Technical Manual
for
NJPDES Discharge to Ground Water Permits

New Jersey Department of Environmental Protection

Division of Water Quality
Bureau of Nonpoint Pollution Control

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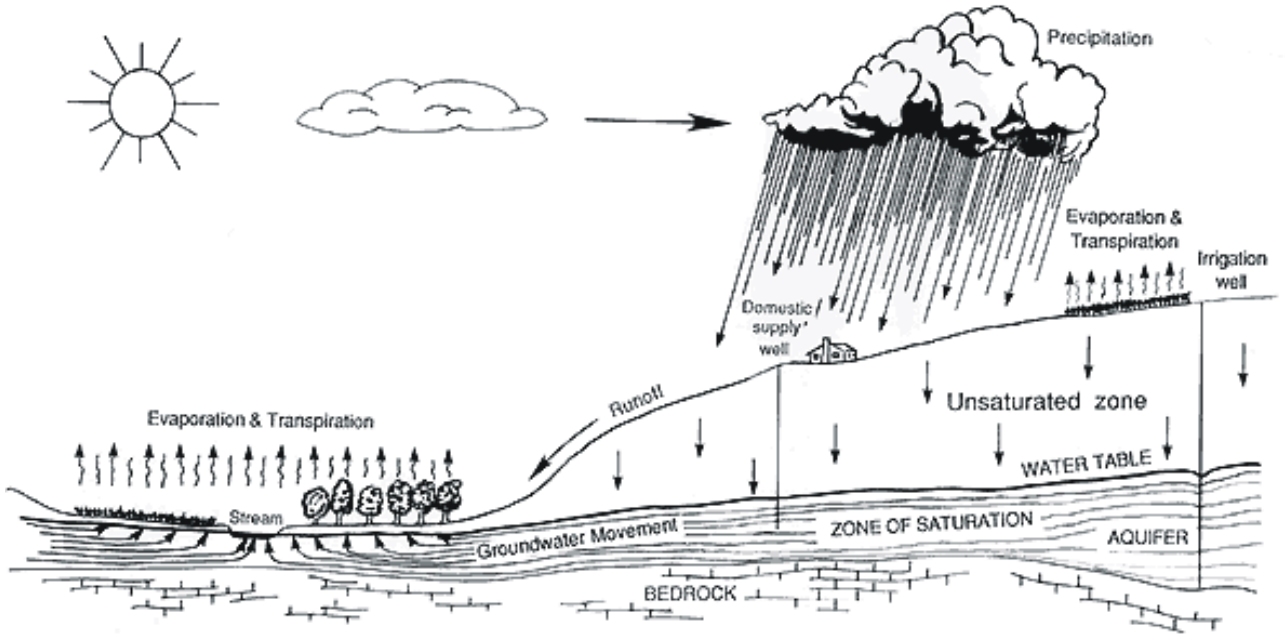

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Foreword

What is the purpose of this Technical Manual?

This Manual is intended to provide guidance to permittees, consultants, and other interested parties regarding the New Jersey Pollutant Discharge Elimination System-Discharge to Ground Water (NJPDES-DGW) permitting program for ongoing discharges. This guidance includes instructions for preparing administratively and technically complete applications. It also outlines what types of permits are available. This Manual includes references to other existing supplemental technical guidance documents that provide additional information regarding the NJPDES-DGW program. Additional information may also be obtained by visiting the Division of Water Quality website (www.state.nj.us/dep/dwq).

The types of discharges covered by this Manual are typically from approved operations and not discharges associated with unintentional "spills" or "releases" of contaminants or historical contamination. These approved operations discharge wastewater of known quantity and quality of pollutants to the ground. Examples include discharges of sanitary wastewater from housing developments, schools, businesses and industries, as well as discharges of non-hazardous industrial wastewater and some stormwater discharges. These discharges typically do not represent hazardous situations or lead to the creation of contaminated ground water sites because they can be controlled at the source. If you are interested in pursuing information regarding the remediation of contaminated sites, please call the Hazardous Site Science Element at (609) 633-6801.

Using this Manual

To expedite the permit process the Department recommends that you familiarize yourself with the contents of the Manual prior to contacting the Bureau of Nonpoint Pollution Control (BNPC) and proceeding with the permit process. After you become familiar with the contents of this Manual, you should arrange a pre-application meeting by sending a written request to the BNPC or by fax to (609) 984-2147.

How is this Manual organized?

This Manual is organized into two parts.

- Part 1 contains general information that provides an overview of the NJPDES-DGW permit program, its purpose, importance, and how to obtain a permit.
- Part 2 discusses specific technical guidance and a checklist of information you will need to compile and submit to the BNPC for technically complete applications.

PART 1: GENERAL OVERVIEW

What is the NJPDES-DGW permit program?

The New Jersey Water Pollution Control Act (WPCA, N.J.S.A. 58: l0A *et seq.)* authorizes the Department to regulate and control the discharge of pollutants into the waters of New Jersey. This authority is implemented through the NJPDES regulations (N.J.A.C. 7:14A-l *et seq.)* and its affiliated permit programs. In the early 1980's, the NJPDES-DGW permitting program was created. In accordance with the regulations, every discharge of pollutants to ground waters of the State requires a NJPDES-DGW Permit.

However, there are certain exceptions in the rule which are clarified later in the Manual.

What is the goal of the program?

The goal of the NJPDES-DGW permitting program is to restore, enhance and maintain the ground water quality of New Jersey. This goal is achieved pursuant to the WPCA and the Ground Water Quality Standards (GWQS), which can be found at N.J.A.C. 7:9-6 *et seq.* The GWQS designate ground water classifications throughout the state, designated uses, and ground water quality criteria and constituent standards. Currently the state's ground water is divided into 3 classes:

- Class I — Ground Water of Special Ecological Significance (mostly the Pinelands & Natural Areas)
- Class II — Ground Water for Potable Water Supply (most of the state)
- Class III — Ground Water with Uses other than Potable Supply (much smaller areas)

Every ground water discharge in the State will impact one of these three classes of ground water. As described above, each class has a primary goal that is to be achieved. The GWQS are based on the quality of ground water not influenced by discharges.

How are the NJPDES regulation's goals achieved?

The primary tool for achieving the regulation's goals are the NJPDES-DGW permits issued by the Department. There are several types of NJPDES-DGW permits ranging from individual permits to general permits. Each NJPDES-DGW permit issued by the Department is developed to restore, enhance, and maintain the ground water quality of the State, in accordance with the GWQS.

Permits contain appropriate conditions appropriate for each discharge. Conditions ideally reflect the level of risk posed by each discharge to its surrounding environment with just the right amount of regulatory oversight to address the risk. Conditions range from minimal, such as Best Management Practices (BMPs), to more stringent, such as requirements to treat wastewater prior to discharge.

In order to demonstrate compliance with the GWQS, NJPDES-DGW permits may include any or all of the following components: BMPs and preventative measures; discharge limitations and/or monitoring requirements and ground water monitoring programs. The Department collectively refers to these components as the "Ground Water Protection Program" which is known as "GWPP" (pronounced "gwip"). A GWPP Plan can be developed by the Department, or by the permittee. The GWPP Plan presents for the public record what a facility does, or will do, to ensure compliance with the applicable environmental protection standards.

The scope of the NJPDES-DGW program

The NJPDES-DGW program regulates discharges of pollutants that may impact ground water. The NJPDES rules (N.J.A.C. 7:14A) require any person who discharges pollutants to obtain a NJPDES permit. Under the rules at N.J.A.C. 7:14A-1.2,

> A 'discharge' means an intentional or unintentional action or omission resulting in the releasing, spilling, leaking, pumping, pouring, emitting, emptying, or dumping of a pollutant into the waters of the State, onto land or into wells from which the pollutant might flow or drain into such waters, or into waters or onto lands outside the jurisdiction of the State which pollutant enters the waters of the State, and shall include the release of any pollutant into a municipal treatment works. A leak into a secondary containment system which does not involve a release into the waters or lands of this State is not a "discharge" for purposes of applying the rules under this chapter to violations of the Underground Storage of Hazardous Substances Act, N.J.S.A. 58:11-49 *et seq.* and the rules promulgated pursuant thereto, N.J.A.C. 7:14B."

