project Cost Summary

Account	MH	Wage Rate	Labor Cost	Matl Cost	Total Cost	Percentages

5.2.7 Option 7- UF/ RO / Thermal Evaporation

Option 7 - UF/RO/Thermal Evaporation



[redacted]

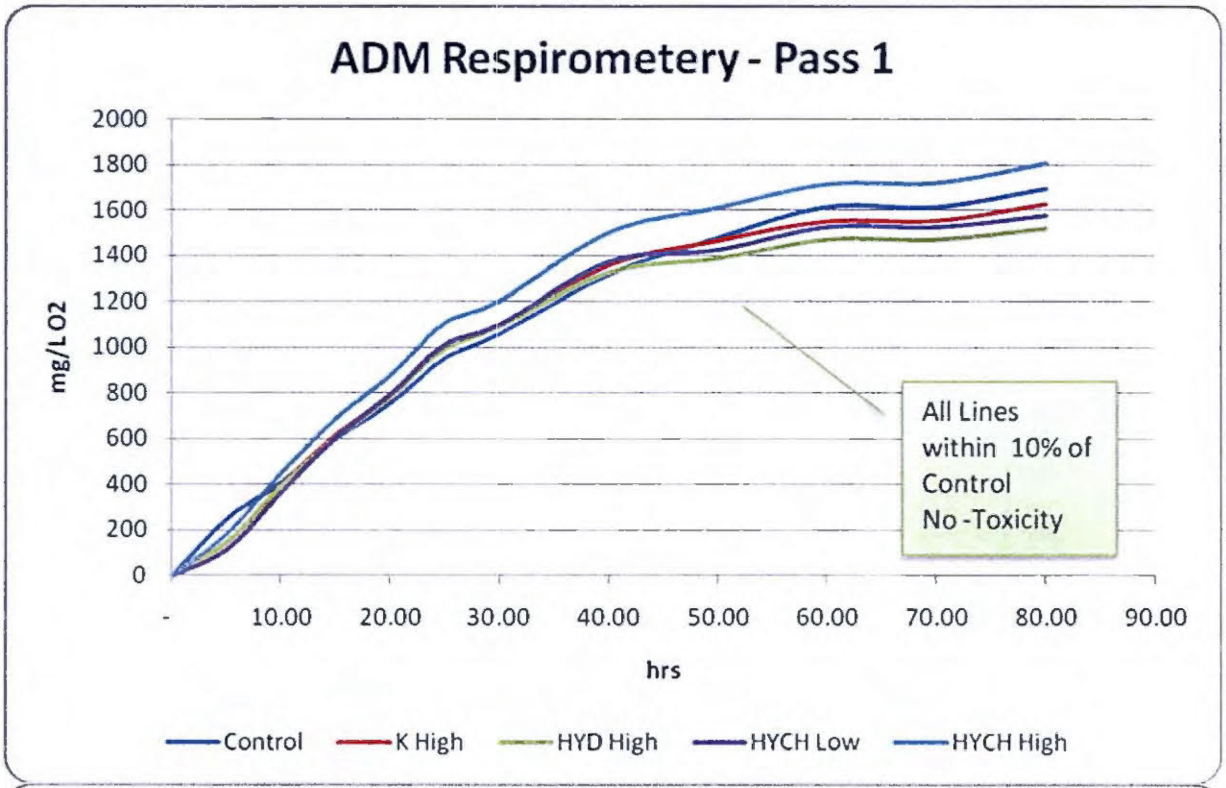
6 Appendix C

Results from Respirometer and Nitratox testing of ADM Decatur MLSS using currently being piloted chemistries.

