Mock Antidegradation Alternatives Analysis

City of Anywhere, IA

May, 2010

SEAL	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa _______________________________________ John Doe Date License number 00000 My license renewal date is December 31, _________. Pages or sheets covered by this seal: _______________________________________ _______________________________________ _______________________________________

NOTE: This document is intended to provide an example of the general methodology to be used in developing an alternatives analysis for the purpose of compliance with Iowa's antidegradation rule and implementation procedure. The use of described treatment alternatives and associated costs are for illustrative purposes only. Actual alternatives evaluated and the selected alternative within an alternatives analysis will vary depending upon multiple factors unique to a given situation. The evaluation or selection of specific treatment alternatives within this document is NOT intended to:

- **Establish minimum requirements for the number of alternatives to be evaluated.**
- **Provide guidance for the type of alternatives to be evaluated.**
- **Provide guidance for the design or technical acceptability of any alternative.**
- **Provide guidance for meeting design standards and reliability requirements.**
- **Provide a basis for estimated pollutant removal efficiencies.**
- **Provide a basis for estimated costs.**
- **Endorse or express IDNR concurrence with or approval of any specific treatment process or plant configuration.**

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City of Anywhere, IA
Antidegradation Alternatives Analysis

May 14, 2010

Executive Summary

The City of Anywhere is in the process of planning improvements to its wastewater treatment system. Changes to the State of Iowa's water quality standards enacted in 2006 have resulted in anticipated NPDES effluent limits that the existing facility is not capable of meeting. In addition, the City anticipates significant growth over a 20-year planning period. This Alternatives Analysis identifies and evaluates different potential treatment improvements that are (a) capable of meeting the proposed effluent limits and (b) offer a range of treatment and disposal capabilities to evaluate non-degrading and less-degrading alternatives as mandated by Iowa's antidegradation policy and implementation procedure.

A total of seven alternatives were evaluated including the base pollution control alternative, 3 non-degrading alternatives and 3 less-degrading alternatives. The alternatives were evaluated based on their practicability, economic efficiency, affordability and degradation on a pollutant-by-pollutant basis. One of the non-degrading alternatives (recycle/reuse) was determined to be non-practicable. The two remaining non-degrading alternatives (land application and regional treatment) were found to be economically inefficient. Of the three less-degrading alternatives, Alternative No. 6 - Activated Sludge (Extended Aeration) was found to be the least degrading reasonable alternative (i.e. the preferred alternative).

Although the preferred alternative is considered less degrading and expected to improve overall water quality in the receiving stream network for a number of pollutants, degradation for some pollutants of concern will occur. Therefore, a description of the project social and economic importance is included at the end of the analysis.

Existing Conditions and Design Parameters

Tables 1 and 2 summarize existing and design wastewater influent flows and loadings for the City of Anywhere.

Table 1: Existing Flows and Loadings[1]

Flows (mgd)		Maximum Month Influent Loads (lbs/d)	
ADW	0.098	BOD_5	170
AWW_{180}	0.22	TSS	200
AWW_{30}	0.31	TKN	30
MWW	0.70		
PHWW	1.28		

1. Estimated existing (2010) population = 1,000

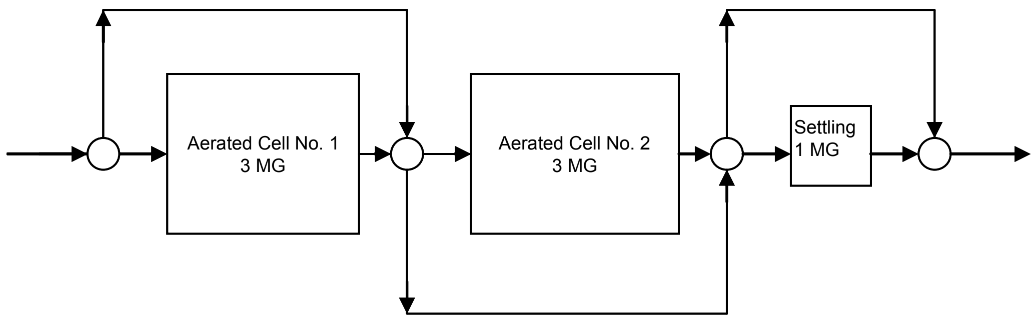
Table 2: Table 2: Design Flows and Loadings[1]

Flows (mgd)		Maximum Month Influent Loads (lbs/d)	
ADW	0.15	BOD_5	255
AWW_{180}	0.27	TSS	300
AWW_{30}	0.36	TKN	45
MWW	0.75		
PHWW	1.48		

1. Projected design year (2030) population = 1,500.

The City is currently in substantial compliance with its NPDES permit and there are no enforceable schedules for improvements at this time. The existing treatment facility consists of a 3-cell aerated lagoon system. The aerated cells (Cells 1 and 2) have a volume of 3 million gallons each. The quiescent cell volume is 1 million gallons. The original ADW and AWW_{30} design flows for the lagoon system are 0.10 mgd and 0.25 mgd, respectively. The design organic loading is 200 lbs/day BOD_5. No significant industrial contributors are present or anticipated.