This definition is rather broad, so it is useful to examine three categories of discharges:

- Discharges that are exempt from the requirement to obtain a NJPDES permit;
- Discharges that are subject to NJPDES but for which a permit is not required at this time;
- Discharges that require a permit;

The following section discusses these issues.

Discharges that are exempt from the NJPDES-DGW permit program

The following ground water discharges are exempt by regulation from the requirement to obtain a NJPDES-DGW permit:

- Discharges from individual subsurface sewage disposal systems that are designed, constructed, installed and operated in compliance with The Realty Improvement Sewerage and Facilities Act, N.J.S.A. 58:11-23 et seq., and Standards for Individual Subsurface Sewage Disposal Systems, N.J.A.C. 7:9A (also known as Chapter 199). These systems receive approvals from the local Health Departments.
- Return flows from irrigated agriculture.
- Past discharges, except those existing permitted discharges identified in N.J.A.C. 7:14A-7.2(c). This exemption includes discharges that are from past spills and other un-permitted releases that are subject to the requirements of N.J.A.C. 7:26-E. This exemption also applies to landfills that stopped operating prior to January 1, 1982.
- Any discharge not to exceed 60 calendar days and in compliance with the instructions of a Department on-scene coordinator or remedial project manager pursuant to 40 CFR 300 (the National Oil and Hazardous Substances Contingency Plan) or 33 CFR 153.10(e) (Pollution by Oil and Hazardous Substances), and the Spill Compensation and Control Act, N.J.S.A. 58:10-23.11.
- Any discharge in compliance with the instructions of an On-Scene Coordinator pursuant to 40 CFR 300 (The National Oil and Hazardous Substances Pollution Plan) or 33 CFR

153.10(e) (Pollution by Oil and Hazardous Substances), and the State Spill Compensation and Control Act, N.J.S.A. 58:10-23.11;

- Any introduction of pollutants from nonpoint source agricultural and silvicultural activities, including runoff from orchards, cultivated crops, pastures, range lands, and forest lands. This paragraph does not exempt the point source discharges from concentrated animal feeding operations as defined at N.J.A.C. 7: 14A-1.2, from concentrated aquatic animal production facilities as defined at N.J.A.C. 7: 14A-l.2, from silvicultural point sources as defined at N.J.A.C. 7:14A-l.2, or to aquaculture projects as defined at N.J.A.C. 7:14A-l.2.

Discharges to ground water that are subject to NJPDES but for which a permit is not required at this time

Although the NJPDES-DGW permit program covers a broad range of discharge activities, there are many common discharges listed below that the Department considers de minimus and do not require a permit at this time.

De minimus discharges share several common traits: (1) pollutants are directed to the ground surface where they are expected to infiltrate into the ground and eventually into ground water, and will not create a constant ponded or flowing fluid condition, (2) pollutants are non-hazardous, and (3) these discharges do not pose a significant risk to ground water quality. Examples of this type of discharge are listed below:

- Discharges of stormwater from residential areas.
- Discharges of stormwater runoff from parking lots, or rooftops, where no pollutants are stored.
- Discharges of wastewater from intermittent washing the exterior of trucks, cars, and houses etc., including outdoor car washing at car dealer's facilities. This does not include actual car wash facilities with injection wells or infiltration basins, and it does not include washing involving hazardous detergents such as those used for power washing of boats.
- Discharges of clean water from sump pumps used to dewater basements.
- Discharges of dewatered construction sites which must be conducted in accordance with Chapter 251 (soil erosion control).
- Discharges of stormwater from salt piles which are contained under roofs and on pads.
- Discharges from the draining of swimming pools or back washing of pool filters. If undertaken in accordance with the provisions of N.J.A.C. 7:14A-8.5(b)5.
- Discharges from water softeners at residences and small businesses.
- Discharges of small quantities of dredge spoils:

  <5000 cubic yards of spoils from the Atlantic coast from Cape May to Sandy Hook;
  <1000 Cubic yards with no residential or recreational exposure.
  Please refer to the document entitled "The Management and Regulation of Dredging Activities and Dredged Material in New Jersey's Tidal Waters" available from the DEP Office of Dredging.
- Discharges from existing dredge disposal sites where new dredge spoils are not being deposited.
- Discharges of condensate from air conditioners and steam pipes.

- Discharges of solid waste deemed to be "Beneficial Reuse" material by the Department's Division of Solid Waste.

(Note: this list represents many discharge situations brought to the Department's attention over the years. If you feel you have a de minimus discharge that is not listed, call the BNPC to see if the list can be expanded to include your discharge.)

Discharges for which a NJPDES-DGW permit is required

If your discharge is not exempt by regulation, then you will be required to apply for a NJPDES-DGW permit. Examples of discharge activities for which people need to apply for a permit include but are not limited to discharges of sanitary wastewater from housing developments, schools, businesses, factories, etc., and discharges of industrial wastewater and some stormwater discharges. Please refer to N.J.A.C. 7:14A-7 for clarification.

These discharges often use the following regulated units:

- Injection wells (including subsurface disposal systems serving facilities with an aggregate design flow in excess of 2,000 gpd);
- Infiltration/percolation lagoons;
- Spray irrigation;
- Overland flow systems;
- Surface impoundments;
- Dredge spoils;
- Residuals surface impoundments.

What about sanitary landfills and hazardous waste facilities?

The regulations for landfills and hazardous waste facilities are very specific, and they must be followed explicitly. If you believe you must implement a monitoring program of this type, please contact the BNPC or Division of Solid Waste, at the phone numbers shown in Table 1. You should ask for specific guidance and/or examples of GWPP plans that have been approved. Persons responsible for discharges to ground water from sanitary landfills, as provided for in N.J.A.C. 7:26, shall conduct ground water monitoring in accordance with N.J.A.C. 7:14A-9. Persons responsible for discharges to ground water from hazardous waste facilities, as defined in N.J.A.C. 7:26, shall conduct ground water monitoring in accordance with N.J.A.C. 7:14A-10.

HOW TO APPLY FOR A NJPDES-DGW PERMIT

The application checklist items

Once it has been determined that you need a NJPDES-DGW permit for your discharge, you must submit an application. The Department has created a checklist outlining all administrative requirements. The checklist and necessary forms may be obtained from the Bureau of Permit Management (BPM), the BNPC or our website (http://www.state.nj.us/dep/dwq/forms.htm).

Each applicant should start by reviewing the checklist to determine the information necessary for a complete application which includes the submission of a TECHNICAL REPORT. Part 2 of this Manual will assist you in completing this Report.

Types of NJPDES-DGW permits

There are 3 types of NJPDES-DGW permits:

- Individual Permits
- General Permits
- Permit-by-Rule (see 7:14A-7.5 and 8.5 for a complete listing)

INDIVIDUAL PERMITS

Individual permits are written specifically for each facility and its unique setting and operational considerations.

There are two types of individual permits.

- GWPP Permits (the applicant develops the GWPP Plan)
- Custom permits (the Department develops the GWPP Plan)

GWPP Permits

The GWPP permit consists of two components, 1) a Ground Water Protection Program (GWPP) Plan, and 2), the permit shell. The unique feature of a GWPP Permit is that the GWPP Plan is a document, prepared by the permittee, which upon BNPC approval, is incorporated into the NJPDES-DGW permit by reference. The portion of the permit developed by the BNPC contains the regulatory requirements associated with all NJPDES-DGW permitted facilities. The GWPP affords the permittees the opportunity to submit revised GWPP Plans for approval as site specific changes occur. The revised GWPP Plans may be approved quickly with consultation from the BNPC. After the BNPC approves the GWPP, it is incorporated into the permit document and is public noticed for public comment.

The GWPP permit is ideal for anyone who wants a more active role in the creation (specific conditions) and maintenance of their permit. Detailed guidance for developing a GWPP Plan is available from the BNPC in a Manual titled "Guidelines for Developing Ground Water Protection Program Plans," or at the DWQ web-site. In addition, the BNPC holds training sessions each year. Please call the BNPC for further information.

Custom Permits

The custom permit includes a GWPP Plan developed by BNPC staff based on information from the "Technical Report" submitted by the applicant, and also contains the regulatory requirements associated with all NJPDES-DGW permitted facilities. BNPC staff work with the applicant through the development of the permit and the applicant is generally offered the ability to review the permit prior to issuance of the draft permit.