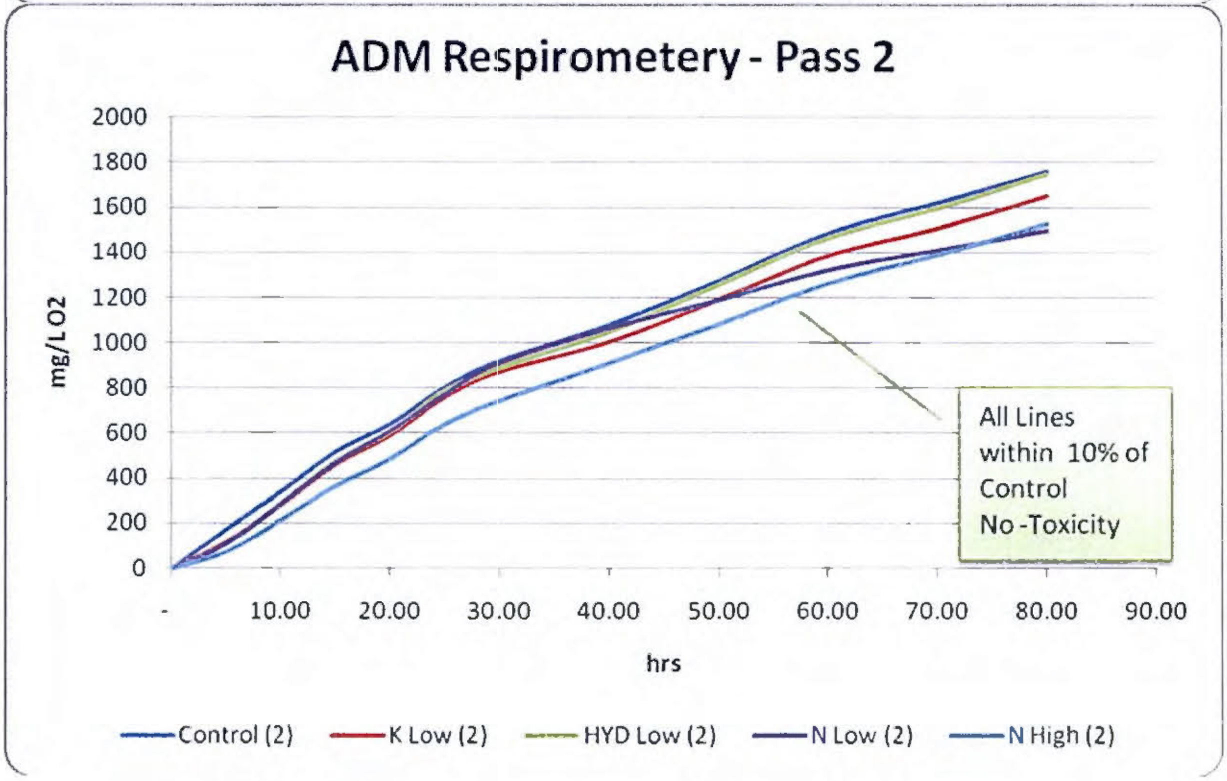
We used the services of Riverbend Laboratories to perform respirometer and nitrotox testing of the four chemistries currently being testing using ADM's MLSS. The chemistries were dosed at ~20ppm and ~200ppm and diluted 60:40 with fresh DAF to simulate a scenario envisioned by the Decatur Sanitary District.

	ppm Nickel	HOLD Time, Hrs	ppm, by wt	% Reduction
LOW SAMPLES TO RIVERBEND			added	
Feed	0.07			
Kroff	0.05	3.75	15.11	0.33
Hydrite	0.04	3.87	18.41	0.34
Hychem	0.06	3.63	18.68	0.18
Nalmet	0.04	3.87	20.39	0.47
HIGH SAMPLES TO RIVERBEND				
02441 5-10 DAF to Pilot DE	0.06			
Kroff	0.02	3.63	190.18	0.58
Hydrite	0.02	3.87	194.07	0.58
Hychem	0.03	3.75	207.83	0.37
Nalmet	0.02	4.23	254.95	0.60

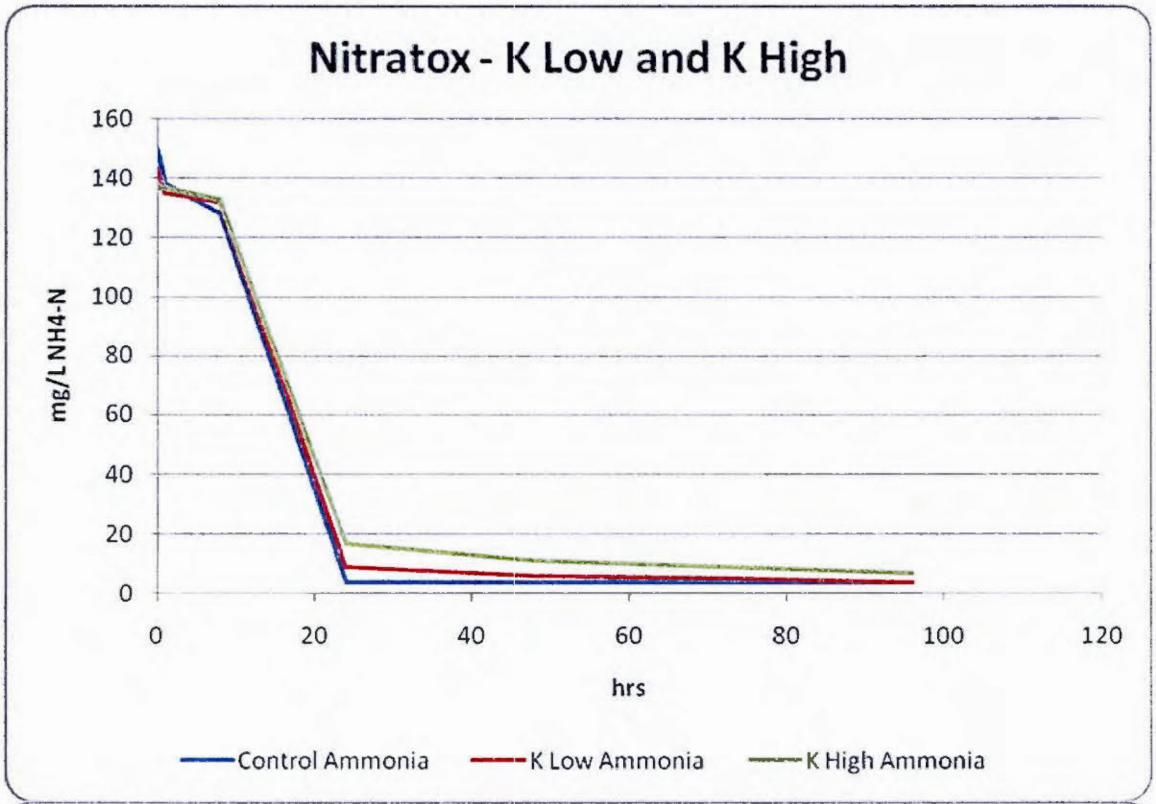
Report from RiverBend Laboratories is attached below.