Figure 1: Existing Aerated Lagoon System Schematic



Receiving Stream Network

The existing discharge receiving stream network consists of discharge to an unnamed creek tributary to the Wapsipinicon River to the Mississippi River.

The current receiving stream network designations, Use Attainability Analysis (UAA) and impairment status are summarized in Tables 3, 4 and 5:

Table 3: Current Stream Designations

Stream	Current Designation	Source
Unnamed Cr.	A1, B(WW-1)	567 IAC 61.3(1)b
Wapsipinicon R.	A1, B(WW-1), HH	2/17/10 Surface Water Classification Document
Mississippi R.	A1, B(WW-1), HH, C	2/17/10 Surface Water Classification Document

Table 4: UAA Status

Stream	UAA Type(s)	Fieldwork Complete?	Recommended Designation(s)	Status
Unnamed Cr.	Recreational and Aquatic	Yes	A2, B(WW-2)	Pending rulemaking and EPA approval

Table 5: Impairment Status[1]

Stream	Impairment(s)	TMDL Status	Notes
Unnamed Cr.	None	N/A	Not monitored
Wapsipinicon R.	Bacteria	Not scheduled	Multiple downstream segments impaired
	Biological	Not Scheduled	Multiple downstream segments impaired based on ISU mussel study. Multiple potential causes (flow/habitat alterations, nutrients and/or siltation).
Mississippi R.	Bacteria	Not scheduled	Multiple downstream segments impaired
	Arsenic	Not scheduled	Multiple downstream segments impaired
	Aluminum	Not scheduled	Multiple downstream segments impaired

1. Source: Final 2008 Impaired Waters List (submitted to EPA)

Effluent Limitations

Existing NPDES permit limits are shown in Table 6.

Table 6: Existing NPDES Permit Limits

Parameter	Season	Concentration (mg/L)			Mass (lbs/d)		
		7-d	30-d	Max. day	7-d	30-d	Max. day
CBOD5	Yearly	40.0	25.0[1]		83.0	52.0[1]	
TSS	Yearly	120.0	80.0		250.0	166.0	
Ammonia	Jan		-	-		-	-
	Feb		-	-		-	-
	Mar		-	-		-	-
	Apr		34.0	34.0		51.0	51.0
	May		20.0	20.0		42.0	42.0
	Jun		15.5	15.5		32.0	32.0
	Jul		13.3	13.3		28.0	28.0
	Aug		11.0	11.0		23.0	23.0
	Sep		13.2	13.2		28.0	28.0
	Oct		18.9	18.9		39.0	39.0
	Nov		25.0	25.0		51.0	51.0
	Dec		39.0	39.0		57.0	57.0
pH	Yearly	6.0		9.0			

1. Minimum 85% removal required (567 IAC 62.3(1))

Ammonia limitations in the existing permit were based on pre-2006 water quality standards utilizing the protected flow concept. Months with wasteload allocation (WLA)-calculated monthly ammonia averages greater than 40 mg/L were not included in the NPDES permit due to lack of reasonable potential of a municipal WWTP with no significant industrial contributors to violate this high a limit.

Secondary and wasteload allocation calculated WQBELs for discharge alternatives based on new Water Quality Standards, the current receiving stream network designations and design flows are shown in Tables 7 and 8.

Table 7: Activated Sludge and Aerated Lagoon Modifications Alternatives

Parameter	Season	Concentration (mg/L)			Mass (lbs/d)		
		7-d	30-d	Max. day	7-d	30-d	Max. day
$CBOD_5$	Yearly	40.0	25.0[1]		120.0	75.0[1]	
TSS	Yearly	45.0	30.0[1]		135.0	90.0[1]	
Ammonia	Jan		5.2	15.2		15.5	45.6
	Feb		5.8	14.2		17.4	42.6
	Mar		2.8	14.7		8.4	44.1
	Apr		2.1	15.7		6.3	47.1
	May		1.8	15.2		5.5	45.6
	Jun		1.3	14.4		4.0	43.4
	Jul		1.1	17.6		3.2	52.8
	Aug		1.0	16.2		3.0	48.7
	Sep		1.5	16.5		4.5	49.5
	Oct		2.8	15.7		8.4	47.1
	Nov		3.4	14.7		10.2	44.1
	Dec		4.0	16.0		11.9	47.9
TRC	When disinfecting		0.017	0.035		0.051	0.11
pH	Yearly	6.5		9.0			
E. Coli	3/15 – 11/15		126 #/100 mL geomean				
Chloride	Yearly		389	629		1,169	1,890
Sulfate	Yearly		1,514	1,514		4,549	4,549
Total D.O.	Yearly	Minimum Concentration (mg/L)					
		5.0					

1. Minimum 85% removal required (567 IAC 62.3(1))

Table 8: Controlled Discharge Lagoon Alternative

Parameter	Season	Concentration (mg/L)			Mass (lbs/d)		
		7-d	30-d	Max. day	7-d	30-d	Max. day
$CBOD_5$	Yearly	40.0	25.0[1]				
TSS	Yearly	120.0	80.0				
pH	Yearly	6.0		9.0			
Chloride	Yearly		389	629		8,752	14,161
Sulfate	Yearly		1,514	1,514		34,085	34,085
Maximum allowable discharge rate = 2.7 MGD							

1. Minimum 85% removal required (567 IAC 62.3(1))

POC Identification and Tier Protection Level

Table 9 identifies the pollutants of concern for the proposed treatment facility.