GENERAL PERMITS

When a large number of discharges can be regulated using a uniform and consistent approach, the Department issues General Permits. General Permits are created and issued to facilities that involve similar types of operations, discharge the same types of waste, engage in similar disposal practices and require similar monitoring. The advantage of a General Permit is that the permit is noticed for public comment and issuance process once, for the entire state. Then, it is a simple matter for the applicant to apply for the permit via a "Request for Authorization" (RFA) and submit the required technical requirements. Once the Department is satisfied the proposed

discharge qualifies for the general permit, an authorization is issued. More General Permits are in development at this time because the BNPC has found this method of permitting is very efficient.

Existing NJPDES-DGW General Permits

The following NJPDES- DGW General Permits are currently available from the Department:

- I1 - Basin Discharges at Operating Landfills
- 12 - Potable Water Treatment Plants
- T1 – Existing Subsurface Sewage Disposal (Septic systems)
- SM - Scrap Metal General Permit

The **I1 General Permit** is for Basin Discharges at Operating Landfills. This General Permit authorizes stormwater basin discharges at operating sanitary landfills. The permit is for site runoff into sedimentation basins, retention basins, detention basins, and surface impoundments (collectively referred to as basins). This runoff flows into basins without contacting landfill refuse. The permit includes monitoring and other permit requirements.

The **I2 General Permit** is for Potable Water Treatment Plants. This General Permit covers potable water treatment plants (WTP) discharging filter backwash and clarifier water to outdoor basins. The discharge results the treatment of raw water to drinking quality standards, which often requires the removal of low concentrations of iron, manganese, organic matter, and trace amounts of other metals. When filters are backwashed or when clarifiers are cleaned, the wastewater generated is usually discharged to a basin that ultimately discharges to groundwater. The general permit requires sampling of accumulated sludge from the basins in addition to other permit requirements.

The **T1 General Permit** is for Existing Sanitary Subsurface Sewage Disposal Systems serving facilities with an aggregate wastewater design flow in excess of 2,000 GPD. To be eligible, the subsurface sewage disposal system(s) must have been designed and approved in accordance with the Standards for Individual Subsurface Sewage Disposal Systems (N.J.A.C. 7:9A et seq.) or its precursors, prior to January 1, 1990. This permit requires routine inspections and maintenance.

The **SM Scrap Metal General Permit** regulates the scrap metal processing and automotive dismantling industries. This is one of several stormwater general permits the BNPC has developed in recent years to regulate nonpoint pollution. This permit requires the implementation of BMPs and monitoring.

PERMIT-BY-RULE

Certain discharges to ground water are permitted by rule. Rules specifying eligibility are found at N.J.A.C. 7:14A-7.5 and 8.5. The types of permit-by-rule that currently exist are listed below. If you have any questions about any of these, please call the BNPC or one of the other relevant lead agencies identified in the descriptions.

Existing Discharges Eligible For Permit-By-Rule

The following activities or discharges are eligible for a permit by rule.

- Discharges to ground water from activities associated with the flushing or cleaning of potable water mains and fire water systems, including hydrants and sprinklers;
- Discharges to ground water from activities associated with the development of potable wells;

- Discharges to ground water from activities associated with the development and sampling of monitoring wells in accordance with a NJPDES permit;
- Discharges to ground water, where the discharge does not exceed 30 calendar days, from wells which test aquifers for the purpose of obtaining hydrogeologic data. This permit by rule does not apply when the Department is remediating a contaminated site as defined in N.J.A.C. 7:26C-1.3;
- Discharges to ground water from individual subsurface sewage disposal systems, other than those excluded under N.J.A.C. 7:14A-8.1(b)2, that are designed, constructed, installed and operated in compliance with the Realty Improvement Sewerage and Facilities Act (N.J.S.A. 58:11-23 et seq.), and the Standards for Individual Subsurface Sewage Disposal Systems (N.J.A.C. 7:9A), where applicable.
- Discharges to ground water from injection wells used as a component of closed loop heat pump systems constructed according to any well permit condition(s)/standards adopted pursuant to N.J.S.A. 58:4A-4. 1 et seq. All closed loop systems shall contain only fluids that are allowable under conditions of such well permit, and are leak proof such that the only discharge is heat content.
- Injection wells used as components of an open loop heat pump system constructed in accordance with all applicable well construction requirements of N.J.A.C. 7:10-12. Any such injection well shall discharge water into the same aquifer from which the water was drawn and with a quality that is the same as the ambient ground water, except for heat content.
- Air conditioning or cooling water return flow injection wells that are constructed in accordance with all applicable well construction requirements of N.J.A.C. 7:10-12 that discharge water into the same aquifer from which the water was drawn and with a quality that is the same as the ambient ground water, except for heat content.
- Underground injection of swimming pool filter backwash water and water softener backwash water into seepage pits, when the activity is conducted in accordance with N.J.A.C. 7:14A-8.18.
- Underground injection wells associated with the feasibility or engineering design studies necessary to obtain or comply with a water supply allocation permit pursuant to N.J.A.C. 7:19 or NJPDES permit pursuant to this chapter.
- Underground injection of stormwater runoff from the roofs of buildings, so long as the roofs are devoid of pollutant sources and devices (for example, motors, tanks, drums) that contain pollutants.
- The following permits-by-rule are for discharges to ground water which occur when the Department is remediating a contaminated site as defined in N.J.A.C. 7:26C-1.3, pursuant to the rules at N.J.A.C. 7:14B implementing the Underground Storage of Hazardous Substances Act (N.J.S.A. 13:1K-6 et seq.), the requirements of the Industrial Site Recovery Act (N.J.S.A. 13:1K-6 et seq.), or when the owner or operator of a contaminated site is conducting remediation under Department oversight, or the requirements of the Spill Compensation and Control Act (N.J.S.A. 58:10-23.11), or the Procedures for Department Oversight of the Remediation of Contaminated Sites at N.J.A.C. 7:26C;
    - Discharges to ground water, not to exceed 90 calendar days, from pilot treatment plants to obtain engineering design data;
    - Discharges related to in situ biotreatability studies where the discharge will not exceed 180 calendar days from the first date of discharge;

- Discharges to ground water not to exceed 30 calendar days from wells to test aquifers for the purpose of obtaining engineering design data;
- Discharges to ground water not to exceed 90 calendar days from any other facility or equipment associated with the monitoring, engineering, remedial alternatives activities, or design studies necessary to evaluate a contaminated site;
- Discharges to ground water to remediate contamination from discharge of heating oil as defined at N.J.A.C. 7:14A-1.2, at a residential building of four (4) units or less.

What constitutes a technically complete application?

A technically complete application is one that includes all the information necessary to construct a high quality GWPP Plan and provides all the information necessary to demonstrate compliance with the GWQS. The requirements for compiling this information are specified in N.J.A.C. 7:14A-7.9, and are explained further in Part 2. If you plan to operate facilities such as operating landfills or hazardous waste facilities, additional information required is specified in N.J.A.C. 7:14A-7.10 and 7.15.

The BNPC recognizes that all the information in the regulations is not necessary in order to develop a technically complete application and acceptable GWPP Plan. N.J.A.C. 7:14A-7.9(a)1 allows for flexibility, and after consulting with the BNPC some specific items may not be required.

PART 2: TECHNICAL GUIDANCE

DEVELOPING A TECHNICAL REPORT

The NJPDES regulations specify that certain technical information must be submitted for every NJPDES-DGW permit application. This information is generally submitted in a package called the Technical Report. A complete Technical Report describes each discharge and how it will be managed. It should present the technical data in a format that describes the waste, its biological and chemical makeup, proposed level of treatment, disposal method and location of and risk to sensitive receptors. If you pursue the GWPP permit approach, please refer to the GWPP Guidance Manual in addition to this Manual.

The minimum requirements of the Technical Report are specified in N.J.A.C. 7:14A-7.9. However, for convenience, below you will find detailed instructions for compiling the technical information necessary to prepare the Technical Report.

A complete Technical Report must consist of the following information unless otherwise specified by the BNPC in accordance with N.J.A.C. 7:14A-7.9. Additional or alternative information may be required depending on the particular details of the project.

