# Section 3 — Point Source Nutrient Reduction Technology Assessment and Implementation Plan

## Section 3.1 Technology Assessment and Implementation Plan

### Establishing Effluent Limits

The following describes the applicable federal and state laws and regulations pertaining to the establishment of effluent limits in NPDES permits. There are two bases for establishing effluent limits: technology and water quality. Technology-based limits establish the floor or minimum level of treatment a facility must provide. More stringent water quality-based limits must be imposed in permits when the technology-based limits will not assure compliance with state water quality standards.

### Technology-Based Limits for POTWs

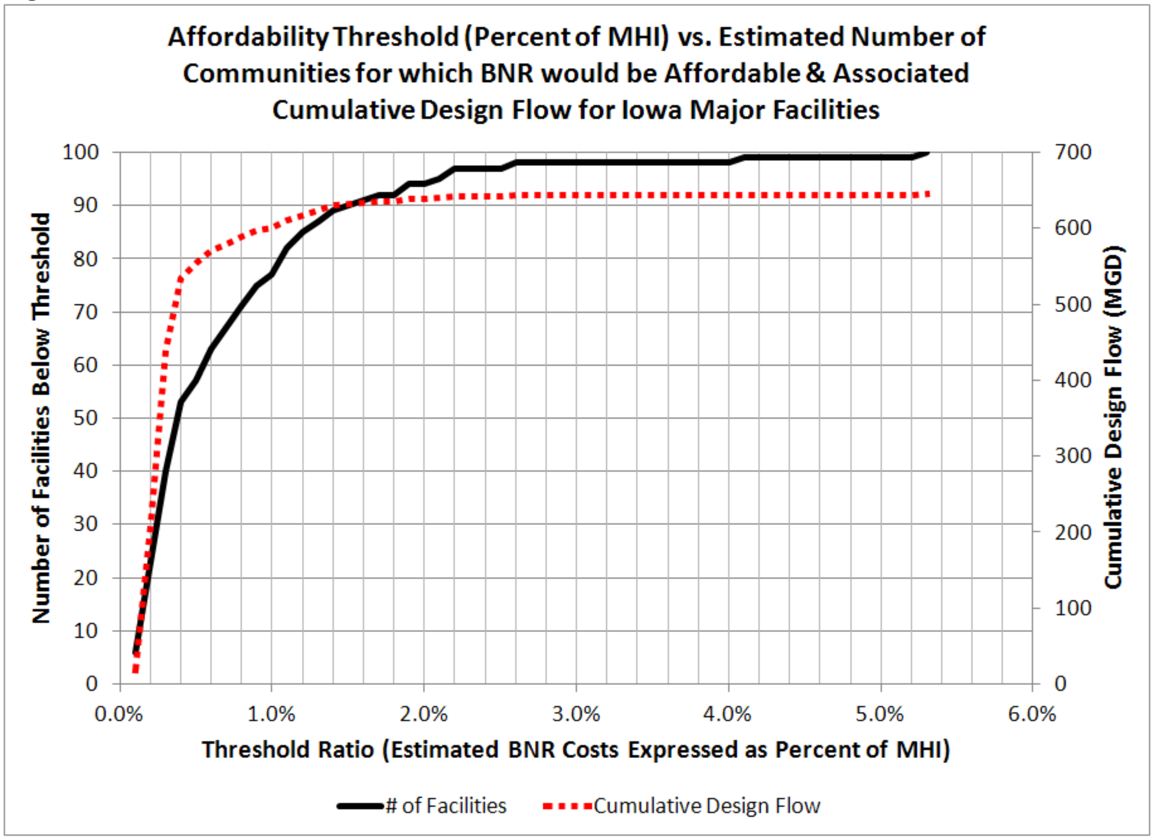
Technology-based limits for POTWs have been established by EPA in 40 §CFR 133 under authority of Section 304(d) of the Clean Water Act and represent the degree of reduction attainable through the application of secondary wastewater treatment technology. Technology-based effluent limits for a pollutant not covered by federal effluent standards may be imposed on a case-by-case basis (IAC 567-62.8(5)). Such limitation must be based on the effect of the pollutant in water and the feasibility and reasonableness of treating such pollutant.

Although continuously evolving, many nutrient removal technologies in wastewater treatment are already proven and well-established. Thus, nutrient removal for Iowa's wastewater treatment facilities is technologically feasible. The primary mechanism IDNR will use in assessing the "reasonableness" of nutrient removal for individual facilities is the estimated costs for improvements and the ability of end users to afford those costs.

Affordability of wastewater treatment improvements is dependent upon a number of factors including capital costs, existing and projected debt service, and operation and maintenance costs. Without detailed financial information from a facility it is not possible to determine affordability. Screening criteria are available to indicate the likelihood that a project will be affordable with minimal information. EPA economic guidance (U.S. EPA 1995) and proposed rules to implement the new disadvantaged communities' law (455B.199B) suggest that if the ratio of projected total wastewater costs to a community's Median Household Income (MHI) is less than one percent, then a project is affordable barring very weak community economic indicators. If the ratio is greater than two percent then a project is not affordable unless economic indicators are strong. Projects resulting in a ratio between one and two percent may or may not be considered affordable dependent upon the strength of secondary economic indicators such as comparison of county MHI to statewide MHI, bond rating, etc.

