General Permit #4 Rationale

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Written by: Daniel Olson, R.S.

Coverage: All discharging private sewage disposal systems in Iowa

Type of systems covered: Predominantly buried sand filters (~80%), aerobic treatment units (~6%), free access sand filters (~5%), peat filters (~3%), textile filters, lagoons and wetlands (all<2%).

Discharge points: The majority of systems discharge to the ground surface in a homeowner's backyard or to a road or drainage ditch. A smaller percentage discharge directly or close enough to a waterway to be considered to be discharging to a stream.

System performance: The following is a collection of data from US EPA "Onsite Wastewater Treatment Systems Manual" Tables 3-19, representing studies on the treatment performance of various onsite treatment technologies.

Type of system	$CBOD_5$ (mg/L)	TSS (mg/L)	TN (mg N/L)	Fecal Coliforms (cfu/100mL)
Buried Sand filter	8	12.5	30	10^2
Aerobic treatment unit*	27.5	52.5	42.5	10^4
Textile filters	10	7.5	45	10^2

*Aerobic treatment units (ATU) in Iowa require a tertiary sand filter
Source: Siegrist, 2001

This information is consistent with test results in Iowa. The best available information is on sand filters since they are the predominant type of system and have been used for 30+ years.

Typical results for sand filters in Iowa
CBOD5: <10mg/L
TSS: <15mg/L
E. coli: <2000 cfu/100mL

Systems that discharge to Class A waterways may require disinfection. This is typically done with UV lights. These results met the current limits for $CBOD_5$ (25mg/L) and TSS (25mg/L) consistently for approximately 88% of the discharging systems in Iowa. The current requirement for E. coli is 235cfu/100ml for systems one mile up gradient of a Class A or C water. Systems not within this area do not have a limit for E. coli. Insufficient data is available on the other 12% of systems to make a scientifically accurate estimate of these parameters. Nationally, other discharging systems have performed satisfactorily with proper maintenance.

Presently ATU's, textile and peat filters require regular maintenance, ATU's in rule and textile and peat filters through manufacturers requirements. Regular maintenance is important to achieve proper effluent results.

New Limits:

Effluents Discharging To	E. coli cfu/100 mL	CBOD5 mg/L	TSS mg/L
Class “A1”, “A3” waters	235	25	25
Class “A2” waters	2880	25	25
All other water use classifications	no limit	25	25

Basis for limits:
The new proposed requirements will include permitting those systems that discharge to designated waters of the state. The CBOD5 and TSS limits remain unchanged. The E. coli limit for Class “A2” waterways reflects the limit for public systems in IAC567-61.3(3).

Given that the majority of discharging onsite systems do not directly discharge to waterways, further treatment can be expected as the effluent soaks into the ground. Evaporation can also be significant. With the historically excellent performance of discharging systems in Iowa (particularly sand filters), adequate operation and maintenance can provide a better benefit than effluent sampling. The new permit language requires that only those systems that discharge to, or can reasonably be assumed to enter; designated waters of the state will need to apply for General Permit #4. These systems may impact waters of the state and particularly designated waters. The effluent testing for these systems will be increased in frequency to twice a year. The limits above will apply. The number of permits issued will be more manageable with increased ability by the Department to monitor these systems.

Systems that do not discharge to designated waters of the state will require annual operation and maintenance inspections but no General Permit #4 or effluent testing. They will however be permitted by rule. This means they must operate and maintain their system according to procedures outlined by the Department. Buried sand filters will require an annual inspection by a knowledgeable person including a tank and effluent pipe inspection and inspection of the treatment area. A knowledgeable person can be the homeowner but they must be trained. More complex systems such as ATU’s, textile and peat filters will require annual or semi-annual operation and maintenance inspections by a manufacturer or state trained service provider. These inspections may include effluent sampling if required by the manufacturer. Inspection records must be kept by the owner and produced upon demand for sand filters. Aerobic treatment units, textile and peat filters require maintenance contracts and inspection reports must be submitted to the administrative authority. Lagoons have been removed from the rules as alternatives for residences. Free access sand filters may only be used following an ATU.

The most important aspect of designing an onsite wastewater treatment system is ensuring aerobic conditions in the secondary treatment system. Code requirements

require an unsaturated zone for soil systems and venting for sand, peat and textile filters. This ensures an adequate supply of oxygen for aerobic bacteria to treat the wastewater properly. This presence of oxygen also ensures nitrification of ammonia to nitrate and /or nitrite. The discharging systems utilized in Iowa all provide significant reduction of ammonia to nitrate. A study of peat filters done in Australia is illustrative of the performance of media filters. In that study the mean average concentration of ammonium-nitrogen was 3.16mg/L. A study conducted by the National University of Ireland showed a 99% reduction in ammonia in sand filters and a similar study of constructed wetlands done at the University of Akron showed a level of 1.5mg/L ammonia for that effluent. For these reasons an ammonia limit is not included in this permit.

Metal concentrations were also considered as part of the review of the General Permit #4. Users of onsite wastewater systems are advised about the things that should and should not be put into the system. Household chemicals are the likely source of any metals that may enter an onsite system. Case studies on metals in onsite systems are minimal. Studies that have been done have found low levels of metals in septic tank effluent. Typically these constituents are measured in micrograms per liter. The majority of these are well below the EPA action levels for these constituents. These measurements were done on septic tank effluent prior to treatment in the media filter. The media filter can be expected to reduce the metal concentrations further by adsorption to the media particles and cation exchange. Removal of sources of metals from the wastewater stream by altering user habits and implementing alternative disposal practices is the recommended course of action by EPA.