Table 9: Pollutants of Concern

POC	Secondary or WQBEL?	Beneficial Use Affected	Tier	Notes
Organic Matter ($CBOD_5$)	Yes	Aquatic life	2	See Table 10 for discharge alternative determinations of degradation.
Suspended Solids (TSS)	Yes	General uses	2	See Table 10 for discharge alternative determinations of degradation.
Ammonia-Nitrogen	Yes	Aquatic life	2	Compliance with WQBELs will not cause degradation.
Bacteria (E. coli)	Yes	Contact recreation	2	Unnamed Cr. (unmonitored) not currently listed as impaired. Tier 2 review level assumed.
TRC	Yes	Aquatic life	2	Applicable only if chlorine is used to disinfect. Chlorine disinfection is not proposed.
Chloride	Yes	Aquatic life	2	See Table 10 for discharge alternative determinations of degradation.
Sulfate	Yes	Aquatic life	2	See Table 10 for discharge alternative determinations of degradation.
Total Nitrogen	No	Human health (drinking water), aquatic life (indirect), general uses (nuisance aquatic life)	2	No WQS numeric criteria.
Phosphorus	No	Aquatic life (indirect), general uses (nuisance aquatic life)	2	No WQS numeric criteria.
Priority Pollutants	No	Human health, aquatic life	2	WQS numeric criteria, but no anticipated effluent limits based on reasonable potential.

Identification & Discussion of Alternatives

The existing aerated lagoon system consistently meets current NPDES permit limits. However, changes to the State's water quality standards enacted in 2006 which eliminated the protected flow concept and designated all perennial streams for aquatic life and recreational contact (unless determined otherwise by Use Attainability Analysis) have resulted in projected permit limits that the existing facility cannot meet at existing loadings. Historical effluent ammonia monitoring data for this and other facilities throughout the State indicate that the proposed ammonia limits would not be met with a conventional aerated lagoon. In addition, the existing facility would not be able to meet proposed bacteria limits without dedicated disinfection facilities. There is currently no effluent sampling data available for chloride, sulfate or priority pollutants enumerated in Table I of 567 IAC 61.

<u>Alt. No. 1: Recycle/Reuse</u>

To be considered a Non Degrading Alternative (NDA), this option must include recycle or reuse of the entire proposed increase in treated wastewater volume. This alternative was determined to be not practicable due to the following factors:

- Seasonal constraints and lack of consumptive demand for agricultural irrigation, landscape irrigation, recreational area irrigation or industrial water use applications.
- Aquifer augmentation through well disposal is prohibited by 567 IAC 62.9.

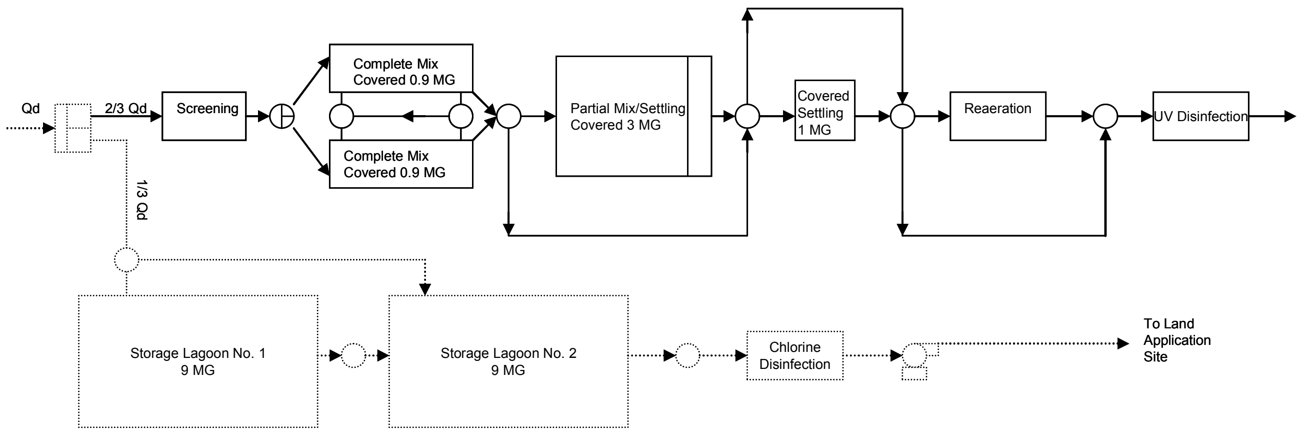
<u>Alt. No. 2: Land Application</u>

Land application of the proposed increase in design loading in addition to any treatment modifications necessary to meet the new WQBELs was evaluated and determined to be economically inefficient. For estimating purposes, the costs associated with land application were added to Alternative No. 4, the Base Pollution Control Alternative (BPCA).