Nutrient reduction costs are generally affordable for most of Iowa's major municipal facilities based on the ratio of estimated project cost to Median Household Income (MHI). These same facilities also have the largest design flows and, in general, the greatest point source nutrient contribution. If the communities served by major municipal facilities can afford a project cost/MHI ratio of 0.5%, the design flow treated by those facilities for which nutrient reduction is affordable is over 550 MGD, or roughly 86% of the total design flow for all major municipal facilities. This relationship is shown in Figure 3-1 below.

Figure 3-1:




## Three Tiers of Nutrient Removal

The three most commonly cited "tiers" of nutrient removal are Biological Nutrient Removal (BNR), Enhanced Nutrient Removal (ENR) and the Limit of Technology (LOT).

Biological Nutrient Removal is commonly associated with sequenced combinations of aerobic, anoxic and anaerobic processes which facilitate biological denitrification via conversion of nitrate to nitrogen gas and "luxury" uptake of phosphorus by biomass with subsequent removal through wasting of sludge (biomass). Effluent limits achievable using BNR at wastewater treatment facilities that treat primarily domestic wastewater are 10 mg/L of total nitrogen (TN) and 1.0 mg/L of total phosphorus (TP).

Enhanced Nutrient Removal typically uses BNR with chemical precipitation and granular media filtration to achieve lower effluent nitrogen and phosphorus concentrations than can be achieved through BNR alone. ENR systems are capable of producing effluent with nitrogen and phosphorus values of about 6 mg/L of total nitrogen and 0.2 mg/L of total phosphorus (Falk et al. 2011).

The term "Limit of Technology" (LOT) is generally associated with the lowest effluent concentrations that can be achieved using any treatment technology or suite of technologies. It is commonly referenced as an upper bound in nutrient removal performance. However, there is no consensus or regulatory definition establishing specific treatment requirements for the LOT. As such, effluent values associated with the LOT are debatable. Some have proposed statistical approaches that define the LOT as the minimum effluent concentrations that can be expected to be reliably met over a specific averaging period using widely available and proven treatment processes (Neethling et al. 2009, Bott et al. 2009). Commonly referenced thresholds for the LOT for BNR are 3 mg/L for total nitrogen and 0.1 mg/L for total phosphorus (U.S. EPA 2007, Jeyanayagam 2005). Lower effluent values are possible using tertiary chemical addition & filtration, advanced effluent membrane filtration, ion exchange and/or adsorption processes but may not be practical.

## Technology Based Limits for Industries

Technology-based limits for industrial discharges are established by federal effluent guidelines adopted in 40 CFR subchapter N, under the authority of CWA Sections 304 and 306, and are adopted in the state of Iowa by reference in IAC 567-62.4. Where EPA has not promulgated a federal standard for a particular industrial category, technology-based limits must be developed on a case-by-case basis at the time of permit issuance (CWA section 402(a)(1)(B) and IAC 567-62.6(3)(a)). In developing case-by-case technology-based limits for industries, the limits must conform to 40 CFR Part 125 Subpart A – Criteria and Standards for Imposing Technology-Based Treatment Requirements.

EPA has promulgated federal effluent guidelines for 57 classes of industries but, with few exceptions, such effluent standards do not establish technology-based requirements for total nitrogen or total phosphorus. Where there are promulgated federal guidelines for TN or TP, the NPDES permit will contain effluent limits consistent with those guidelines.

Data on the amounts of nitrogen and phosphorus discharged by industries is not readily available but likely varies significantly based on the type of industry. For example, process wastewater discharged by a meat processing facility will likely contain significantly higher nutrient concentrations than the discharge from a steam electric power plant. Most industries do not operate biological wastewater treatment plants because the nature of their wastewater makes biological treatment infeasible so requiring all industries to install BNR is not reasonable. All major industries and minor industries with existing biological treatment systems will be required to collect data on the source, concentration and mass of total nitrogen and total phosphorus in their effluent and to evaluate alternatives for reducing the amounts of both pollutants in their discharge. IDNR will use the results of these evaluations to establish case-by-case technology-based effluent limits in NPDES permits except in cases where the industry is subject to a federal effluent standard for total nitrogen or total phosphorus. The nitrogen and phosphorus effluent limits for industries and for POTWs with significant industrial loads will be determined consistent with 40 CFR Part 125 Subpart A and IAC 567-62.8(5).

## Water Quality-Based Limits

The second basis for establishing NPDES permit limits is through state water quality standards; this is the "water quality-based" process. NPDES permits must contain requirements as needed for discharges to meet water quality standards (IAC 567-62.8(2)). Where implementation of technology-based limits for a wastewater treatment plant (WWTP) will not assure compliance with the water quality standards, permits must specify more stringent water quality-based effluent limits. While Iowa has not yet adopted numeric standards for total nitrogen or total phosphorus from which water quality-based effluent limits can be derived, permits must still contain necessary requirements to assure compliance with (1) narrative "free-from" water quality criteria in the Iowa Water Quality Standards that are applicable to all surface waters at all places and at all times (IAC 567-61.3(2)) and with (2) Iowa's antidegradation policy (IAC 567-61.2(2)).