The general structure of the Technical Report should include the items as organized as below:

- Site Description
- Pollutant Characterization
- Treatment of Wastewater/Pollutants (Option 1 or 2)
- Soils, Geology and Water Quality Information

Site Description

FACILITY OPERATION

Each application should include a detailed description of the facility. Specify the nature of the establishment by identifying all activities and operations conducted at the site. Also, provide the square footage of each building, number of employees and the maximum population the facility is designed to serve on a daily basis. If operation of the facility is seasonal, specify dates of operation. If shift work is conducted, specify the number and duration of shifts. Please include the source of all sanitary, non-sanitary wastes and stormwater discharged to ground water (i.e. lavatory, cafeteria/kitchens, showers, floor drains, laboratory, water softeners, non-contact cooling water, process waste streams and outdoor material storage areas). The aggregate sanitary wastewater design flow of the facility and the maximum daily discharge of non-sanitary wastes must be established. For all non-sanitary wastes, please provide information, including a Material Safety Data Sheet (MSDS), for each pollutant or chemical stored on-site and a detailed description of all processes which generate non-sanitary pollutants.

SITE PLANS AND MAPS

1. A plot plan of the facility should be prepared showing:
    - all property boundaries;
    - municipal tax block and lot information;
    - all surface water bodies, wetlands and all areas prone to flooding as identified on State flood delineation maps including any necessary buffer areas associated with each watershed management area and sub-watershed the facility is located in and the direction of ground water flow;
    - existing and proposed surface elevations of the property using 2-foot contour intervals unless otherwise approved;
    - all ground water monitoring wells;
    - all soil borings, soil test pits and permeability tests;
    - all existing and proposed buildings and roadways
    - all water supply wells. Include the depth of the screened interval and yield;
    - all stormwater management facilities (i.e. detention/retention basins, catch basins, drainage swales, etc.);
    - all outdoor materials storage areas;
    - all underground storage tanks;
    - all rock outcrops or sinkholes, gullies and other erosional features.
2. Include an 8 1/2" by 11" plan showing only property boundaries and locations of all buildings, pollutant treatment, storage and disposal areas. This plan is often incorporated into permits.
3. In addition to the plot plan, a general map (USGS 7.5 minute topographic map) must be included. It must designate site property boundaries, adjacent property ownership and land use, surface water bodies, water supply wells, dwellings, wetlands, mines, quarries, dumps, oil and gas wells, and roads within one-half mile of the facility boundaries. This information is useful in identifying pollutant sources and their proximity to sensitive receptors. Plot plans and other technical drawings must be sealed by a New Jersey licensed Professional

Engineer.

4. Well Search: Well searches should be conducted in the expected direction of plume migration, and/or within areas of capture zones of wells within one-half mile of the facility. The Bureau of Water Allocation should be contacted to collect the well search information. If the facility is located in an area where potable water supply is limited to individual supply wells, it may be necessary for additional searches to be conducted. These should include information from local health departments or door-to-door surveying, if necessary.

   The well search should be focused on demonstrating the possible interactions between contaminant plumes and wells. You may be required to do an assessment of the likelihood of the plume interacting with wells. This will entail knowledge of well depth, screen length, pumping capacity, aquifer characteristics, capture zones, etc.

5 Watershed Information: The watershed and subwatershed in which the facility is located must be specified. This information can be obtained from the Office of Watershed Management at the numbers listed below. These offices may also be contacted to obtain consistency determinations required for certain DGW applications.

Northwest Watershed Area	Upper Delaware River, Walkill, Pochuck, Papakating, Central Delaware Tributaries	(609) 633-3812
Northeast Watershed Area	Pompton, Pequannock, Wanaque, Ramapo, Lower Passaic, Saddle, Hackensack, Pascack, Hudson, Upper and Mid-Passaic, Whippany, Rockaway	(609) 633-1179
Raritan Watershed Area	Elizabeth, Rahway, North & South Branch Raritan, Woodbridge, Lower Raritan, South River, Lawrence Brook, Millstone River,	(609) 633-7020
Atlantic Coastal Watershed Area	Monmouth Watersheds, Barnegat Bay Watersheds, Mullica, Wading River, Great Egg Harbor, Tuckahoe, Cape May Watersheds	(609) 984-6888
Lower Delaware Watershed Area	Maurice, Salem, Cohansey, Lower Delaware Tributaries, Rancocas Creek and Crosswicks Creek	(609) 633-1441

Pollutant Characterization

In order to assess the impact the discharge may have on the environment, a pollutant

characterization is required for each discharge in accordance with N.J.A.C. 7:14A-7.9(d)2. However, it is the Department's experience that not all the constituents in N.J.A.C. 7:14A-7.9 need be characterized, based on risk or knowledge of the source. Therefore, the following sections describe what is typically required to be characterized for sanitary discharges and industrial discharges.

POLLUTANT CHARACTERIZATION FOR SANITARY DISCHARGES

Sanitary sewage is defined as "any liquid waste containing animal or vegetable matter in suspension or solution, or the water carried wastes resulting from the discharge of water closets, laundry tubs, washing machines, sinks, dishwashers, or any other source of water carried waste of human origin or containing putrescible material. This term specifically excludes industrial, hazardous or toxic wastes and materials."

For sanitary discharges, include a description of the design quantity and quality of effluent discharged to ground water for the following parameters which are common to most sanitary waste streams (if discharge monitoring reports are available, please include them).

- flow (gallons-per-day) gpd
- pH (SU)
- ammonia-nitrogen (mg/l)
- nitrate-nitrogen (mg/l)
- fecal coliform **(#** colonies/l00 ml)

POLLUTANT CHARACTERIZATION FOR INDUSTRIAL DISCHARGES

If your waste cannot be characterized as sanitary, it is by default industrial, even if only a small fraction of the waste is non-sanitary. Because there are so many industrial chemicals, guidance for characterizing the waste is specified in N.J.A.C. 7:14A-7.9(d)2.

Determination of Environmental Performance Standards and the Point of Compliance

After characterizing the pollutants, it must be decided which pollutants represent a concern. Once you have a list of these pollutants, you need to demonstrate through a technical discussion how you will be able to achieve the applicable environmental performance standards (EPS) at a point of compliance. Depending on the regulated unit, and its location with respect to sensitive receptors and the risk of the discharge to those receptors, the EPS vary. Thus, there can different standards for each pollutant. For sanitary discharges, the Department offers a default set of pollutants to characterize (see list above).

How to establish the relevant Environmental Performance Standards

The Technical Report or GWPP must include a statement regarding the applicable EPS, the risk the pollutants of concern represent to sensitive receptors, and how one intends to achieve the EPS and minimize the risk.

At a minimum, all DGWs including injection wells, are required to achieve the EPS called the Ground Water Quality Standards (GWQS), as specified in N.J.A.C. 7:9-6. These are chemical and/or biological constituent standards designed to protect human health and the environment. In addition, other relevant performance standards exist for sanitary landfills and hazardous waste facilities, and those standards required to protect against impacts to surface water and human contact.

The Technical Report must indicate whether the facility is located in a Class I, II, or III ground water area, and shall include the appropriate letter designation such as I-A, I-PL, etc. It will usually be necessary for the applicant to discuss this with the BNPC during the pre-application meeting, because determining the appropriate Ground Water Classification is very important and requires a thorough understanding of the GWQS. Furthermore, if the discharge is located in close proximity to a surface water body where surface water quality would be impacted, an assessment of the surface water quality criteria for that stream may be required to establish an appropriate EPS.

Establishing the point of compliance

One of the most important tasks in developing a permit is establishing the point of compliance. The point of compliance is where the GWQS will be met for the pollutants specified in your permit. Often a map or series of maps and geologic cross-sections will be needed to clarify the point, or points, of compliance. The zone between the source of the discharge and the point of compliance is considered a Classification Exception Area (CEA) and the concentration of pollutants can be above the GWQS in this area without permit noncompliance. Traditionally, points of compliance have been hydraulically upgradient of a potable well, surface water body or property boundaries. You will need to discuss with the BNPC the specifics as to exactly where the point(s) of compliance are for each parameter of concern. You can also have different points of compliance for different pollutants because it is known that pollutants behave differently in the subsurface environment. For example, some pollutants are almost totally adsorbed by unsaturated soils, such as phosphorus, but other pollutants, such as nitrate, may persist for long distances in ground water. In addition, some pollutants may be prone to alteration in the environment and become even more toxic. For example, TCE, a common industrial solvent, often converts in the ground to vinyl chloride, a known carcinogen. Table 3 shows common EPS as related to different categories of discharges.

