Guidance for Land Application of Municipal Biosolids

Idaho Department of Environmental Quality
Revised December 8, 2011

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Table of Contents

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1. Introduction

IDAPA 58.01.16, Wastewater Rules, Section 650 states that sludge can be used for soil augmentation only in conformance with a *sludge disposal plan* or in a manner approved specifically for that site. The sludge disposal plan of Section 650 is referred to in this guidance as a *biosolids management plan.*

The purpose of this guidance is to assist biosolids generators, users, and regulatory officials in developing biosolids management plans that comply with state requirements. This guidance relates specifically to the use of biosolids resulting from the treatment of *municipal* wastewater.[1]

This document describes the information that the Idaho Department of Environmental Quality (DEQ) will consider when reviewing a biosolids management plan for land application of municipal biosolids. This guidance is not a rule and is not intended to take the place of a thorough understanding of applicable laws, substitute for practical experience, or address every situation that may be encountered. This guidance is not intended to ensure compliance with federal regulations or local ordinances, but there are references to federal regulations and federally approved practices. Appendices provide additional information for site-specific situations that may pertain to federal regulations. Alternatives to this guidance may be accepted on a case-by-case basis by consulting with DEQ and obtaining approval.

If you identify any errors in these guidelines or believe additional information should be included, please notify DEQ in writing (by regular or electronic mail). Your recommendations will be reviewed for inclusion in future revisions of this document.

1.1 Definitions

The following definitions apply to this guidance:

- Biosolids. The term *biosolids* is defined in IDAPA 58.01.16.010 as *sludge*. For purposes of this guidance, these terms are interchangeable. Biosolids refers to the semi-liquid mass produced and removed by the wastewater treatment process that can be beneficially recycled.[2] Biosolids do not include the grit, garbage, and large solids that are removed by screens or filters in the wastewater treatment process. The most common way to recycle biosolids is to use them for soil augmentation. In most cases, augmentation means biosolids are applied to the land at a rate beneficial for plant growth. Biosolids must meet state and federal criteria when used for soil augmentation.
- Biosolids Generator. A *biosolids generator* is an entity that generates biosolids, such as a publicly operated or owned treatment works.
- Biosolids Management Plan. A *biosolids management plan* is equivalent to the *sludge disposal plan* referred to in IDAPA 58.01.16.650.

[1] Much of the information provided herein will be applicable to management of non-municipal biosolids; a biosolids generator of non-municipal biosolids should consult with DEQ to develop an appropriate management plan.
[2] Note that domestic septage is regulated under IDAPA 58.01.15, "Rules Governing the Cleaning of Septic Tanks," and describes the manner in which septage may be disposed. However, DEQ recognizes the value in recycling septage, so septage may be used for soil augmentation if done in conformance with IDAPA 58.01.16.650. Please consult with your DEQ regional office for additional guidance.

- Biosolids Preparer. The person who prepares biosolids, or *biosolids preparer,* is either the person who generates biosolids during the treatment of domestic sewage in a treatment works or the person who derives a material from biosolids.
- Biosolids User. The *biosolids user* is the entity that uses biosolids, such as the person who applies biosolids to land to provide extra nutrients for crops.
- Responsible Party. The *responsible party* is the entity responsible for complying with state and federal requirements for management of biosolids. The responsible party is most often the biosolids generator or preparer, but depending on the circumstances, a biosolids user may also be deemed the responsible party.

1.2 Biosolids Land Application

Land application is the predominant method of disposal of municipal biosolids in Idaho. Approximately sixty percent of the municipal biosolids produced in the state are reclaimed in this manner. Biosolids can have value as a soil conditioner and a source of plant nutrients. DEQ supports the properly managed beneficial use of biosolids for land application, consistent with state and federal rules.

1.3 Authorities and Responsibilities

The use of biosolids must meet all applicable regulations, including federal and state laws and local ordinances.

1.3.1 State Regulations

The Environmental Protection and Health Act (EPHA), Idaho Code §§ 39-101, *et seq.*, charges DEQ with protecting human health and the environment. Under the authority granted DEQ in the EPHA, and in accordance with the Idaho Administrative Procedures Act (Idaho Code §§ 67-5200, *et seq.*), DEQ has adopted rules and published guidance.

IDAPA 58.01.16, Wastewater Rules, and IDAPA 58.01.02, Water Quality Standards, implement portions of the EPHA and include provisions for the protection of human health and the environment from contamination by the land application of municipal biosolids. In particular, IDAPA 58.01.16.650 regulates the use of sludge for soil augmentation and requires a DEQ-approved sludge disposal plan—a biosolids management plan.