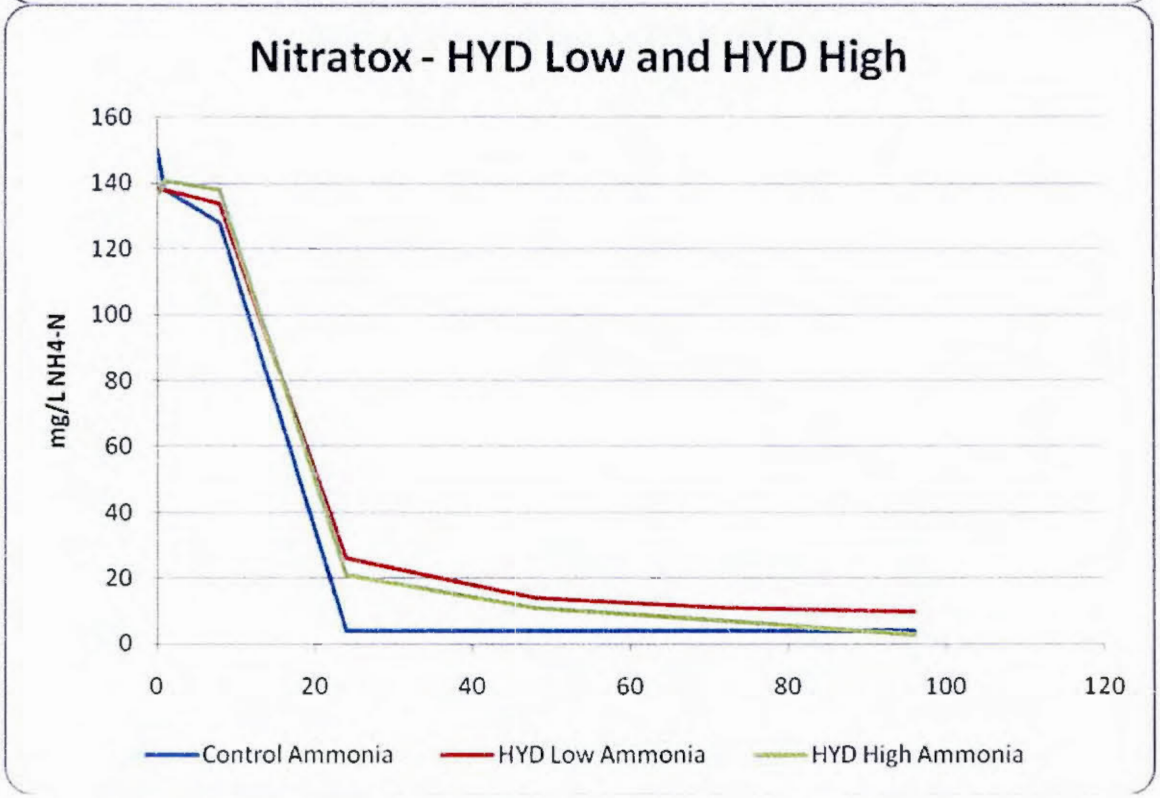


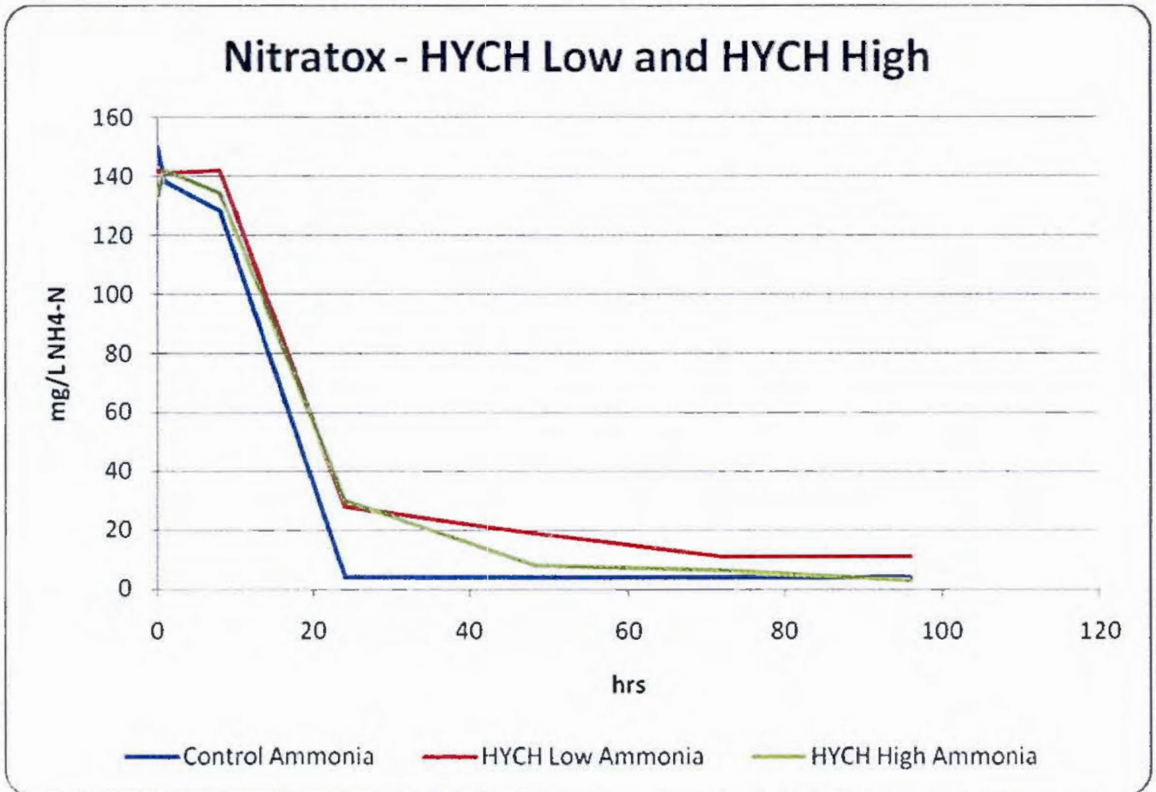
ADM Respirometery - Pass 1
mg/L O2
hrs
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
All Lines within 10% of Control No-Toxicity
Control
K High
HYD High
HYCH Low