The Iowa Wastewater Facilities Design Standards Chapter 21 governs design requirements for land application of wastewater. The minimum storage required for land application is 200 days based on climatic restraints per Figure 3 of Chapter 21. The additional volume of storage required to allow land application of the proposed increase in design loading was calculated by proportioning the future design load such that any increases in wastewater loading above the existing design loading would be land applied. Since loadings are projected to increase by 150% over a 20-year design period, 1/3 of the design wastewater flows would be diverted for dedicated land application. The storage requirement associated with storage of 1/3 of the design flows for 200 days was calculated as 18 million gallons using the design AWW_{180} as a conservative estimate of the maximum 200-day wet weather flow. The associated land area required for two 9 million gallon storage lagoons would be approximately 10 acres. The land application area required for slow rate application assuming a maximum percolation of 10 inches per month would be approximately 22 acres neglecting any buffer area.

Assuming that the land application site could be located adjacent to the treatment and storage site (no transmission costs) the addition of a slow rate land application system to land apply this proportion of the flow would add approximately $2.6 million dollars (present worth) to the BPCA project cost, including storage lagoons, a pumping station, chlorine disinfection prior to land application, land purchase, sprinkling system and associated operation and maintenance costs. This cost differential includes design of the BPCA for existing flows and loadings rather than projected flows and loadings for the 20-year design life.

Figure 2: Land Application Schematic



Alt. No. 3: Regional Treatment

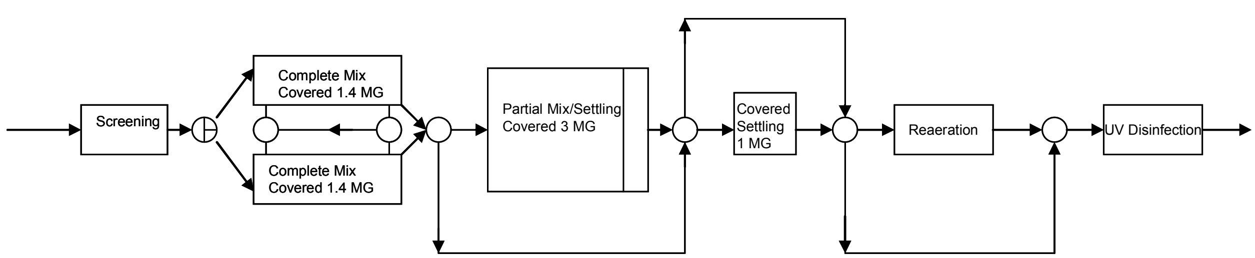
Regional treatment is only considered an NDA in this analysis if the authority receiving the wastewater has adequate surplus treatment capacity available to receive the additional wastewater while remaining within its current permitted design capacities for both flow and loading. That is, the activity occurs within the design capacity of the receiving treatment plant and a separate antidegradation review is not required.

The City of Somewhere's treatment plant is the nearest facility that would be capable of accepting Anywhere's wastewater. This alternative was evaluated and determined to be economically inefficient. Capital and operation costs for a pumping station, equalization basin and force main to pump the community's entire wastewater flow were determined in addition to the present worth value for charges for treatment by Somewhere for a 20-year design period. To implement this alternative, the wastewater from Anywhere would have to be pumped approximately 10 miles. The higher cost of this alternative is primarily due to the lengthy force main and associated pumping costs that would be required.

Alt. No. 4: Lagoon Modifications

This alternative would consist of modifications to the existing lagoon system to accommodate planned growth and enable compliance with secondary and water quality based effluent limits. Specific improvements would include the addition of preliminary screening, conversion of the existing partial mix aerated lagoons into covered complete mix/partial mix/settling lagoons followed by the existing settling cell and reaeration. UV disinfection would also be included to enable the plant to meet bacteria limits.

Figure 3: Lagoon Modifications Schematic



Alt. No. 5: Controlled Discharge Lagoon

This alternative would consist of construction of a new 3-cell controlled discharge lagoon facility at the existing treatment site. The lagoon system would incorporate sufficient storage for the 180-day average wet weather flow and discharge treated effluent twice per year, once in the spring and once in the fall. Removal efficiencies for secondary treatment parameters ($CBOD_5$ and TSS) are expected to be similar to those of the existing aerated lagoon. However, the controlled discharge lagoon alternative is considered an LDA because:

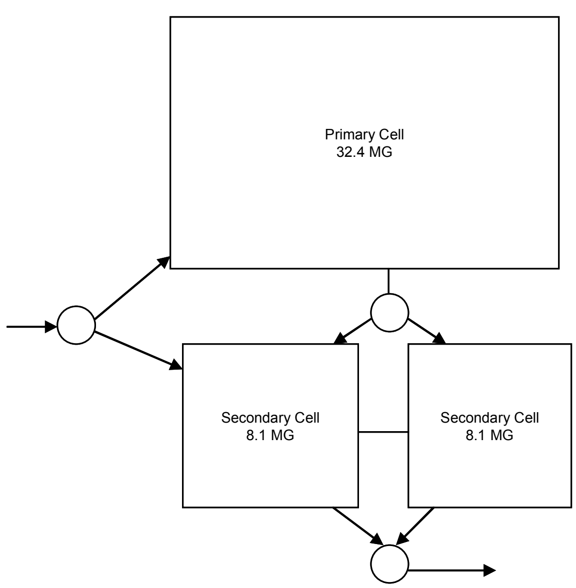
(a) Discharges would coincide with seasonal high streamflow periods (spring and fall) and avoid critical low flow periods when point source discharges have the greatest impact on water quality.