When a facility proposes to discharge a new or increased amount of any pollutant, an antidegradation "alternatives analysis" must be performed. The alternatives analysis must consider non-degrading and less degrading alternatives to the increased discharge, and the facility must implement the least-degrading alternative that is practicable, affordable and cost efficient. Iowa's antidegradation policy applies on a pollutant-by-pollutant basis, meaning that the alternatives analysis must consider each pollutant that will be discharged in an increased amount. These pollutants would include any new or increased discharge of total nitrogen or total phosphorus.

### Total Maximum Daily Loads

A total maximum daily load (TMDL) is a calculation that determines the maximum amount of a pollutant that can enter a stream or lake from different sources and still allow the stream or lake to meet the Iowa water quality standards. The IDNR is required by the CWA to determine the TMDL for all waters identified on the state's CWA Section 303(d) impaired waters list. These TMDL calculations must be reviewed and approved by EPA. One part of the TMDL calculation is the point source wasteload allocation (WLA), which may be used to calculate water quality-based effluent limitations to include in an NPDES permit. When determining the appropriate point source WLA to be used in the TMDL calculation, the IDNR will consider this point source nutrient strategy as the basis for setting the WLA for point sources. The IDNR will not impose effluent limitations in NPDES permits that require load reductions beyond the reductions achieved by implementation of this strategy unless it is determined necessary to allow the stream or lake to meet Iowa water quality standards.

### Monitoring in NPDES Permits

The Iowa Administrative Code (567 IAC 63.3(1), Table II) specifies the minimum monitoring requirements that must be included in NPDES permits issued to POTWs and industries with continuous discharge wastewater treatment plants that treat organic waste. These requirements include final effluent monitoring for total nitrogen and total phosphorus using 24-hr composite samples with the sampling frequency determined by the size (design Population Equivalent - PE) of the treatment works. The sampling frequency is once every 3 months for plants with a design PE of 3,001 to 15,000 and once every 2 months for larger plants. Permits issued since 2009 to POTW's and to industries with biological treatment plants have specified these minimum requirements. At present there are seven NPDES permits (6 for POTWs, 1 for an industrial WWTP) issued to major wastewater treatment facilities in Iowa that require either total nitrogen or total phosphorus monitoring or both. The IDNR will continue to specify total nitrogen and total phosphorus monitoring in permits issued to continuous dischargers with biological treatment including both POTWs and industries. Facilities are strongly encouraged to begin monitoring programs for TP and TN prior to NPDES permit reissuance to better assess current nutrient loading and removal capabilities that are possible with their existing treatment systems.

The minimum monitoring frequencies for total nitrogen and total phosphorus for industries that do not discharge an organic waste will be determined using the rule-referenced *Supporting Document For Permit Monitoring Frequency Determination*, August 2008 but will not be less frequent than once per quarter.

IDNR will identify the appropriate total nitrogen and total phosphorus lab testing methods for wastewater and ambient stream water quality to ensure consistent data and allow for accurate accounting of removal of nutrients from wastewater treatment plants. These lab methods may be specified in NPDES permits with total nitrogen and total phosphorus testing requirements.

### Construction Schedules

Permits can contain construction schedules for installing or modifying facilities to remove nutrients. Two possibilities exist for specifying technology-based limits and schedules, permittees will be given the opportunity to select which option they prefer: (1) the NPDES permit will include a schedule for installing or modifying facilities to reduce nutrients. Following construction completion and an optimization and performance evaluation period, final limits will be added to the NPDES permit or, (2) final limits will be included in the NPDES permit and a consent administrative order will be issued concurrently that would establish the schedule for installing or modifying facilities to remove nutrients to comply with permit limits.

### Implementation Plan

All major wastewater treatment facilities and minor industrial facilities that already treat process wastewater using biological treatment will be required to evaluate the economic and technical feasibility for installing BNR. It is expected that most major municipal wastewater treatment facilities (>1 MGD AWW

Flow) can economically meet technology-based TN limits of 10 mg/L and TP limits of 1 mg/L on an annual average basis with BNR technology. Technology-based nutrient limits for industrial facilities and municipal facilities that have significant industrial loads will be developed on a case-by-case basis due to the differing amounts of nutrients present in these wastewaters. Nutrient reduction will be required for major industries where it is found by IDNR to be feasible, reasonable and cost effective using the procedures specified in 40 CFR Part 125 Subpart A.

Permit limits for TN and TP will be expressed as an **annual average**. Since biological treatment processes are more efficient at reducing nutrients at higher water temperatures, higher quality wastewater effluent is typically produced in the spring, summer, and fall than in the winter. Thus, while properly designed and operated biological treatment systems may not be capable of meeting TN and TP limits of 10 mg/L and 1 mg/L respectively during winter months, data averaged for the year should yield results at or below these limits.

The basis for implementation of this approach is that the technology-based effluent limits for a pollutant not covered by federal effluent standards may be imposed on a case-by-case basis (IAC 567-62.8(5)). Such limitation must be based on the <u>effect of the pollutant in water</u> and the <u>feasibility and reasonableness of treating such pollutant</u>.

If a permitted discharger installs nutrient reduction processes and technology-based TN and TP limits are included in the NPDES permit, then it is the position of the IDNR that the TN and TP discharge limits will not be made more restrictive for a period of at least 10 years after the completion of the nutrient reduction process construction. Iowa Code section 455B.173(3C) establishes the moratorium on more restrictive limits for municipal dischargers. For non-municipal discharges, this prohibition can be enforced through the permitting process or as a part of the adoption of any future nutrient limitation. An evaluation of the nutrient removal performance and future optimization will be submitted to IDNR once facilities are constructed and have operated for a period of five years.