HYCH High



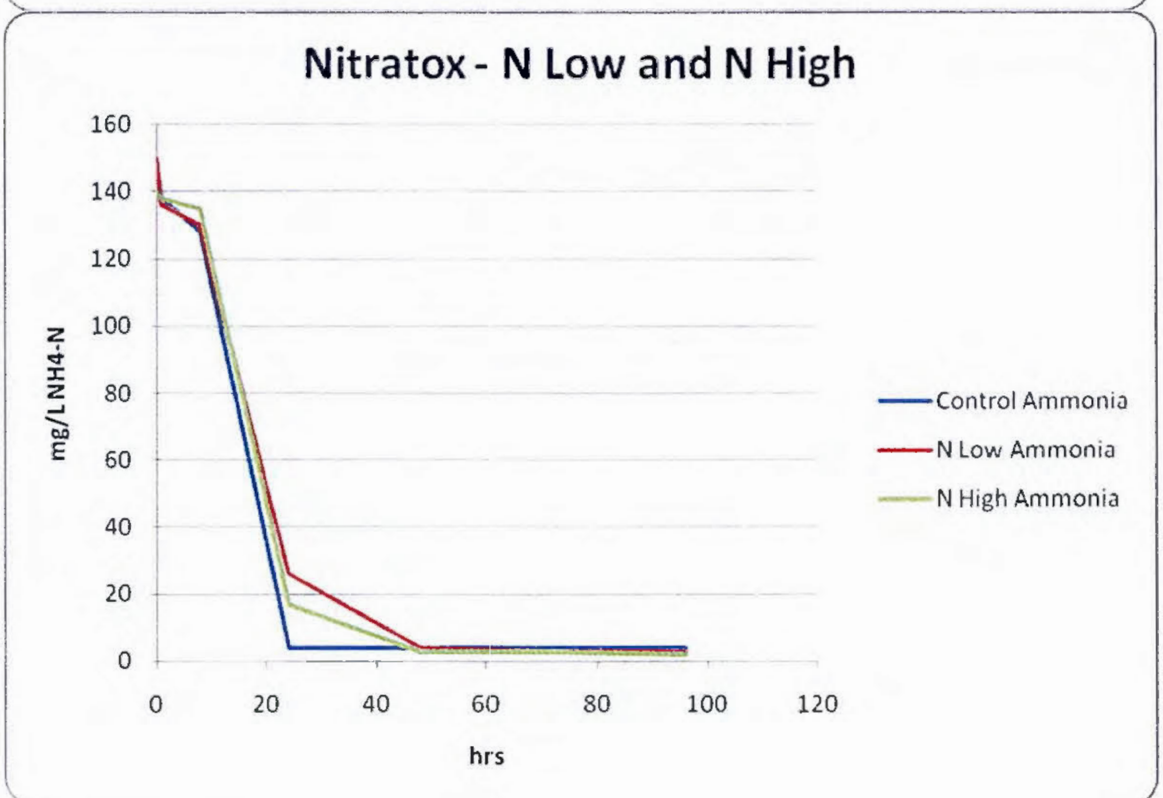
ADM Respirometery - Pass 2
mg/L O2
hrs
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
All Lines within 10% of Control No-Toxicity
Control (2)
K Low (2)
HYD Low (2)
N Low (2)
N High (2)