(b) Nutrient reductions are expected to be greater than for the aerated lagoon modifications. Although limited information is available regarding the nutrient removal performance of controlled discharge lagoons within Iowa, available literature indicates that up to 80% total nitrogen and 50% phosphorus removal can be achieved in controlled discharge lagoon systems (EPA 832-F-02-014).

However, with respect to TSS this alternative is considered more degrading than either Alternative No. 4 or Alternative No. 6. The controlled discharge lagoon alternative would necessitate a larger mass loading of TSS to the receiving stream than the other alternatives due to the algal growth typical of open wastewater lagoon systems.

The controlled discharge lagoon alternative would provide for the lowest annual operating energy expenditure and operation & maintenance costs of the reasonable treatment alternatives. However, a large lagoon volume and associated land area would be required. For the design flow, approximately 49 million gallons of storage capacity would be required. The lagoon water surface area would be 34.5 acres and the total treatment site area required would be in excess of 40 acres. Also, a potentially large area would be required for further future expansion, if the City eventually grows beyond the 20-year projected population estimate and a controlled discharge treatment method is to be retained.

Figure 4: Controlled Discharge Lagoon Schematic



Alt. No. 6: Activated Sludge (Extended Aeration)

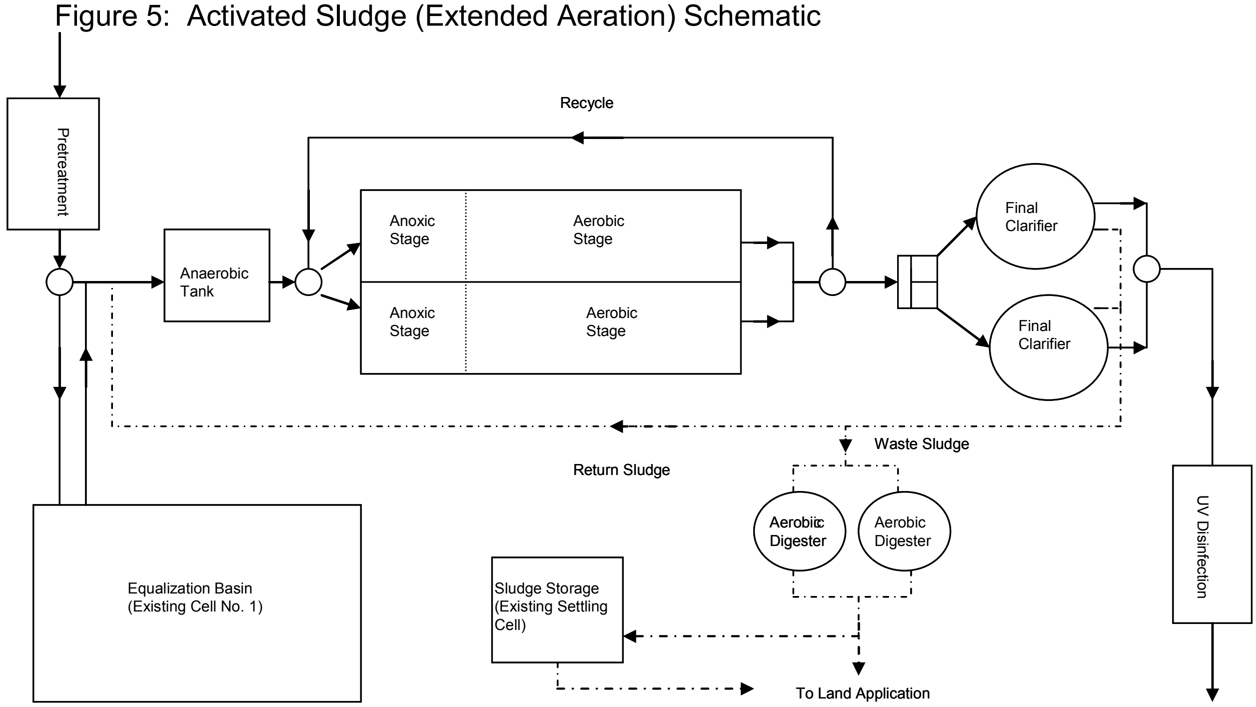
This alternative consists of a mechanical extended aeration activated sludge facility constructed at the existing lagoon site. Two of the existing lagoon cells would be converted to provide flow equalization and sludge storage, respectively. New headworks facilities, activated sludge aeration basins, final clarifiers and aerobic sludge digesters would be provided. UV disinfection facilities would be utilized to meet seasonal bacteria limits. This alternative is considered the least degrading of the alternatives found to be reasonable due to the following factors:

(a) Effluent mass loads from this process for $CBOD_5$, TSS, and ammonia are expected to be lower than for the other reasonable treatment process alternatives.