Table 3 Environmental Performance Standards Relevant to Different Discharges

Discharge Category	Environmental Performance Standards
Discharges to impoundments that are not designed to leak to ground water.	• Compliance with the GWQS (different for Class I, II, III). • No hydraulic overloading. • No leaks. • BMPs to protect against leaks. • Risk assessment to determine the impact of leaks.
Discharges to ground water that do not meet GWQS prior to disposal. (Option 1)	• Compliance with the GWQS (different for Class I, II, III). • No hydraulic overloading. • No ponding. • Maintenance of an unsaturated zone below the disposal area. • No mounding that would encroach upon a surface water body/wetland area, basement, or other property. • Plume delineation and risk assessment in reference to environmental receptors. • Zone of Endangering Influence if deep well injection N.J.A.C. 7:14A-8.12(a)1.

Discharges to ground water of wastewater that meets the GWQS prior to disposal. (Option 2)	• Compliance with the GWQS (different for Class I, II, III). • No hydraulic overloading. • No ponding. • Maintenance of an unsaturated zone below the disposal area. • No mounding that would encroach upon a wetland or surface water, basement, or other property. • Zone of Endangering Influence if deep well injection N.J.A.C. 7:14A-8.12(a)1.

Establishing the level of wastewater treatment

The application must demonstrate that the discharge will comply with the GWQS and applicable EPS, and must include a clear statement outlining the proposed level and method of treatment that will be used. Treatment methods can range from minimal, such as allowing the ground to work as a treatment unit, to advanced, such as tertiary wastewater treatment plants. There are basically 2 options for treatment:

OPTION 1

This Option allows pollutants to be directed into the ground or onto the ground surface at a concentration greater than the GWQS, and reliance on natural attenuation processes in the ground (dilution, absorption, filtration, biodegradation, etc.) to treat the pollutant(s) as necessary. The application will need to include some type of dilution, vegetative uptake calculation and/or absorption model, or other calculations to show that the soil and/or ground water is capable of treating the pollutants to the GWQS by the point of compliance. You may also need to provide additional treatment of the waste and reduction of the concentration of the pollutants prior to ground water disposal. Ground water monitoring wells are typically required to ensure that the GWQS are achieved at the point of compliance.

As stated earlier, Option 1 allows the applicant to perform dilution or attenuation modeling that demonstrates that the GWQS for specified pollutants can be met at a point(s) downgradient of the disposal area. For most discharges, the modeling approach typically involves predicting the fate of discharged pollutants and how sensitive receptors are impacted. The point, or points of compliance downgradient, will be defined as the downgradient sensitive receptor(s) such as supply wells, surface waters, or the downgradient property boundary. In general, nitrate-nitrogen is a good indicator of a human health or environmental impact threat from sanitary wastewater on ground water, however ammonia-nitrogen is more of a concern if a surface water body is likely to be impacted. For industrial or non-sanitary discharges, dilution modeling is dependent on the chemical characteristics of the individual pollutants of concern. An appropriate model or multiple modeling programs may be necessary to estimate the impacts from the discharged pollutants.

Selection of Option #1 requires that the permittee demonstrate through dilution modeling or plume delineation that the GWQS can be achieved upgradient of sensitive receptors and/or the downgradient property boundary. This is an option most commonly used for large septic systems or treatment plants located in the Pinelands (where the standard for nitrate-nitrogen is 2 mg/l). These systems discharge many constituents at a level greater than the GWQS. Prior to choosing the dilution/absorption model option, the permittee must establish that ambient ground water concentrations are below the maximum concentrations as defined in Table 1 of N.J.A.C. 7:9-6 for each pollutant of concern. If background water quality is above the standards, the

permittee must assess the reasons for the parameter being above the standard and report those findings in the application. If background water quality is of concern, dilution may not be an option for achieving the GWQS.

The dilution model must be able to both quantify the characteristics and delineate the boundaries of the wastewater plume, while accounting for initial piezometric conditions and background ground water quality along with other pertinent hydrogeologic characteristics of the site. The GWQS must be met at the downgradient points of compliance. If potable wells are the major concern, monitoring wells should be positioned at a point between the expected path and depth of the plume and before potable well capture zones. In addition, the monitoring wells should be positioned a sufficient distance from the potable wells that allows for ample warning time and possible remediation if a plume is detected threatening the safety of a potable well.

In the case where plumes are predicted to discharge to surface water bodies, you should contact the appropriate surface water permitting bureau to determine if further courses of action are necessary. You may be required to perform dilution modeling or predict mass loadings to the surface water body, or uptake calculations of pollutants by wetlands organisms, or other measures as stipulated by the Department.

Based on the results of your modeling efforts, discharge limits should be proposed for each pollutant of concern. In the case of nitrate-nitrogen dilution modeling for sanitary discharges, an initial value of 40 mg/l entering the ground water may be used without further consultation from the BNPC. If you would like to use a different value, you must consult with the BNPC for approval.

If the BNPC determines ground water dilution is a viable method of meeting GWQS at the downgradient compliance point, a NJPDES-DGW permit will be issued with discharge limitations and monitoring requirements based on the results of the dilution model. Ground water limitations and monitoring requirements will be established based on the GWQS. Monitoring wells are typically required to assess compliance with the GWQS, as needed.

Characteristics of a good model

Use and application of any model must meet the following criteria and requirements:

- The model must have a history that documents its ability to represent real world situations;
- The set of equations that govern ground water flow and pollutant transport, and the derivation of these equations must be presented;
- The numerical methods used to solve the set of ground water flow and pollutant transport equations must be presented;
- The Boundary Conditions and Initial Conditions used in solving the ground water flow and pollutant transport equation sets should be represented both mathematically and in narrative format;
- A technical narrative describing the model to be used and a justification of its application in the subject context must be presented. This should include whether the model is finite element, finite difference or some other approach.
- Perform mass balance calculations on selected elements of the model to verify physical validity;
- Limits and confidence on modal predictions should be established and stated in the beginning of the modeling report; and

- All inputs and outputs to the model should be listed and explained in detail.

OPTION 2

This is where engineered treatment of the pollutants to a level equal to or less than the GWQS prior to discharge to ground water is provided. In this case, the point of compliance is measured at a location before the wastewater is discharged to the ground. This is often referred to as meeting the standards at the "end-of-pipe" via man-made treatment works. Selection of Option 2 generally expedites the review of the application because of the more extensive technical data and dilution modelling needed to support Option 1 projects. Option 2 allows the applicant to provide a treatment system for discharges that discharges effluent meeting the limits, specified in Table 5 below, prior to disposal. The list may be reduced or expanded on a case-by-case basis based on the type of facility and discharge.

Selection of Option 2 requires the permittee to notify the BNPC in writing that the treatment system will be designed, constructed and operated in such a manner that the following discharge limits in Table 5 will be met at a point prior to discharge to the disposal system. If a surface water body is anticipated to be impacted, these limits may change based upon the surface water quality limitations.

Table 5. Discharge Limits For Typical Monitored Sanitary Parameters

PARAMETER	Class II-A	Class I-PL
Total Nitrogen (maximum) (N03 -N +NH3-N)	10 mg/l	2 mg/l
Fecal Coliform (daily max.)	200 col/ l00 ml	200 col/l00 ml
Chlorine	*	*
Volatile Organics	**	**

* Chlorination is not an acceptable means of disinfection for ground water discharges.

** The discharge of non-sanitary wastes is prohibited. The facility will be required to monitor for the presence of non-sanitary wastes on at least an annual basis. Increased monitoring may be required based on the type of facility and the presence and potential discharge of non-sanitary wastes.