Nitratox - K Low and K High
160
140
120
100
80
60
40
20
0
mg/L NH4-N
0
20
40
60
80
100
120
hrs
Control Ammonia
K Low Ammonia
K High Ammonia


Nitratox - HYD Low and HYD High
160
140
120
100
80
60
40
20
0
mg/L NH4-N
0
20
40
60
80
100
120
Control Ammonia
HYD Low Ammonia
HYD High Ammonia



Nitratox - HYCH Low and HYCH High
160
140
120
100
80
60
40
20
0
mg/L NH4-N
0
20
40
60
80
100
120
hrs
Control Ammonia
HYCH Low Ammonia
HYCH High Ammonia



Nitratox - N Low and N High
160
140
120
100
80
60
40
20
0
mg/L NH4-N
0
20
40
60
80
100
120
hrs
Control Ammonia
N Low Ammonia
N High Ammonia

7 Appendix D

Results from Respirometer and Nitratox testing of SDD MLSS using currently being piloted chemistries

We used the services of Riverbend Laboratories to perform respirometer and nitrotox testing of the four chemistries currently being testing using ADM's MLSS. The chemistries were dosed at ~20ppm and ~200ppm and diluted 60:40 with SDD MLSS to simulate a scenario envisioned by the Decatur Sanitary District.

	Sample List		
SDD	SDD Influent to their plant, 6 X 1L		for Dilution of all Controls and Treated samples
ADM	ADM Effluent (untreated , 'as is' pH), 6 X 1L		for Dilution of 'as is' Controls
ADM	ADM Effluent (untreated , 6pH), 2 X 1L		for Dilution of 6pH Controls
SDD	SDD Mixed Liquor, 8 X 1L		for Respirometery bug source
ADM-A	Treated & Filtered DAF #1 - Kroff ~200ppm, 1 X 600ml		Sample of interest
ADM-B	Treated & Filtered DAF #2 - Hydrite ~200ppm, 1 X 600ml		Sample of interest
ADM-C	Treated & Filtered DAF #3 - Hychem~200ppm, 1 X 600ml at 6pH		Sample of interest
ADM-D	Treated & Filtered DAF #4 - Nalmet ~200ppm, 1 X 600ml		Sample of interest
	Respirometery (by volume)		
	Control 'as is' for A, B & D	60% ADM untreated 'as is' effluent & 40% SDD influent	
	Control 'pH' for C	60% ADM untreated 6pH effluent & 40% SDD influent	
	Sample A	60% Treated DAF #1 - K ~200ppm & 40% SDD influent	
	Sample B	60% Treated DAF #2 - HYD ~200ppm & 40% SDD influent	
	Sample C	60% Treated DAF #3 - HYCH ~200ppm @ 6pH & 40% SDD influent	
	Sample D	60% Treated DAF #4 - N ~200ppm & 40% SDD influent	
	Nitrification		
	Same as Respirometery		

Report from RiverBend Laboratories

Respirometry Results

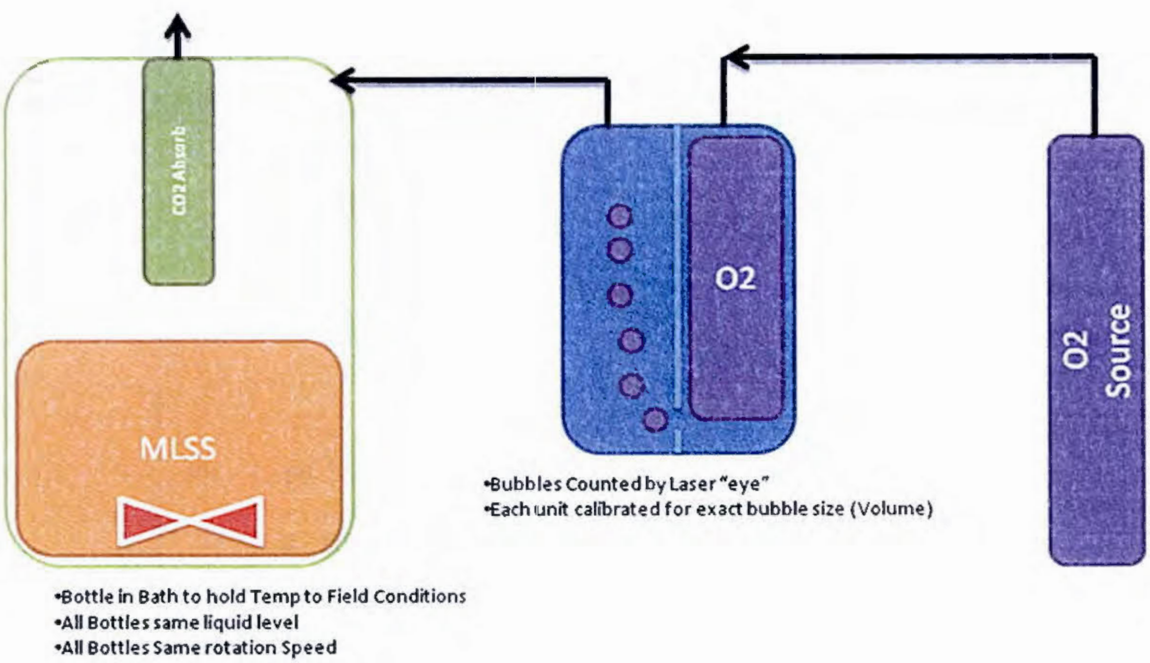
Executive Summary:

Samples A, B, and D showed no toxicity, though they had a very slight inhibition; as can be seen in the short delay of oxygen uptake. This was the bacteria acclimating to the new material.

Sample C showed no toxicity, though it had a very slight inhibition; as can be seen in the short delay of oxygen uptake. This was the bacteria acclimating to the new material.

Method:

The method involves setting up several identical bottles on a Challenge Respirometer in aerobic mode. The Challenge Respirometer accurately measures minute changes in oxygen uptake for the bacteria culture in question. This allows us to look at the total possible toxicity to the aeration bacteria (Aerobic Heterotrophs and Nitrifiers combined). By utilizing a control (normal conditions, we can establish a baseline oxygen uptake and then add various amounts of chemicals or suspect waste stream to be tested to see if there are any toxic (lower oxygen uptake) reactions with the biology. In this case all reactors were held a temp of 85F (+/- 5.0). Each reactor had 400 mL of City of Decatur MLSS.



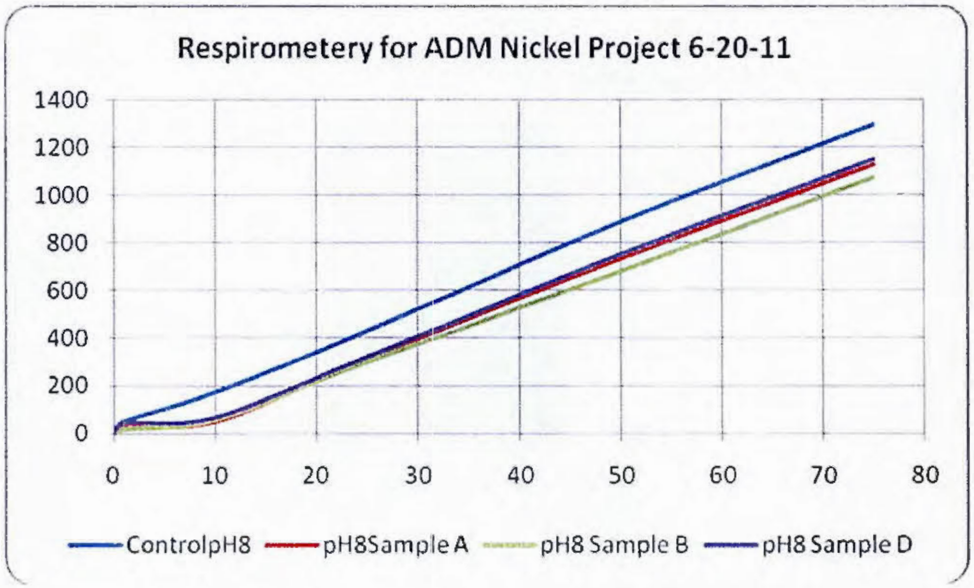
In this test we looked at the following.