## Implementation Plan Details

Technology-based nutrient requirements will be specified in municipal and industrial NPDES permits for major facilities, and minor industrial facilities with existing biological treatment systems, at the next permit renewal. NPDES permits will be amended or reissued to include effluent limits for TN and TP according to the following: 1) BNR already installed; 2) BNR not installed and no capacity increases are planned; 3) BNR not installed and capacity increases are planned:

<u>Category 1) BNR already installed</u>

a) Installed and Operating: If BNR is installed at a given plant and operating, then the NPDES permit will specify technology based limits (no more stringent than 10 mg/l TN; 1 mg/l TP) and will require influent and effluent monitoring for both parameters.
b) Installed and NOT Operating: If BNR is installed at a given plant and NOT operating, then the NPDES permit will require the BNR facilities to be operated. Final limits for TN and TP (no more stringent than 10 mg/l TN; 1 mg/l TP) will be incorporated into the NPDES permit at the end of a one year process optimization and performance evaluation. The NPDES permit will require influent and effluent monitoring for both parameters according to 567 IAC Chapter 63.

<u>Category 2) BNR not installed and no capacity increases are planned</u>

If BNR is not installed and no increases in treatment facility design capacity are planned, then the renewed NPDES permit will include a requirement for the facility to submit a report with the results of a study, within two years of reissuance of the NPDES permit, evaluating the costs and feasibility of installing BNR at a given wastewater treatment facility. The report will also include a proposed schedule for when BNR will be installed at a given wastewater treatment facility. The negotiated schedule will be incorporated into the NPDES permit or administrative consent order. The TN and

TP discharge limits will be determined at the end of a one year process optimization and performance evaluation following the BNR process startup. The performance evaluation will include the determination of technologically achievable TN and TP concentrations. The NPDES permit will be amended to include the TN and TP limits as determined from the performance evaluation. The permit limits will be no more stringent than 10 mg/L TN and 1 mg/L TP. The NPDES permit will require influent and effluent monitoring for both parameters according to 567 IAC Chapter 63.

Category 3) BNR not installed and capacity increases are planned
If BNR is not installed and increases in treatment capacity are planned, then the evaluation of installing nutrient removal will be conducted as a part of the construction permitting process through current antidegradation procedures. Nutrient removal will be encouraged at this stage. If nutrient removal is not included with the plant expansion, then the NPDES permit will be written using the procedure in Category 2 above. If nutrient removal is included in the plant expansion, then the NPDES permit will be amended after a one year optimization and performance evaluation following BNR process startup, similar to the Category 2 procedures. The permit limits will be no more stringent than 10 mg/L TN and 1 mg/L TP. The NPDES permit will require influent and effluent monitoring for both parameters according to 567 IAC Chapter 63.

For an industrial wastewater facility with nutrient discharges but **no** biological treatment, a schedule will be incorporated into the next permit. The schedule will require the industry to assess the feasibility, reasonableness and cost of nutrient reductions. If nutrient reduction is found to be feasible, reasonable, and affordable, the permit will be revised to incorporate technology-based effluent limits based on the assessment.

## Section 3.2 - Cost Estimates

| Estimated Costs for BNR Improvements for Muncipal Majors (Target Effluent TN = 10 mg/L, Target Effluent TP = 1 mg/L) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Treatment Type | # of Facilities | Combined Design AWW Flow (MGD) | Combined Annual Average Flow[1] (MGD) | Total Capital Cost ($M) | Total Annual O&M Cost ($M) | Total Present Worth Cost ($M)[2] | Total Annual Cost ($M) | $/1,000 gallons Treated[3] | Weighted Monthly Cost/Household[4] | Weighted % of MHI[4] |
| Activated Sludge | 56 | 533 | 355 | 348 | 25 | 686 | 51 | 0.39 | 7.75 | 0.18% |
| Fixed Film | 37 | 101 | 67 | 430 | 7 | 524 | 39 | 1.59 | 25.83 | 0.73% |
| Aerated Lagoon | 9 | 11 | 8 | 110 | 3 | 147 | 11 | 3.92 | 85.16 | 2.13% |
| Totals | 102 | 645 | 430 | 887 | 35 | 1,358 | 101 | 0.64 | 11.85[5] | 0.29%[5] |

1. Average annual flow estimated as 2/3 of design AWW flow.
2. Present worth values calculated using discount rate of 4.125% and a 20-year design life.
3. Based on annual average flow.
4. % of MHI for BNR improvements only. Estimates weighted by number of households.
5. Aggregate value weighted by number of households.

| Estimated Costs for BNR Improvements for all Industries with Biological Treatment (Target Effluent TN = 10 mg/L, Target Effluent TP = 1 mg/L) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatment Type | # of Facilities | Combined Design Flow (MGD) | Total Capital Cost ($M) | Total Annual O&M Cost ($M) | Total Present Worth Cost ($M)[1] | Total Annual Cost ($M) | $/1,000 gallons Treated[2] |
| Activated Sludge | 20 | 44.2 | 29.3 | 2.0 | 56.1 | 4.2 | 0.26 |
| Fixed Film | 1 | 0.6 | 2.7 | 0.04 | 3.3 | 0.2 | 1.06 |
| Aerated Lagoon | 7 | 5.8 | 86.5 | 2.20 | 116.0 | 8.6 | 4.05 |
| Totals | 28 | 50.7 | 118.5 | 4.2 | 175.5 | 13.1 | 0.71 |