If Option 2 is chosen, the wastewater treatment plant shall be designed, constructed and operated to meet the above referenced discharge limitations. Because Option 2 minimizes risks to sensitive receptors and does not require time consuming dilution modeling evaluations, a draft NJPDES-DGW permit will typically be issued in a much shorter period of time than if Option 1 is chosen. Further, since Option 2 limits the discharge of nutrients, particularly nitrate–nitrogen (limited in the permit as Total Nitrogen) to a quality not exceeding the GWQS, the Department will not require ground water quality monitoring wells to monitor nutrients provided discharge limits are consistently met as specified in a final NJPDES-DGW permit. A minimum of one ground water monitoring well may be required to be installed immediately adjacent to the disposal area if, in the Department's opinion, the discharge setting is considered a high risk to a sensitive receptor and/or to monitor ground water elevations. Effluent limitations for fecal coliform will be required to be consistent with the effluent limitations for the Beneficial Reuse of Wastewater if unrestricted public access to the disposal area is proposed.

Soils, Geologic and Water Quality Information

The applicant is required to specify how pollutants will enter the ground water. The technical report or GWPP plan must indicate the type of regulated unit through which the pollutant will, or could potentially (in the case of lined surface impoundments), enter the ground. There should be a statement that the activity will involve a subsurface disposal bed, spray irrigation system, or infiltration percolation lagoon, etc. Common to all of these methods of discharging water into the ground is establishing how much water the ground can absorb, which should be expressed as gallons per day per square foot (gal/day/ft^2). In the case of surface impoundments, you simply need to demonstrate that the liner is impermeable. See details in the Technical Guidance For Sizing and Positioning of Spray Irrigation Systems. Overland Flow Systems. Infiltration/Percolation Lagoon Systems, and Surface Impoundments, available on the DWQ website.

This section includes technical information required to assess the ground's ability to accept wastewater and attenuate pollutants. It is intended for both shallow or surficial disposal to the unsaturated zone, which often rely on the soil for additional treatment, and deep well injection, which is usually to a saturated formation. The format details the technical information required followed by an explanation as to why the information is important. The technical submission should include a discussion on how the results of the on-site investigations demonstrates the viability of the ground water discharge proposal. Based on your pre-application meeting, you may need to provide any or all of the following technical information. Geologic and soils reports must be signed by a geologist or pedologist or other individual experienced with geology, soils, hydrogeology, etc.

DEPTH TO BEDROCK

A determination must be made to determine the depth to bedrock (soil thickness) below each disposal area for geological provinces other than the Coastal Plain. Specify the type of bedrock and the method used in making this determination (e.g. geophysical survey, boring, publication, etc.).

For shallow discharges, this information is useful in helping to assess the risk of pollutants passing directly into bedrock fractures without first passing through a sufficient layer of soil which acts as a filter. Bedrock is often the location of "deeper" potable ground water and the fractures in bedrock are often extensive and wide enough to allow pollutants to easily migrate great distances.

SOIL DESCRIPTION

A complete soil description obtained from a minimum of one soil pit within 25 feet of each disposal area and a sufficient number of soil borings to provide a representative cross-section of the soil characteristics within each disposal area must be submitted. Additional testing may be required depending upon the nature and extent of the project and the soil characteristics. Soil borings should be to a minimum depth of 20 feet or to bedrock, whichever is shallower, or to a depth that supports the type of dilution/absorption modeling used. Soil descriptions must be based upon the USDA soil classification system. Soil horizons that may not be permeable enough for the given loading rate must be identified and specifications regarding how the

problem will be alleviated must be provided. Detailed information on the development of the Soil Description is outlined below:

- Sufficient borings shall be made of the entire area of the proposed property to characterize and verify the ground water conditions beneath the site with respect to the types of material, uniformity, hydraulic conductivity, porosity and depth to ground water. Borings should employ a grid pattern, wherever possible, such that there is, at a minimum, one boring in each major geomorphic feature. The borings pattern shall enable the development of detailed cross sections through the entire area of the proposed subdivision in order to sufficiently define the geology:
  - i. Subsurface data obtained from borings shall be collected by standard undisturbed soil sampling techniques for engineering properties, and split spoon sampling or standard penetration tests for engineering indexes and classification. Diamond bit coring shall be used for rock borings. Samples shall not be composited. Sampling intervals for the borings shall be determined by the geologist or geotechnical engineer. It is recommended that sampling be performed on a continuous basis in each boring for the first 20 feet below the lowest elevation of the land disposal system and collected at five foot intervals thereafter;
  - ii. All borings shall be a minimum depth of 20 feet below the lowest elevation of wastewater disposal within the proposed disposal area. The Department reserves the right to require deeper minimum depth in areas in which 20 feet is not sufficient to describe the geologic formation and ground water flow patterns below the proposed disposal sites in regard to potential contaminant migration paths;
  - iii. Boring logs shall be submitted for each boring, recording rock and soil conditions encountered. Each log shall include a soil or rock description in accordance with the USDA Soil Classification System or the Rock Qualification Description System, method of sampling, the depth of soil or rock, the water levels encountered, the blow counts, the soil tests and dates. All depths described within the boring log shall be correlated to New Jersey Geodetic Control Survey Datum; and
  - iv. Samples from each significant soil /rock class encountered shall be collected by standard undisturbed sampling techniques and analyzed for bulk density, porosity and hydraulic conductivity. It is recommended that a sufficient number of samples, as determined by the geologist or geotechnical engineer, be analyzed for the index properties to verify the uniformity or non uniformity of the geologic formation encountered.

For shallow discharges, this information is useful in helping to assess the spatial distribution of soils and predicted permeability. In general, a thick layer of unsaturated soil spread out over a large area that allows adequate movement of water is desirable. A minimum desired thickness of the unsaturated soil is dependent on the type of pollutant, level of treatment and the proposed loading rate.

SOIL TEXTURE

A textural grain size analysis of soil samples collected at the proposed level of infiltration and each discrete soil horizon within the zones of treatment and/or disposal must be included.

Additional samples at deeper horizons may need to be collected and analyzed, especially if the soil in zone of disposal is more hydraulically restrictive than the soil in the zone of treatment. In the case of soil replacement systems for sanitary wastewater disposal, the textural grain size analysis may only be required to be performed on a sample of the fill to be used. In the event that less than 4 feet of fill is used, or for any other type of disposal system, the textural grain size analysis must be performed on both the select fill and the native soil to a depth of 4 feet beneath the proposed level of infiltration.

For shallow discharges, this information is useful to help assess the filtering capacity of the natural soil and its permeability. If the native soil is found to be inadequate for a given purpose, suitable fill material may be required.

DEPTH TO WATER TABLE

Depth to the seasonal high water table and the static water table below each disposal area must be determined. Specify the method used in making these determinations. Describe all perched or special water table conditions. Generally, there are two acceptable methods for determining the depth to the seasonal high water table. The highest layer within or below the soil profile that exhibits mottling is an indication of the seasonal high water table, except when the water table is observed at a level higher than the level of mottling. The second method of determining seasonal high water table is to install piezometer wells in the area of the proposed disposal system to monitor the static water level. This monitoring must be conducted during the period of January through April (inclusive) and must encompass at least three separate observation events. These observations must not occur more frequently than once per every two weeks. Allowances must be made in interpretation of data from excessively wet or dry periods.

For shallow discharges, this information is used to help assess the thickness of the unsaturated zone.

PERMEABILITY

A determination of the permeability of the soil within each disposal area expressed as hydraulic conductivity (k). In order to determine the permeability of the most hydraulically restrictive layer below the proposed disposal area, permeability tests must be performed on each different soil horizon and/or rock substratum. This testing must occur to a minimum depth of 20 feet or to the static water table to determine vertical permeability. Horizontal permeability must be established below static water level. For individual disposal areas greater than 2,000 gpd, the results of percolation tests alone do not satisfy the requirement for the determination of vertical and horizontal conductivity.

Hydraulic conductivity (k) must be determined in the upper most saturated zone. The methods used and number of tests used to determine hydraulic conductivity must provide an adequate hydraulic characterization of on-site conditions to demonstrate that the aquifer can accept the volume of discharge proposed. The Department has outlined below the minimum testing requirements necessary for NJPDES-DGW permit applications based upon volume of discharge proposed.

Volume of Discharge per disposal area	Type of Test Required	Number of Tests Required

< 2,000 gpd	Any approved method as stated in N.J.A.C. 7:9A	*b
2,000 - 5,000 gpd	Single well slug or bail tests (rising or falling head)	*c
5,001 gpd-20,000 gpd	Single well short term pumping test (minimum 30 minutes) *a	*c
> 20,000 gpd	Multiple well short term pumping test (minimum 30 minutes) *a	*d

*a The duration of the test must provide adequate stress on the aquifer to be consistent with the proposed discharge and should reflect on-site conditions.