IDAPA 58.01.17, Recycled Water Rules, authorizes DEQ to permit biosolids land application sites. In most situations, a permit is not necessary as long as IDAPA 58.01.16.650 is followed. DEQ reserves the right to require a permit under IDAPA 58.01.17 on a case-by-case basis.

1.3.2 Federal Regulations

As required by the Clean Water Act Amendments of 1987, the U.S. Environmental Protection Agency (EPA) developed Code of Federal Regulations (CFR), Title 40, Part 503, Standards for the Use or Disposal of Sewage Sludge (EPA, 1993), to protect public health and the environment from certain pollutants that might be present in municipal biosolids. To ensure that the regulated community is aware of its legal obligation to conform to the federal regulations, in addition to state law, IDAPA 58.01.16.650 references 40 CFR Part 503.

40 CFR Part 503 establishes requirements for the disposal of biosolids when they are applied to land to condition the soil, and the regulation also includes general provisions regarding surface disposal, incineration, and pathogen and vector reduction. In most cases, the requirements of 40 CFR Part 503 apply to "any person who prepares sewage sludge, applies sewage sludge to land, or fires sewage sludge in a sewage sludge incinerator, and to the owner/operator of a surface disposal site." Additionally, treatment works treating domestic sewage must apply for a federal permit and abide by the terms of the permit.

EPA is the permitting and enforcement authority for 40 CFR Part 503. Approval of a biosolids management plan by DEQ only relates to compliance with state law and IDAPA 58.01.16.650.

For federal compliance issues and questions, please contact your local EPA office. You may also find the following documents helpful:

- *A Plain English Guide to the EPA Part 503 Biosolids Rules*, (EPA, 1994), http://www.epa.gov/owm/mtb/biosolids/503pe/index.htm
- *Guide to Field Storage of Biosolids and Other Organic By-Products Used in Agriculture and for Soil Resource Management*, (EPA, 2000) http://www.epa.gov/OW-OWM.html/mtb/biosolids/fsguide/fsguide.pdf
- *Process Design Manual: Land Application of Sewage Sludge and Domestic Septage*, EPA/625/K-95/001, (EPA, 1995) http://www.epa.gov/nrmrl/pubs/625k95001/625k95001.pdf

In many instances, compliance with federal biosolids management requirements may result in compliance with state law as well. However, the state and federal regulatory programs are operated independently, and the regulated community must ensure compliance with both. Note also that some biosolids may contain constituents that are subject to additional federal regulation beyond 40 CFR Part 503 (see Table 4, page 10), and the responsible party must comply with all applicable requirements.

2. Discussion

After treatment and processing, biosolids are rich with nutrients and may be recycled through soil augmentation, also known as land application.[3] If done properly, introduction of biosolids to the land improves and maintains productive soils and stimulates plant growth. The controlled land application of biosolids can complete a natural cycle in the environment, potentially reducing the need for chemical fertilizers and improving physical properties of the soil, such as bulk density, aggregation, porosity, and water retention.

2.1.1 Biosolids Management is Complex

DEQ recognizes the value in biosolids recycling. However, biosolids management is a complex endeavor that requires strategic planning to avoid the following potential problems:

- Disease transmission through plants or animals
- Accumulation of heavy metals and toxic chemicals in the food chain
- Contamination and degradation of surface water or ground water quality due to runoff or leachate migration under or near the application site
- Nuisance conditions, such as odors, vectors, and unsightliness

DEQ will evaluate a biosolids management plan and ensure that it contains complete and accurate plans or methods for dealing with these common problems, along with cohesive management of biosolids, soils, and crop management.

2.1.2 Biosolids Management Plans Are Required by Idaho Law

IDAPA 58.01.16.650 requires that biosolids management plans (referred to in the rule as sludge disposal plans) for soil augmentation be submitted to DEQ for review and approval prior to land application of municipal biosolids. Review and approval of a biosolids management plan occurs at DEQ regional offices located around the state.

The plan must include the following ownership information, as applicable:

- Name and address of the biosolids generator.
- Name and address of the person who prepares the biosolids for the biosolids user.
- Name and address of the person who owns the land on which the biosolids are to be applied. If the land is leased, evidence of authority to use the property for land application, such as a lease agreement that specifically mentions land application, must be included with the plan.

Biosolids management plans must accurately and completely describe biosolids management at all times. Therefore, the plan must be regularly updated to reflect modifications or changes in management practices. To avoid the potential for an enforcement action, DEQ must be provided with the proposed modifications and updates to the plan prior to implementation, and such proposals must be approved by DEQ prior to implementation.

[3] Biosolids not land applied are generally incinerated or buried in a landfill. This guidance does not address these other methods of disposal.