1. Present worth values calculated using discount rate of 4.125% and a 20-year design life.
2. Based on design flow.

| Estimated Costs for BNR Improvements for Major Municipals + all Industries with Biological Treatment (Target Effluent TN = 10 mg/L, Target Effluent TP = 1 mg/L) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatment Type | # of Facilities | Combined Flow (MGD)[2] | Total Capital Cost ($M) | Total Annual O&M Cost ($M) | Total Present Worth Cost ($M)[1] | Total Annual Cost ($M) | $/1,000 gallons Treated[2] |
| Activated Sludge | 76 | 399.5 | 377.3 | 27.2 | 742.5 | 55.2 | 0.38 |
| Fixed Film | 38 | 67.8 | 432.3 | 7.1 | 527.5 | 39.2 | 1.59 |
| Aerated Lagoon | 16 | 13.5 | 196.3 | 5.0 | 263.1 | 19.6 | 3.98 |
| Totals | 130 | 480.8 | 1,005.8 | 39.2 | 1,533.1 | 114.1 | 0.65 |

1. Present worth values calculated using discount rate of 4.125% and a 20-year design life.
2. Based on design flow for industries + estimated average annual flow for municipals.

# Section 3.3 - List of Affected Facilities

## Major Municipalities (> 1.0 MGD):

| | NPDES NO. | FACILITY NAME | TREATMENT TYPE | 2010 POPULATION |
|---|---|---|---|---|
| 1 | 2503001 | ADEL CITY OF STP | AERATED LAGOON | 3,682 |
| 2 | 5502001 | ALGONA CITY OF STP | TRICKLING FILTER | 5,560 |
| 3 | 8503001 | AMES WATER POLLUTION CONTROL FACILITY | TRICKLING FILTER | 58,965 |
| 4 | 5307001 | ANAMOSA CITY OF STP | TRICKLING FILTER | 5,533 |
| 5 | 7709001 | ANKENY CITY OF STP | ACTIVATED SLUDGE | 45,582 |
| 6 | 1509001 | ATLANTIC CITY OF STP | TRICKLING FILTER | 7,112 |
| 7 | 2613001 | BLOOMFIELD CITY OF STP (MAIN) | AERATED LAGOON | 2,640 |
| 8 | 819001 | BOONE CITY OF STP | ACTIVATED SLUDGE | 12,661 |
| 9 | 4103001 | BRITT CITY OF STP | TRICKLING FILTER | 2,069 |
| 10 | 2909001 | BURLINGTON CITY OF STP | ACTIVATED SLUDGE | 25,663 |
| 11 | 9113001 | CARLISLE CITY OF STP | AERATED LAGOON | 3,876 |
| 12 | 1415001 | CARROLL, CITY OF STP | ACTIVATED SLUDGE | 10,103 |
| 13 | 709001 | CEDAR FALLS CITY OF STP | TRICKLING FILTER | 39,260 |
| 14 | 5715001 | CEDAR RAPIDS CITY OF STP | ACTIVATED SLUDGE | 126,326 |
| 15 | 407003 | CENTERVILLE CITY OF STP (EAST) | ROTATING BIOLOGICAL CONTACTOR | 5,528 |
| 16 | 5903001 | CHARITON CITY OF STP | OXIDATION DITCH | 4,321 |
| 17 | 3405001 | CHARLES CITY, CITY OF STP | TRICKLING FILTER | 7,652 |
| 18 | 1811002 | CHEROKEE CITY OF STP | ACTIVATED SLUDGE | 5,253 |
| 19 | 7329001 | CLARINDA CITY OF STP | TRICKLING FILTER | 5,572 |
| 20 | 1716901 | CLEAR LAKE SANITARY DISTRICT | SEQUENCING BATCH REACTOR | |
| 21 | 2326001 | CLINTON CITY OF STP | ACTIVATED SLUDGE | 26,885 |
| 22 | 5208001 | CORALVILLE CITY OF STP | SEQUENCING BATCH REACTOR | 18,907 |
| 23 | 7820001 | COUNCIL BLUFFS CITY OF STP | TRICKLING FILTER | 62,230 |
| 24 | 4515001 | CRESCO CITY OF STP | ACTIVATED SLUDGE | 3,868 |
| 25 | 8816001 | CRESTON CITY OF STP | TRICKLING FILTER | 7,834 |
| 26 | 8222003 | DAVENPORT CITY OF STP | ACTIVATED SLUDGE | 99,685 |
| 27 | 9630001 | DECORAH CITY OF STP | ACTIVATED SLUDGE | 8,127 |
| 28 | 2424001 | DENISON MUNICIPAL UTILITIES-STP | ACTIVATED SLUDGE | 8,298 |
| 29 | 7727001 | DES MOINES METROPOLITAN WRF | ACTIVATED SLUDGE | 203,483 |
| 30 | 2330001 | DEWITT CITY OF STP | OXIDATION DITCH | 5,322 |
| 31 | 3126001 | DUBUQUE CITY OF STP | ACTIVATED SLUDGE | 57,637 |
| 32 | 9926001 | Eagle Grove, City of STP | ROTATING BIOLOGICAL CONTACTOR | 3,583 |
| 33 | 4236001 | ELDORA CITY OF STP | SEQUENCING BATCH REACTOR | 2,732 |
| 34 | 7428002 | EMMETSBURG CITY OF STP | ROTATING BIOLOGICAL CONTACTOR | 3,904 |
| 35 | 3218002 | ESTHERVILLE CITY OF STP | TRICKLING FILTER | 6,360 |
| 36 | 723001 | EVANSDALE CITY OF STP | ACTIVATED SLUDGE | 4,751 |
| 37 | 5131001 | FAIRFIELD CITY OF STP | OXIDATION DITCH | 9,464 |
| 38 | 9525001 | FOREST CITY, CITY OF STP | ROTATING BIOLOGICAL CONTACTOR | 4,151 |
| 39 | 9433003 | FORT DODGE CITY OF STP | ACTIVATED SLUDGE | 25,206 |
| 40 | 5625001 | FORT MADISON CITY OF STP | ACTIVATED SLUDGE | 11,051 |
| 41 | 4130002 | GARNER CITY OF STP | AERATED LAGOON | 3,129 |
| 42 | 6525001 | GMU WASTEWATER TREATMENT FACILITY | ROTATING BIOLOGICAL CONTACTOR | 5,269 |
| 43 | 140001 | GREENFIELD CITY OF STP | TRICKLING FILTER | 1,982 |