*b The number of tests must be consistent with the requirement in N.J.A.C. 7:9A.

*c A minimum of 2 tests performed in a well installed within the proposed disposal area.

*d A minimum of 2 tests performed in 3 wells, with the pumping well installed within the proposed disposal area and 2 observation wells located at 90^{o} to the pumping well.

Based on the above field testing, derive the following aquifer properties for each disposal area:

- hydraulic gradient (i)
- transmissivity (T)
- velocity (v)

This information is useful in sizing the disposal area and predicting the velocity, mounding and shape of ground water plumes emanating from the source.

When designing a traditional septic system, meaning the treatment of sanitary sewage is only from a septic tank, the following Long Term Acceptance Rate (LTAR) formula should be utilized to calculate the maximum permissible loading rate to the disposal area:

LTAR = 5k -[1.2/log(k)]

Where k = the hydraulic conductivity of the infiltrative surface in feet/minute.

Notes: the formula will automatically convert the units of ft/minute into a result expressed as gpd/sqft.

0.75 gpd/sqft is the maximum allowable loading rate for pressure dosed systems;

0.62 gpd/sqft is the maximum allowable loading rate for gravity systems.

The LTAR is a formula derived on the expectation that a “biomat” of microscopic organisms will form on most soils receiving only primary treated sewage. Although the underlying soil may be more permeable, the biomat creates a layer that is less permeable, and an increase in the size of the disposal field is warranted to prevent hydraulic failure at the infiltrative surface. Results of the LTAR should be used as one method of sizing the disposal area. If you would like to use a different method, please contact the Department.

GEOLOGIC FORMATION

Provide the name and geologic age of the formation receiving the wastewater. Include a general

narrative description of the major characteristics of the geological formations of the region where the proposed disposal site will be located including thickness, lithology, structural features, degree of weathering and amount of overburden. The type(s) of bedrock formations in the area can be obtained by using geologic maps available through the New Jersey Geologic Survey. However, if bedrock is encountered during in-situ subsurface investigation, the exact formations should be identified by an appropriate environmental or geologic professional. Based on the location of the project you may be required to submit additional geological information as outlined below:

A generalized geologic map

- A generalized geologic map and geologic cross sections, based upon published material and mapping available from USGS and NJGS or unpublished mapping acceptable to the NJGS, for the area including the disposal site and region, and should include, but not be limited to:
- Bedrock outcrop;
- Dip and strike of sedimentary formations and foliation trend and dip angles of igneous and metamorphic rocks;
- Faults and predominant shear zone trends;
- Joint and fracture trends in bedrock including dip angles; and
- Trend direction of solution channels in carbonate rocks and sink holes.

This information is used to determine the classification of ground water, either Class I, II or III, and any special concerns related to the geology and classification.

MOUNDING ANALYSIS

Perform a ground water recharge mounding analysis. Include the methodology and supporting documentation for the model used. The lateral extent of the mounding analysis must be sufficient to demonstrate how the mound will effect nearby wells, excavations, basements, stormwater basins, surface water bodies/ wetlands areas, etc. If there is more than one disposal area, indicate how the mounds will interact with one another.

Many mounding models/calculations use transmissivity as one of the main factors. Transmissivity is often expressed as

$$T = kb,$$

where k is the hydraulic conductivity and b is the saturated thickness of the aquifer. When deriving the value for "b", aquifer thickness, you may use the depth of borings on site without consultation from the BNPC. However, if you wish to use another method that will result in a thicker aquifer, such as basing thickness on geologic maps of the area, or geophysical methods, you should consult the BNPC for additional guidance.

The mounding analysis must be calculated using the most restrictive soil horizon that will remain in the disposal area. The mounding analysis must be accompanied with a cross section of the disposal area depicting the lateral extent of the elevation of the mound. The mound height must be calculated to a minimum of 400 feet from the center of each disposal area. The distance must

be increased if there is a sensitive receptor nearby and the mound height at 400 feet demonstrates a potential impact to sensitive receptor.

One example of a computer mounding model can be found in Ground Water, Volume 22, Number 1. The paper is published by Molden, Sunada, and Warner (1984). Another computer program used to provide mounding analysis, and has been used successfully in the NJPDES-DGW permit application process is ModFlow®. However, any ground water mounding analysis may be used as long as the input parameters and the method of analysis consider all of the significant hydraulic conditions at the analyzed site.

For shallow discharges, a mounding analysis is often needed to demonstrate that the ground water below a disposal unit will not "mound up," encroach on the required unsaturated zone, break the surface of the ground at the disposal area or downslope, and create an overland flow situation. It is also desirable to maintain an unsaturated zone between the infiltrative surface and the top of the mounded water table because it is known that unsaturated soil is a great aid in attenuating pollutants. In the case of sanitary discharges, viruses and pathogens are known to be removed through the filtering capacity of unsaturated soils. Since the water table becomes mounded, and is not flat, the configuration of the mound must be considered to ensure that the aeration zone exists and will be maintained during periods of maximum discharge under seasonal high water table conditions. Much of the literature on this topic suggests that between two (2) and four (4) feet of unsaturated suitable soil must be provided in order to attenuate biological contaminants. For this reason, all applicants for discharges of sanitary wastewater must demonstrate a minimum of four (4) feet of unsaturated zone exists between the top of the mounded seasonal high water table and the infiltrative surface. The Department may reduce the required unsaturated zone to two (2) feet of unsaturated zone if disinfection of the wastewater is proposed.

GROUND WATER FLOW DIRECTION

The direction of ground water flow in the vicinity of each disposal area using one of the following methods for any existing facility must be determined**.** The applicant shall summarize the information on a piezometric map, based upon information outlined below, which may include available data including, but not limited to, existing topography, surface drainage and existing well data. The map shall include the direction of ground water flow in the vicinity of each disposal area and the area and extend a minimum of one-half mile beyond the disposal area(s) .

If the proposal is for a newly constructed facility or for facilities that are expanding and have no quantitative ground water elevation data, Option (A) must be used.

(A) Ground water flow direction shall be based on piezometer wells installed in the vicinity of the wastewater disposal area. Depth of the wells should be adequate to measure the direction of ground water flow within the first occurrence of ground water. If multiple disposal areas are utilized in different areas of the site, a minimum of three piezometers per disposal area should be installed. Specify the time and dates the wells were sampled and the ground water elevations. Discuss how seasonal changes and tides may effect the water table. The piezometer wells must be located on the plot plan and the direction of ground water flow indicated.

Prior to installing the piezometer wells, the applicant should contact the Bureau of Water Allocation at (609) 292-2957 concerning well permit requirements. All piezometer wells must

be surveyed (elevation and location), to Department requirements, by a licensed New Jersey land surveyor.

Properly installed piezometer wells may also be used as ground water monitoring wells for NJPDES-DGW permit monitoring requirements provided the wells are constructed according to Department specifications and are located in positions suitable to provide representative samples of the ground water impacted by the discharge. In most cases, the use of two inch inside diameter piezometer wells is acceptable for ground water monitoring purposes. Four inch wells are recommended for deeper wells. The location of monitoring wells constructed to provide the information required for the application is the sole responsibility of the applicant.

(B) The applicant can estimate the direction of ground water flow based on existing well data, topography, geological reports, surface water flow patterns, etc. However, use of this method may not accurately determine the direction of ground water flow. If this method is used initially, it may require the installation of additional wells as a permit requirement or in a Department initiated permit modification, if data shows additional wells are appropriate.

BACKGROUND GROUND WATER QUALITY

The need to establish background ground water quality is dependent on several factors. These factors include the type of treatment proposed, the monitoring approaches that will be employed, and/or the need to establish an affirmative defense for demonstrating an upgradient source of pollutants.