(b) The extended air activated sludge process would incorporate provisions for biological nutrient removal in the design.

Alternative No. 6 is energy intensive and requires a greater amount of operator expertise/attention than the lagoon alternatives. It also has the highest capital and present worth costs of the reasonable alternatives. The City has indicated that it would be able to provide qualified staffing for this alternative, which is a key consideration in determining whether or not the alternative is practicable.

Figure 5: Activated Sludge (Extended Aeration) Schematic



Alt. No. 7: Activated Sludge (Membrane Bioreactor)

This alternative would combine an activated sludge process and membrane filtration system in lieu of secondary clarifiers. UV disinfection facilities would be included to assure compliance with bacteria limits. This type of treatment produces excellent effluent quality and would be expected to be non-degrading for all monitored effluent parameters except for chloride and sulfate, which are too small to be captured by the membrane filtration system. However, this alternative is significantly more expensive in terms of capital and operational costs than all other practicable alternatives evaluated.

Figure 6: Activated Sludge (Membrane Bioreactor) Schematic

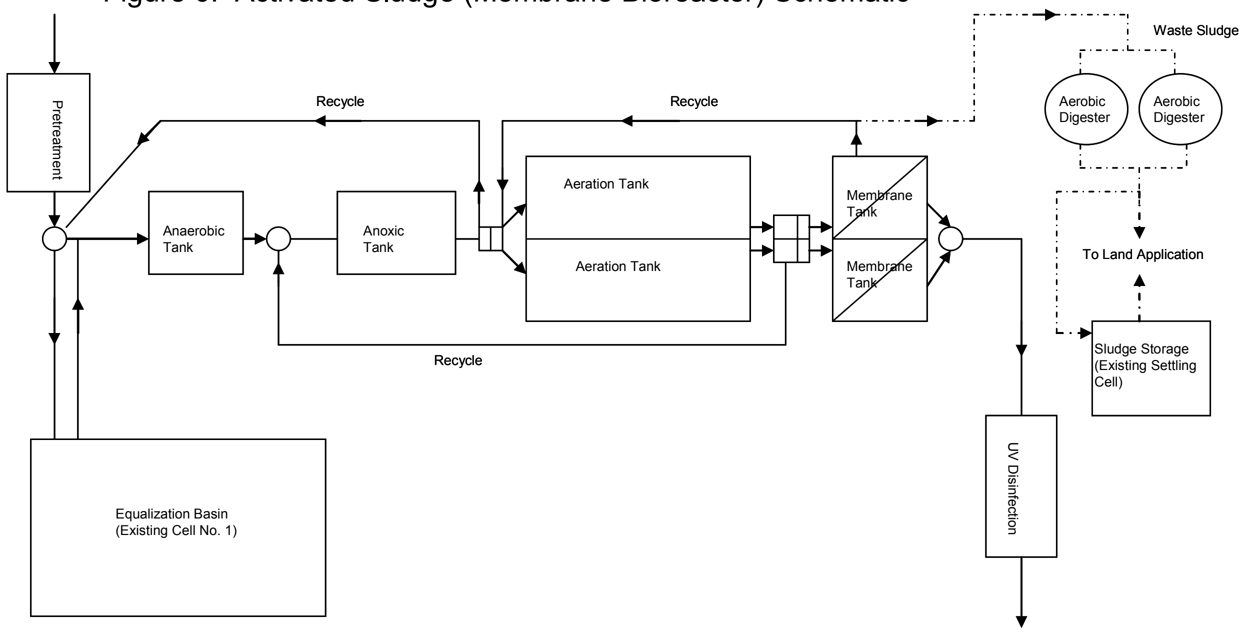


Table 10 summarizes the alternatives identified for wastewater treatment. Table 11 summarizes the evaluation of alternatives with respect to classification as non-degrading, less-degrading or the base pollution control alternative as well as the practicability, economic efficiency and affordability of each alternative.

Table 10: Alternatives and Present Worth Costs

Alt. No.	Description	Present Worth Cost[1]
1.	Recycle/reuse	N/A
2.	Land Application	$5,734,000
3.	Regional Treatment	$4,345,000
4.	Aerated Lagoon Modifications	$3,116,000
5.	Controlled Discharge Lagoon System	$3,325,000
6.	Activated Sludge (Extended Aeration)	$3,483,000
7.	Activated Sludge (Membrane Bioreactor)	$6,266,000

1. The costs presented in this mock analysis are for illustrative purposes only. Actual costs for alternatives may vary. Present worth values are calculated using a discount rate of 4.375% (18 CFR 704.39 discount rate for 2010) and a 20-year design period. Sludge removal and disposal costs for all alternatives that will generate onsite biosolids (including lagoon systems) must be included.