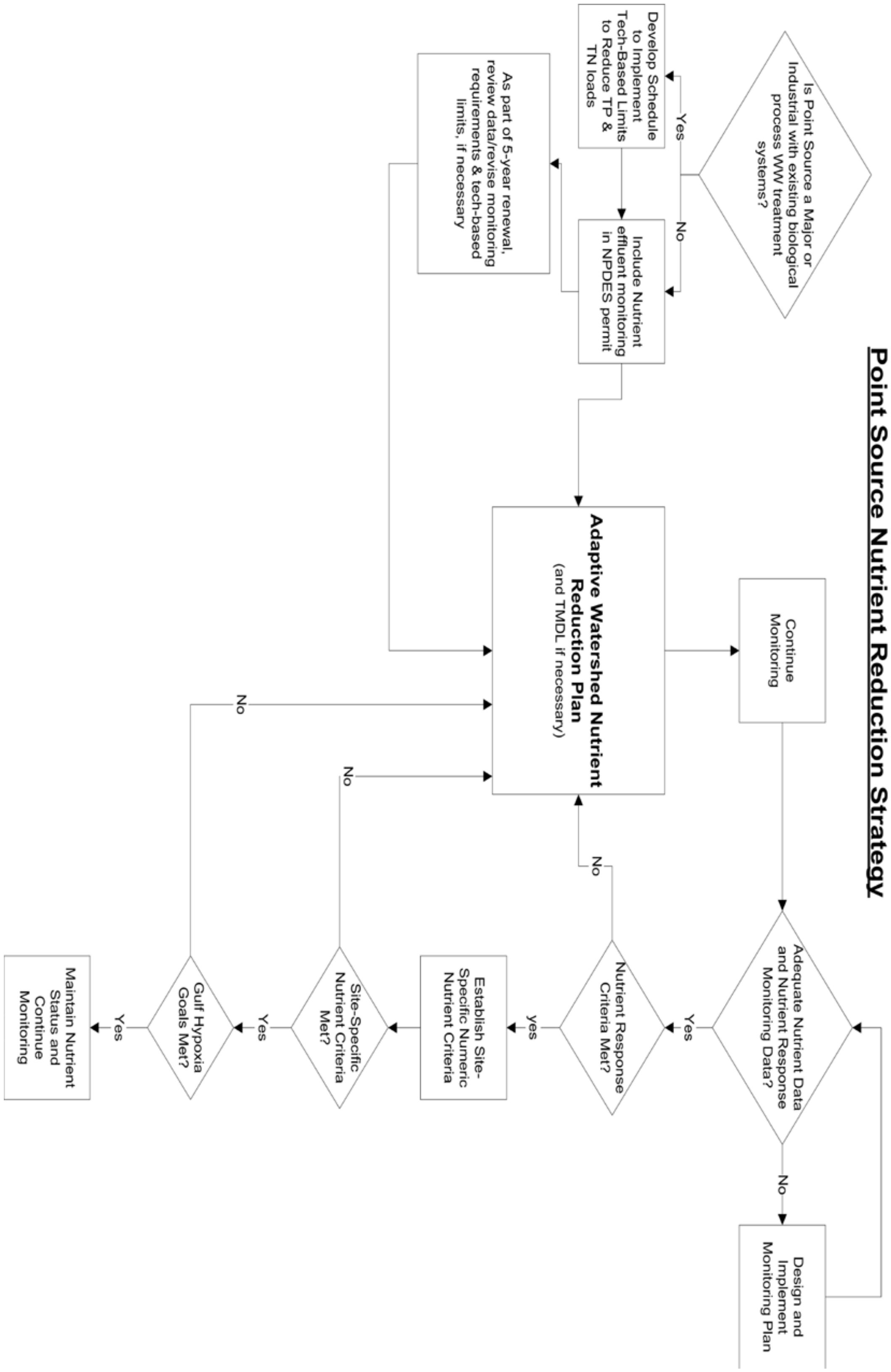
| | | | | |
|---|---|---|---|---|
| 44 | 7736001 | Grimes, City of STP | ACTIVATED SLUDGE | 8,264 |
| 45 | 7930001 | Grinnell, City of STP | TRICKLING FILTER | 9,218 |
| 46 | 3833001 | GRUNDY CENTER CITY OF STP | SEQUENCING BATCH REACTOR | 2,706 |
| 47 | 8335002 | HARLAN CITY OF STP | ROTATING BIOLOGICAL CONTACTOR | 5,106 |
| 48 | 4641001 | HUMBOLDT CITY OF STP | ACTIVATED SLUDGE | 4,690 |
| 49 | 1037001 | INDEPENDENCE CITY OF STP | TRICKLING FILTER | 5,966 |
| 50 | 9133001 | INDIANOLA CITY OF STP (NORTH) | ACTIVATED SLUDGE | 14,782 |
| 51 | 5225001 | Iowa City, City of (North) STP | TRICKLING FILTER | |
| 52 | 5225002 | Iowa City, City of (South) STP | ACTIVATED SLUDGE | 67,862 |
| 53 | 4260001 | IOWA FALLS CITY OF STP | TRICKLING FILTER | 5,238 |
| 54 | 3050901 | IOWA GREAT LAKES SANITARY DISTRICT STP | ACTIVATED SLUDGE | |
| 55 | 1044002 | JESUP, CITY OF STP (SOUTH) | AERATED LAGOON | 2,520 |
| 56 | 5640001 | KEOKUK CITY OF STP | ACTIVATED SLUDGE | 10,780 |
| 57 | 6342001 | KNOXVILLE CITY OF STP | TRICKLING FILTER | 7,313 |
| 58 | 7540001 | LEMARS CITY OF STP | ACTIVATED SLUDGE | 9,826 |
| 59 | 4950001 | MAQUOKETA CITY OF STP | ACTIVATED SLUDGE | 6,141 |
| 60 | 6469001 | MARSHALLTOWN CITY OF | SEQUENCING BATCH REACTOR | 27,552 |
| 61 | 1750001 | MASON CITY, CITY OF STP | ACTIVATED SLUDGE | 28,079 |
| 62 | 6352001 | MELCHER-DALLAS CITY OF STP | AERATED LAGOON | 1,288 |
| 63 | 7751001 | MITCHELLVILLE CITY OF STP | SEQUENCING BATCH REACTOR | 2,254 |
| 64 | 7950001 | MONTEZUMA CITY OF STP | AERATED LAGOON | 1,462 |
| 65 | 5343001 | MONTICELLO CITY OF STP | TRICKLING FILTER | 3,796 |
| 66 | 4453001 | MOUNT PLEASANT CITY OF STP (MAIN) | SEQUENCING BATCH REACTOR | 8,668 |
| 67 | 5758001 | MOUNT VERNON CITY OF STP | ACTIVATED SLUDGE | 4,506 |