- Background samples shall consist of analyses for the parameters associated with the pollutants in the discharge;
- The well(s) used to characterize background water quality shall be located where unaffected, or if not possible where least impacted, by the discharge. Data shall be provided to show that background water quality wells are located in the hydrologic units as the wells subsequently used to monitor the impact of the discharge and screened at the appropriate depth of concern. For example, if there is a concern about how a contaminant may impact surface water in the expected path of the plume, the wells establishing background should be screened across the water table upgradient of the surface water;
- Background ground water quality should be established through the collection of several sampling events, rather than a single discrete value, to provide for a statistically significant background water quality value. In order to obtain a valid sample that enables an assessment of central tendency (mean, median, standard deviation), a minimum of 5 independent samples must be collected and analyzed over a time period which is representative of variability in the ground water (i.e., seasonal, spatial, etc.). Regulation stipulates that all samples must be collected within eighteen (18) months of the Department's receipt of your application;
- The parameters to be analyzed must be determined in consideration of the pollutant characterization discussed earlier in this Manual. Once analyzed, the sample data from each independent event should be pooled for each parameter and central tendencies that are appropriate to the distribution of the data (e.g. parametric or non-parametric) must then be calculated.

The wells used to establish the piezometric map may also be used to obtain the above referenced ground water samples provided they are screened within the appropriate aquifer (usually the

uppermost aquifer).

Existing facilities proposing to expand shall provide the BNPC with the results of ground water quality monitoring downgradient of the existing disposal area to determine if the facility is in compliance with the GWQS. If the facility is not proposing additional pretreatment, substantial modifications or relocation of the disposal areas and has shown that the existing discharge is not in compliance with the GWQS, ground water dilution may not be a viable method of achieving compliance in the downgradient monitoring wells and additional pretreatment will be required.

INSTRUCTIONS FOR DETERMINING ALTERNATIVE FLOW DATA FOR SANITARY DISCHARGES

To determine if a facility requires a NJPDES-DGW permit the design flow of the facility must be determined based on the design criteria found in N.J.A.C. 7:9A. At times an applicant will wish to design their system based on actual flow because the applicant believes the design criteria are not reflective of the operation of their particular facility. Although the disposal bed may be designed for a lower flow, this does not negate the requirement for a NJPDES-DGW permit. As an option, the BNPC allows the use of actual flow data obtained from similar facilities (or the facility in question when the proposed expansion is consistent with the existing use) in order to predict a more individualized "alternate" design flow. The use and size and hours of operation of the facility must be identical if actual water use data is proposed. For example collecting actual water use from an existing church to be used as the basis for determining the design flow of a proposed church is not acceptable if the existing church does not have a large kitchen, multi-purpose room or classrooms and the proposed church includes these amenities. The used of actual water use would also not be appropriate for designing a commercial strip store which would experience a variety of types of tenants. The method of determining an alternate design flow is as follows:

The applicant should discuss the details of collecting and assessing actual flow data with the BNPC and the appropriate Bureau of Engineering (BE) to establish acceptable guidelines. Typical guidelines are outlined below.

Collect actual flow data on a daily basis over an agreed upon time period (minimum 3-months) covering the peak seasonal operational period. When collecting the data, both the peak daily maximum and the average daily flow need to be determined. All individual daily readings must be submitted along with a detailed description of the type of facility (number of golfers, students, etc), hours of operation, and a detailed description of the operation which demonstrates how the data is reflective of the operation of the proposed facility.

Once the peak and average actual flows are known, the alternate design flow can be based on the greater of two values: 1) the highest daily maximum reading, or 2) the average daily flow plus a 50% safety factor, whichever is higher.

Use the new design flow in subsequent calculations. There is no guarantee the alternate design flow value will be acceptable to the BNPC and BE, although if the methodologies are followed as outlined above, the value is typically acceptable.

This method is applicable to most situations, however, on a case-by-case basis the BNPC will

review other methods. Once an alternate flow value has been accepted by the BNPC, it can be used for re-rating existing systems or designing expansions or entirely new systems. NJPDES-DGW permits may be written/modified as needed to correspond with the new alternate flow values.

If there are no water or wastewater records available, the Department design flow standards must be used. In the case of large systems, an alternative safety factor for use with the average flow values may be considered depending on individual projects.

In cases where an expansion is being proposed to an existing facility peak (or modified average) daily flows for the existing structure must be added to the Department's design flow standards for the proposed portion of the project. Exceptions may be made in cases where the use of the proposed addition is identical to the existing use (such as schools). The design capacity can be obtained by adding the peak (or modified average) daily flow of the existing facility to a prorated flow for the proposed expansion.

The above guidelines are to be used when determining the adequacy of existing systems in relation to the volume of wastewater that can be handled. However, it is still the responsibility of the applicant to ensure compliance with the permitted flow. In cases where the BNPC determines that the average and peak flow-data is within the flow limitations outlined in the NJPDES-DGW permit, the BNPC may modify the permit to authorize the expansion of the scope of the project. Should the flow data show the expansion would cause an increase in the permitted flow, the permittee must obtain a NJPDES-DGW permit for an expansion of the permitted flow for the facility.

APPENDICES

Definitions

Ground Water Protection Standards (GWPS):
The standards found in N.J.A.C. 7:9-6, N.J.A.C. 7:14A-8, 9, or 10. Different standards are applicable to different types of regulated units or facilities.

GWPP or GWPP Plan:
A Ground Water Protection Plan, as identified in N.J.A.C. 7:14A-7.6. It is a plan that establishes the method a facility will use to demonstrate compliance with the applicable EPS or GWPS. The GWPP can be developed by the applicant or by the Department. A separate guidance document is available from the Department that describes the detailed instructions for developing a GWPP.

Infiltration/percolation lagoons:
"Infiltration percolation lagoon" means a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to transmit pollutants to the subsurface and which is not an injection well.

Injection wells:
"Injection well" means a well, septic system, subsurface disposal bed, cavity, tube or pipe, or any structure used to deliver fluids directly to a point below the ground surface.

Land disposal of dredge materials:
Any placing of dredge spoil on to the land which can leach into the ground water. "Dredge spoils" means sediments, known as spoils, removed during dredging operations.

Overland flow:
"Overland flow" means the controlled discharge, by spraying or other means, of pollutants onto sloping land with maintained vegetation where a proportion of the wastewater may appear as runoff. Overland flow is also the movement of pollutants across the surface of the land where infiltration may occur.

Residuals surface impoundments:
A surface impoundment that holds residuals. "Residual" means a solid waste that consists of the accumulated solids and associated liquids which are by-products of a physical, chemical, biological, or mechanical process or any other process designed to treat wastewater or any other discharges subject to regulation under the State Act. For purposes of this chapter, residual includes, but is not limited to, marketable residual product, sludge and sewage sludge. Residual excludes screened vegetative waste and grit and screenings.

Spray irrigation:
"Spray irrigation" means a system for land application of pollutants, over maintained vegetated ground surfaces using sprinkler heads or nozzles as a method of application. "Standards for residual use or disposal" means the standards at N.J.A.C. 7:14A-20, 7:26, 7:27 and 40 CFR Parts 257, 258 and 503 which govern minimum requirements for residual quality, management practices, and monitoring and reporting applicable to residual or the use or disposal of residual by any person. These standards may include, but are not limited to, standards for sewage sludge use or disposal.

Surface impoundments:
“Surface impoundment” or “impoundment” means a facility or part of a facility which is a natural topographic depression, a man-made excavation, or a diked area formed primarily of earthen materials (although it may include a liner). It is designed to hold an accumulation of liquid or solid wastes or wastes containing free liquids, and is not an injection well. Examples of surface impoundments are holding, storage, settling and aeration pits, ponds, and lagoons.

Technical Report:
A Summary of all the Technical Information identified in N.J.A.C. 7:14A-7.9, or as explained in 'Plain English" in Part 2.2. The Technical Report can be submitted as a GWPP by following the GWPP Guidance.

Other Guidance Documents Available from the DWQ

Additional Guidance and information sheets are produced form time to time, and are available by request. Please call the BNPC or look at the DWQ website at http://www.state.nj.us/dep/dwq/ Currently, the following Guidance is available:

- Guidelines for Designing, Constructing, and Spray Irrigation Systems, Overland Flow Systems, Infiltration/Percolation Lagoon Systems, and Surface Impoundments. This guidance document has been produced for anyone intending to engineer on of the regulated units describes in this topic heading. It is a compilation of recognized

practices and procedures for designing commonly used mechanisms to manage the disposal of liquid and solid pollutants.

- Guidance For Preparing Applications For 50 Or More Realty Improvement Certifications
- Guidelines For Developing Ground Water Protection Program Plan