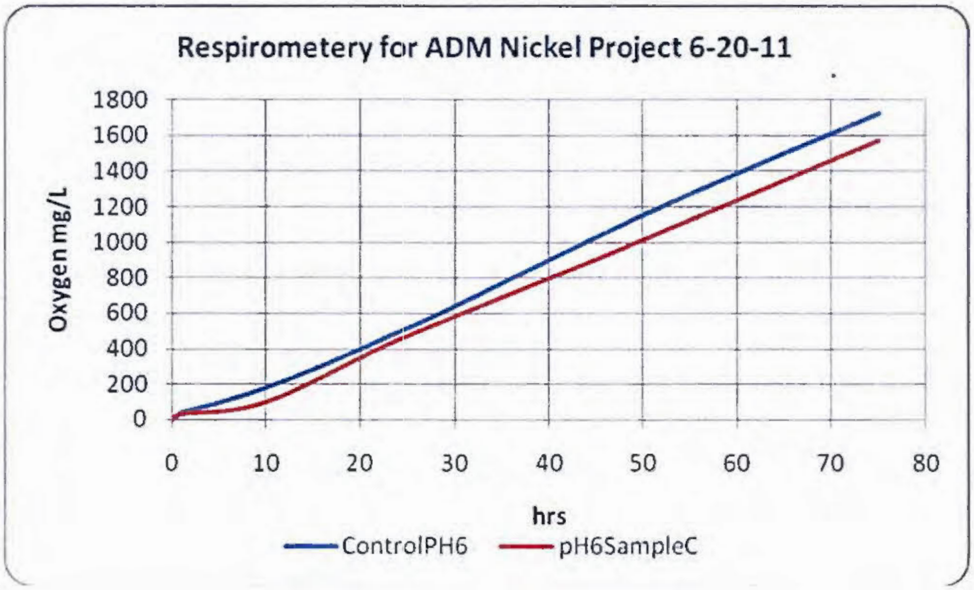
- **Control A,B,D**– 60% ADM untreated 'as is' effluent & 40% SDD influent
- **Sample A** - 60% Treated DAF #1 - K ~200ppm & 40% SDD influent
- **Sample B** - 60% Treated DAF #2 - HYD ~200ppm & 40% SDD influent
- **Sample D** - 60% Treated DAF #4 - N ~200ppm & 40% SDD influent
-
- **Control C** – 60% ADM untreated 6pH effluent & 40% SDD influent
- **Sample C** - 60% Treated DAF #3 - HYCH ~200ppm @ 6pH & 40% SDD influent

Results:

We did not see toxicity in any of the tested materials. There was a mild general inhibition at the beginning of all variables, as seen by the slight delay in the oxygen uptake rate. This lag is the heterotrophic bacteria acclimating to the new material. After this initial lag, the oxygen uptake rate (slope) is identical to the control, thus the bacteria are going right after the organic material with no problem once it figured out how to deal with the new material.

Note: I would venture to guess the ADM Mixed Liquor acclimated to the material faster (the 5-17-11 samples), as it had seen some low levels all during the testing at the ADM plant. I would also expect the SDD Mixed Liquor to acclimate quickly as well if the material was put on full scale.





Nitratox Test Results

Executive Summary:

We saw no toxicity to pure culture nitrifiers in all cases.

Method:

The general method involves setting up each test bottle with a specific volume of pure culture nitrifiers, DI water, and a then a specific concentration of NH4-N (in this case approx 100 mg/L). Each bottle is aerated with exactly the same air flow through a diffuser. A control is maintained and then various concentrations of a suspect chemical or waste stream are added to each variable bottle. NH4-N is then measured throughout the test (1hr, 8 hrs, 24 hours, 48, hours, 72 hours). All reactors are buffered to 7.5 pH.

In this test we looked at the following.

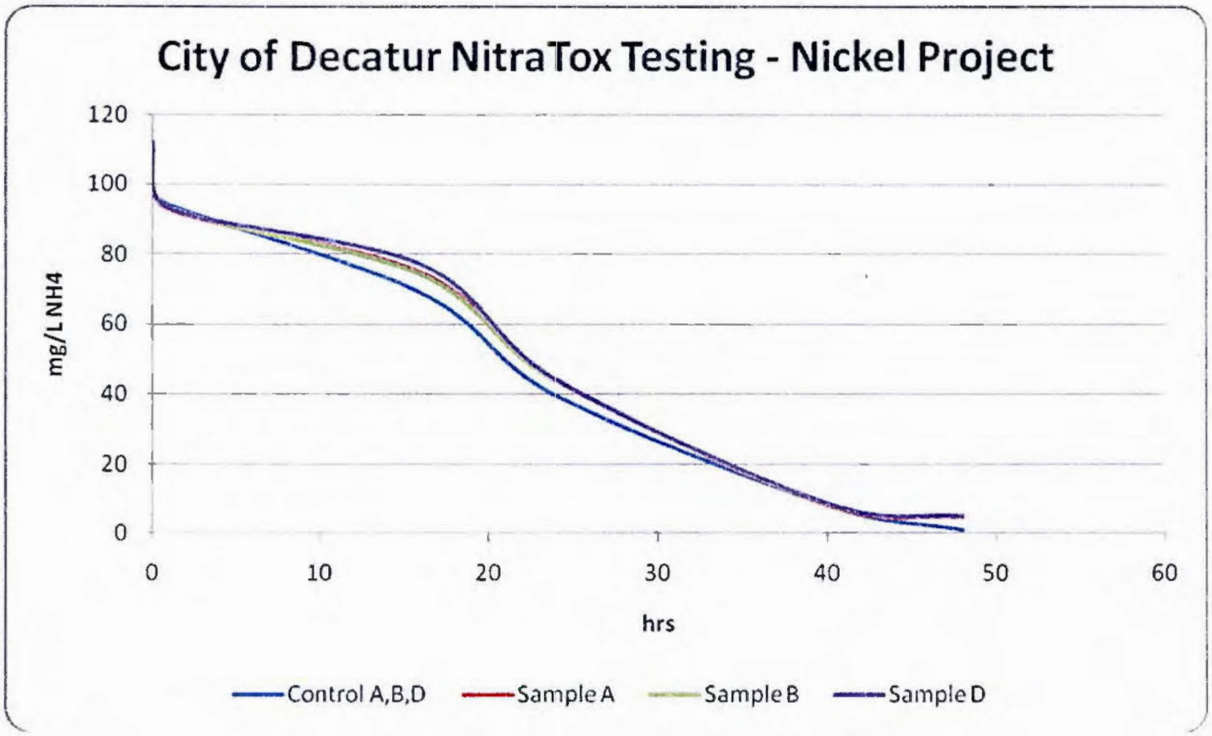
- **Control A,B,D**– 60% ADM untreated 'as is' effluent & 40% SDD influent
- **Sample A** - 60% Treated DAF #1 - K ~200ppm & 40% SDD influent
- **Sample B** - 60% Treated DAF #2 - HYD ~200ppm & 40% SDD influent
- **Sample D** - 60% Treated DAF #4 - N ~200ppm & 40% SDD influent
-
- **Control C** – 60% ADM untreated 6pH effluent & 40% SDD influent
- **Sample C** - 60% Treated DAF #3 - HYCH ~200ppm @ 6pH & 40% SDD influent