| 68 | 7048001 | MUSCATINE CITY OF STP | ACTIVATED SLUDGE | 22,886 |
| 69 | 8562001 | NEVADA CITY OF STP | TRICKLING FILTER | 6,798 |
| 70 | 1970001 | NEW HAMPTON CITY OF STP | TRICKLING FILTER | 3,571 |
| 71 | 5059002 | NEWTON CITY OF STP | ACTIVATED SLUDGE | 15,254 |
| 72 | 5252001 | NORTH LIBERTY CITY OF STP | SEQUENCING BATCH REACTOR | 13,374 |
| 73 | 3353001 | OELWEIN CITY OF STP | ACTIVATED SLUDGE | 6,415 |
| 74 | 8474001 | ORANGE CITY CITY OF STP | AERATED LAGOON | 6,004 |
| 75 | 2038002 | OSCEOLA CITY OF STP | TRICKLING FILTER | 4,929 |
| 76 | 6273001 | OSKALOOSA CITY OF STP (NORTHEAST) | TRICKLING FILTER | |
| 77 | 6273002 | OSKALOOSA CITY OF STP (SOUTHWEST) | ACTIVATED SLUDGE | 11,463 |
| 78 | 9083001 | OTTUMWA CITY OF STP | ACTIVATED SLUDGE | 25,023 |
| 79 | 6368006 | PELLA CITY OF STP | ACTIVATED SLUDGE | 10,352 |
| 80 | 2561001 | PERRY CITY OF STP | ACTIVATED SLUDGE | 7,702 |
| 81 | 6950001 | RED OAK CITY OF STP | TRICKLING FILTER | 5,742 |
| 82 | 1376001 | ROCKWELL CITY, CITY OF STP | TRICKLING FILTER | 1,709 |
| 83 | 7170001 | SHELDON CITY OF STP | ROTATING BIOLOGICAL CONTACTOR | 5,188 |
| 84 | 3659001 | SHENANDOAH CITY OF STP | TRICKLING FILTER | 5,150 |
| 85 | 8486002 | SIOUX CENTER CITY OF STP | TRICKLING FILTER | 7,048 |
| 86 | 9778001 | SIOUX CITY CITY OF STP | ACTIVATED SLUDGE | 82,684 |
| 87 | 2171004 | Spencer, City of STP | ROTATING BIOLOGICAL CONTACTOR | 11,233 |
| 88 | 1178001 | STORM LAKE CITY OF STP | ACTIVATED SLUDGE | 10,600 |
| 89 | 8670002 | TAMA CITY OF STP | ACTIVATED SLUDGE | 2,877 |
| 90 | 1689001 | TIPTON CITY OF STP (WEST) | AERATED LAGOON | 3,221 |
| 91 | 8676001 | TOLEDO CITY OF STP | ACTIVATED SLUDGE | 2,341 |
| 92 | 688001 | VINTON CITY OF STP | ACTIVATED SLUDGE | 5,257 |