Table 11: Alternative Classification and Evaluation

Alt. No.	BPCA, NDA or LDA?	Is the Alternative Reasonable?					
		Practicable?	Economically Efficient?	% of BPCA	Affordable?[2]	% of MHI[3]	Reasonable?
1.	NDA	No	N/A	N/A	N/A	N/A	No
2.	NDA	Yes	No	184	N/A	2.27	No
3.	NDA	Yes	No	139	N/A	1.82	No
4.	BPCA	Yes	Yes	100	Yes	1.41	Yes
5.	LDA[1]	Yes	Yes	107	Yes	1.47	Yes
6.	LDA[1]	Yes	Yes	112	Yes	1.54	Yes
7.	LDA	Yes	No	201	N/A	2.47	No

1. Overall expected effluent quality is similar for the lagoon modifications, controlled discharge lagoon and activated sludge alternatives. However, the proposed activated sludge alternative would offer more flexibility in terms of biological nutrient removal. The controlled discharge lagoon alternative is anticipated to achieve greater nutrient removal than the BPCA and allows flexibility in avoiding discharges during critical water quality periods (i.e., periods of low streamflow).
2. Based on financial capability indicators described in EPA's 1995 Interim Economic Guidance for Water Quality Standards Workbook and 1997 CSO Guidance for Financial Capability Assessment and Schedule Development document, all of the alternatives deemed reasonable are characterized as "medium burden" based on primary and secondary tests. For purposes of this Alternatives Analysis, no attempt has been made to thoroughly evaluate far-reaching and serious socioeconomic impacts and all of the practicable and economically efficient alternatives have been deemed affordable based on the primary and secondary tests alone. According to the scheduling boundaries established in the EPA CSO financial capability document, an implementation period of up to 10 years for the proposed improvements may be appropriate. However, due to the City's historic and projected growth rate, it is anticipated that a shorter schedule will be necessary to keep pace with development. Any additional time requested beyond that required for adequate planning, design and construction would be utilized to attempt to secure additional funding to alleviate the financial burden on residents resulting from the project.
3. % of MHI = Total annual cost of current and proposed treatment/MHI assuming a grant funding level of $400K and financing the remainder of the project with a 20-year SRF loan at an effective annual interest rate of 3.25%.

Preferred Alternative

Alternative No. 6, Activated Sludge (Extended Aeration), is the preferred reasonable treatment alternative based on anticipated treatment performance. Table 12 summarizes evaluation of the reasonable alternatives on a pollutant-by-pollutant basis.

Table 12: Reasonable Alternatives Degradation Comparison

Pollutant of Concern	Potential Degradation?			Comments
	Alt. No.			
	4	5	6	
$CBOD_5$	Yes	Yes	Yes	Anticipated removal efficiencies are expected to increase significantly for Alternatives 4 and 6 compared to existing, however, because of the 50% increase in influent design loading it is not certain that mass loading to the stream at the future design loading will be less than the existing mass loading.
TSS	No	Yes	No	TSS degradation for the covered lagoon process and activated sludge system are precluded by the proposed NPDES permit limits. Net TSS loading to the stream is expected to increase for the controlled discharge lagoon system.
Ammonia-Nitrogen	No[1]	No	No[1]	Anticipated effluent ammonia concentrations and mass are less than the existing NPDES permit for each alternative.
E. coli	No	No	No	The existing facility does not disinfect. The addition of UV disinfection for both the covered lagoon and activated sludge alternatives will decrease bacteria discharged to the receiving stream. The controlled discharge lagoon alternative is also expected to reduce bacteria discharged to the receiving stream.
Chloride	Yes	Yes	Yes	Neither the existing treatment system nor the alternative treatment systems are designed to remove chloride or sulfate. The mass of these pollutants discharged to the stream will increase in the absence of other mechanisms of control. See discussion of chloride, sulfate & priority pollutants in the Justification of Degradation section.
Sulfate	Yes	Yes	Yes	See above.
Total Nitrogen	Yes[2]	Yes[2]	No	The proposed activated sludge alternative incorporates biological nutrient removal capability.
Phosphorus	Yes[2]	Yes[2]	No	See above.
Priority Pollutants[3]	Yes	Yes	Yes	See note below.

1. WLA-based maximum day concentrations and mass loadings for a number of months exceed existing permit limit values. However, each of the treatment technologies evaluated are capable of meeting the existing permit mass limits.
2. Monitoring data sufficient to adequately characterize the existing treatment system's and proposed alternatives' nutrient removal capabilities within Iowa is not available. Neither of the alternative lagoon systems is designed for nutrient removal, although significant removal may occur. In general, it is expected that the controlled discharge lagoon nutrient removal performance would be substantially greater than that of the existing aerated lagoon treatment system and the lagoon modifications alternative. However, for the purposes of this analysis only the activated sludge alternative is specifically designed to incorporate nutrient removal capabilities. Therefore, degradation from both of the lagoon alternatives for both nitrogen and phosphorus is assumed.
3. 567 IAC 61 lists a total of 88 priority pollutants, some of which may reasonably be expected to be present in a treated municipal effluent absent significant industrial contributors. For example, lead and copper may be present in the treated effluent (and the drinking water supply) due to plumbing corrosion. To date the existing treatment facility has not been required to test for any priority pollutants due to lack of significant contributing industries that discharge any of the constituents to the sanitary sewer system and associated lack of reasonable potential to violate water quality standards criteria for these constituents. The concentrations of priority pollutants are not expected to increase as the result of additional wastewater flows and loadings. However, in as much as these constituents may be present in the effluent and the proposed treatment system is not designed to remove them, the total mass discharged to the receiving stream may increase.