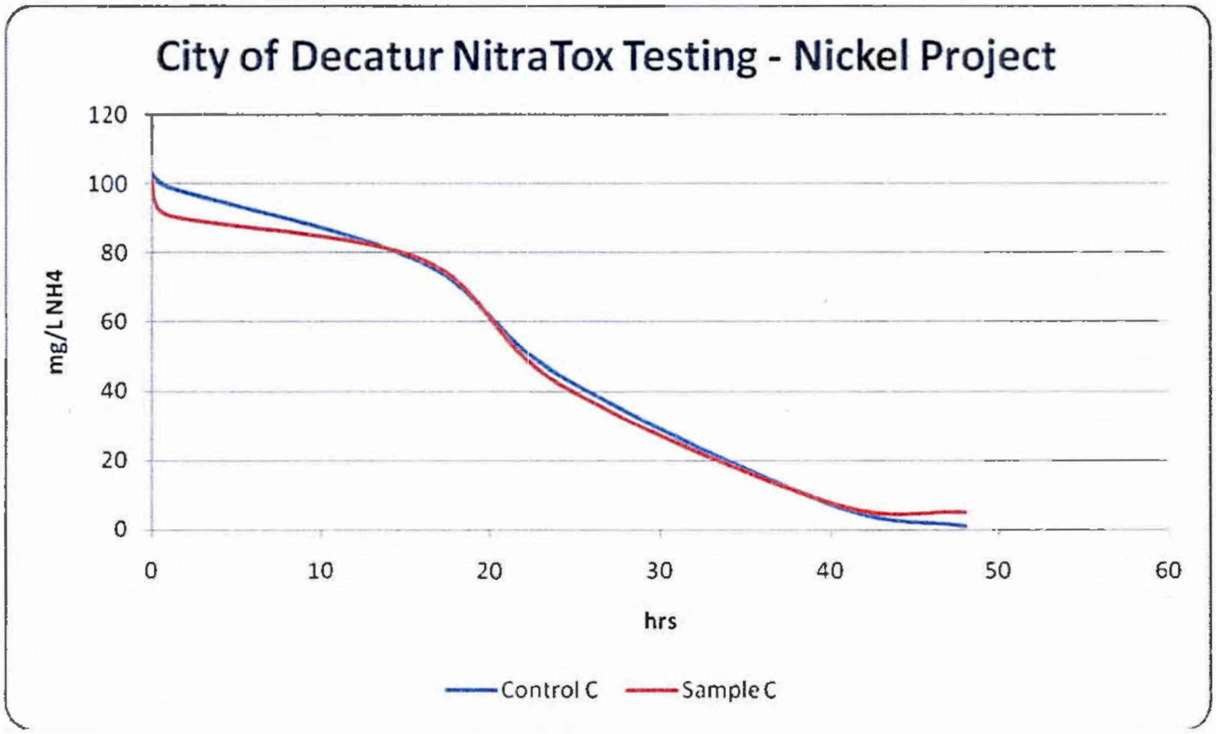
Results:

In general we did not see any toxicity to the nitrification bacteria. The majority of the ammonia was removed over the first 24 hours. All lines followed the control statistically. I do not see any significant deviations from the control, though all variables had a slight lag behind the control initially. Again, this slight lag was not statistically significant.

In the lower pH case we see similar results.

Overall: no toxicity to Nitrifiers in any case.




City of Decatur NitraTox Testing - Nickel Project
120
100
80
60
40
20
0
mg/L NH4
0
10
20
30
40
50
60
hrs
Control C
Sample C