| | | | | |
|---|---|---|---|---|
| 93 | 7085001 | WALCOTT CITY OF STP (SOUTH) | ACTIVATED SLUDGE | 1,629 |
| 94 | 9271001 | WASHINGTON CITY OF STP | TRICKLING FILTER | 7,266 |
| 95 | 790001 | WATERLOO CITY OF STP | ACTIVATED SLUDGE | 68,406 |
| 96 | 2573001 | WAUKEE CITY OF STP | ACTIVATED SLUDGE | 13,790 |
| 97 | 398001 | WAUKON CITY OF STP | TRICKLING FILTER | 3,897 |
| 98 | 990001 | WAVERLY CITY OF STP | TRICKLING FILTER | 9,874 |
| 99 | 4063001 | WEBSTER CITY, CITY OF STP | ROTATING BIOLOGICAL CONTACTOR | 8,070 |
| 100 | 2985001 | WEST BURLINGTON CITY OF STP | ACTIVATED SLUDGE | 2,968 |
| 101 | 7073001 | WEST LIBERTY CITY OF STP | ACTIVATED SLUDGE | 3,736 |
| 102 | 6171001 | WINTERSET CITY OF STP | TRICKLING FILTER | 5,190 |

**Industries with biological treatment for process waste:**

| | NPDES NO. | FACILITY NAME | TREATMENT TYPE |
|---|---|---|---|
| 1 | 2326101 | ARCHER DANIELS MIDLAND CORN PROCESSING | ACTIVATED SLUDGE |
| 2 | 6800100 | CARGILL, INC. | ACTIVATED SLUDGE |
| 3 | 7048101 | GRAIN PROCESSING CORP. | ACTIVATED SLUDGE |
| 4 | 5800100 | TYSON FRESH MEATS, INC. - COLUMBUS JUNCTION | ACTIVATED SLUDGE |
| 5 | 2500100 | TYSON FRESH MEATS, INC. - PERRY | ACTIVATED SLUDGE |
| 6 | 2900900 | IOWA ARMY AMMUNITION PLANT | TRICKLING FILTER |
| 7 | 7000102 | MONSANTO COMPANY | ACTIVATED SLUDGE |
| 8 | 5640101 | ROQUETTE AMERICA, INC. | ACTIVATED SLUDGE |
| 9 | 8670100 | TAMA PAPERBOARD | ACTIVATED SLUDGE |
| 10 | 2326112 | EQUISTAR CHEMICALS, LP | ACTIVATED SLUDGE |
| 11 | 0375102 | AGRI STAR MEAT AND POULTRY LLC | ACTIVATED SLUDGE |
| 12 | 9083101 | CARGILL MEAT SOLUTIONS CORPORATION | OXIDATION DITCH |
| 13 | 8670101 | IOWA PREMIUM BEEF | AERATED LAGOON |
| 14 | 1178105 | TYSON FRESH MEATS, INC. - STORM LAKE | ACTIVATED SLUDGE |
| 15 | 7856100 | OAKLAND FOODS, L.L.C. | SEQUENCING BATCH REACTOR |
| 16 | 5600105 | PINNACLE FOODS GROUP LLC | ACTIVATED SLUDGE |
| 17 | 8748102 | MICHAEL FOODS, INC. | ACTIVATED SLUDGE |
| 18 | 9500102 | REMBRANDT ENTERPRISES, INC. - THOMPSON | AERATED LAGOON |
| 19 | 8400120 | AGROPUR INC. | SEQUENCING BATCH REACTOR |
| 20 | 3621100 | MANILDRA MILLING CORPORATION | ACTIVATED SLUDGE |
| 21 | 9700101 | GELITA USA, INC. | AERATED LAGOON |
| 22 | 6800113 | AJINOMOTO HEARTLAND LLC | ACTIVATED SLUDGE |
| 23 | 2200100 | SWISS VALLEY FARMS | ACTIVATED SLUDGE |
| 24 | 2500103 | NORTHERN NATURAL GAS CO – REDFIELD | AERATED LAGOON |
| 25 | 3300100 | ASSOCIATED MILK PRODUCERS | AERATED LAGOON |
| 26 | 3405100 | CAMBREX | ACTIVATED SLUDGE |
| 27 | 3900103 | GUTHRIE CENTER EGG FARM | AERATED LAGOON |
| 28 | 5200104 | TWIN COUNTY DAIRY, INC. | AERATED LAGOON |

## Section 3.4 – Conceptual Flow Chart



## 3.5 References

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