Justification of Degradation

The preferred treatment alternative will result attainment of all secondary and WQBELs, and will also result in improved water quality with respect to a number of pollutants. Despite a projected 50% increase in the contributing population, the proposed treatment facility will reduce stream pollutant loadings for TSS, ammonia, E. coli and nutrients. BOD treatment removal efficiency will increase and effluent BOD concentrations will decrease. However, the total effluent mass of BOD to the receiving stream may increase at design capacity.

In addition, the mass of micro constituents (i.e. priority pollutants) as well as chloride and sulfate are expected to increase in proportion to City growth. It should be noted that at this time the levels of these pollutants in the existing plant influent and effluent are unknown, or based on limited monitoring or absence of industrial contributors, have been deemed to meet applicable water quality standards. It should also be noted that treatment to remove these pollutants is, as a general rule, not feasible where they are part of a combined municipal wastewater stream. Such pollutants are best addressed through source reduction efforts. For example, reduction in chloride concentrations may be achieved by minimizing the volume of ion exchange water softener regeneration waste discharged to the municipal sewer system. However, selective treatment for removal of chloride at the sewage treatment plant would require the use of an advanced membrane filtration process which in turn would generate a highly concentrated waste stream that is difficult to dispose of. The capital and operating costs of such a system would be prohibitively expensive.

As described above, it has been determined that degradation for some POCs will result from the projected growth of the community and implementation of the preferred treatment alternative. Since Iowa's Antidegradation Implementation Procedures apply to net mass pollutant increases irrespective of effluent or receiving stream pollutant concentrations, and because they do not exempt POCs that are not feasible to remove absent source reduction efforts, the Social and Economic Importance (SEI) of the project must be demonstrated.

Project Social and Economic Importance

1. Identify the affected community:

   The affected community is the City of Anywhere. The project is a municipally owned public treatment works. The entire population of the community will benefit from (and bear the costs of) the project.

2. Identify relevant factors that characterize the social and economic conditions of the affected community:

   Table 13 lists relevant economic statistics for the City.

   Community services currently include electricity provided by Alliant Energy, water and sewer provided by the City, natural gas provided by Peoples Natural Gas and telecommunications services through Partner Communications Cooperative. The City has one elementary and one high school with a total enrollment of 450. Cultural and recreational facilities include a local theatre and historical society, a number of public parks, tennis courts and other recreational facilities within or surrounding the community.

   There are no known potential public health, safety or environmental problems.

Table 13: Anywhere, IA SEI Factors

Factor	Status	Notes	Source	State Average
Rate of Employment	61.2%	Population 16 years and over in civilian labor force	2000 Census	65.3%
Rate of Unemployment	4.4%	Population 16 years and over in civilian labor force	2000 Census	4.2%
Median Household Income	$36,912	1999 Income	2000 Census	$39,469
Poverty Level	6.3%	Families below poverty level in 1999	2000 Census	6.0%
Population Trends	+17.6%	Increase from 1990 to 2000	2000 Census	+5.4%
Housing Starts	12%	1995 - March 2000	2000 Census	7.3%
Sewer Revenue	$104,400	Current annual sewer revenue based on average monthly bill of $20/household/month and 435 households	City	Unknown

3. Describe the important social and economic development associated with the project:

   The proposed project is necessary to meet anticipated effluent permit limits and maintain adequate sewage treatment for the City. Due to rapid historical and projected residential growth as well as more stringent effluent limits, the community requires both expansion of treatment capacity and improvement of treatment efficiency.

   The project is not expected to directly affect community employment rates, income levels, population trends or housing starts. However, it will have indirect impacts on some of these factors. A very modest increase in employment will be realized as the result of anticipated City staffing increases to manage the new treatment facilities. The existing and proposed infrastructure is funded through municipal sewer revenues and will have a number of economic and non-economic impacts including:

   (a) Sewer utility bills will need to be increased by approximately $41/household/month. Although total wastewater conveyance and treatment costs as a percentage of MHI will be below what EPA considers a “high burden” the significant increase in utility bills will require a greater portion of household income to be directed toward wastewater services. It is possible that the project may result in slower community growth rates if future potential residents deem the rates unaffordable and locate elsewhere to avoid this cost.

   (b) By selection of an economically efficient and affordable treatment alternative, the project will minimize the financial impact to affected residents.

   (c) By increasing the treatment capacity and degree of treatment provided, the project will benefit the receiving stream as well as the aquatic and recreational beneficial uses associated with it.

   (d) By increasing the treatment capacity, the project will allow for continued growth of the community.