3. Development of a Biosolids Management Plan: Process Overview

The development of a biosolids management plan includes the following actions:

3.1 Step 1: Consult With DEQ

During a pre-project consultation, DEQ meets with parties interested in land applying municipal biosolids. A pre-project consultation streamlines the development of the plan and reduces DEQ's plan review time by ensuring that the proposed biosolids activity is generally in accordance with state law.

The responsible party should bring the following items to the pre-project consultation:

- *Biosolids Management Plan Checklist* (Appendix A, page 27). Using the checklist will help ensure that all necessary topics are addressed.
- Any other information about the proposed activity that may be available, such as land ownership documentation, site characteristics, biosolids characteristics, and a description of the intended manner of land application.

During the consultation, DEQ and the responsible party will cooperatively develop a list of items needed for completion of the biosolids management plan.

3.2 Step 2: Develop the Biosolids Management Plan

Starting from the list developed during the pre-project consultation, the responsible party will prepare a biosolids management plan that addresses the content requirements of IDAPA 58.01.16.650.

Section 4 of this guidance provides specific suggestions for the type of information DEQ expects to see in a plan. Ultimately, however, individual site characteristics, the scale of the operation, the frequency of land application, and the proposed method of application will dictate the final content of an approvable plan. For simple land application projects, this guidance may cover all required elements in a plan and minimal interaction with DEQ will be necessary. The development of plans for more complex projects, however, may require close cooperation between the responsible party and DEQ, and adequate lead-time for the development of such a plan should be accounted for.

3.3 Step 3: Submit the Biosolids Management Plan to DEQ

DEQ regional office staff typically review biosolids management plans within 45 days of submittal of a complete plan. (Completeness will generally be determined by reference to the Biosolids Management Plan Checklist.) Following review, the regional office issues a written decision to approve, disapprove, or approve-with-conditions the submitted biosolids management plan.

Pursuant to IDAPA 58.01.16.650, written approval by DEQ of the biosolids management plan must be issued prior to the land application of biosolids.

3.4 Step 4: Submit Changes to the Approved Biosolids Plan to DEQ

Biosolids management plans must accurately and completely describe biosolids management at all times. Therefore, the plan must be regularly updated to reflect modifications or changes in management processes. To avoid the potential for enforcement action, DEQ must be provided with the proposed modifications and updates to the plan prior to implementation, and such proposals must be approved by DEQ prior to implementation.

4. Biosolids Management Plan Recommended Contents

In order for DEQ to determine if human health, the environment, and ground water will be protected from contamination by land application of biosolids, a biosolids management plan should provide the ownership information identified in section 2.1.2 of this guidance and address the elements shown in IDAPA 58.01.016.650.03, including the following:

- Biosolids characterization and stabilization (IDAPA 58.01.16.650.03.a)
- Site selection criteria, including soil types, geology, ground water characteristics, land use, topography, and climate (IDAPA 58.01.16.650.03.b)
- Biosolids application process (IDAPA 58.01.16.650.03.c)
- Procedures to prevent reduction in soil productivity and excess nutrient loading (IDAPA 58.01.16.650.03.d)
- Potential health effects from the proposed use, with delineation of methods to be used to alleviate or eliminate adverse effects (IDAPA 58.01.16.650.03.e-f)

Guidance on addressing these requirements is provided in the rest of this section. These content areas are also addressed in the *Biosolids Management Plan Checklist*, Appendix A, page 27.

Biosolids management plan approvals are made on a case-by-case basis with full consideration of site characteristics, project scale, and the number of planned applications. Large-scale operations on lands specifically dedicated to biosolids application may also require an engineering report to provide sufficient detail for a thorough review.

Once approved, the biosolids management plan should be made available to all individuals who use the site and to all responsible parties. Detailed knowledge of the plan by all those involved with the management of biosolids will help ensure compliance with the plan and avoid the potential for an enforcement action.

4.1 Biosolids Characterization and Stabilization

IDAPA 58.01.16.650.03.a specifies that only stabilized sludge (biosolids) can be used for land application. Biosolids stabilization should reduce or eliminate dangerous pathogens in the biosolids, reduce odors, and inhibit further microbial growth to protect public health and the environment. This section of the biosolids management plan should provide the following:

- A description of the wastewater treatment process, including unit processes (i.e. headworks; primary, secondary, and tertiary treatment; disinfection system) and wastewater design flow and origin.
- A description of the proposed method of biosolids removal and treatment, such as thickening, digestion, dewatering, drying, composting, heat treatment, or lime stabilization. Pathogen reduction from the raw biosolids to the treated biosolids also needs to be described.
- An inventory of all constituents of concern that may be found in the biosolids to be land applied as well as information for determining agronomic rates (where applicable) or application limits:

- Analyze for the constituents shown in Table 1 as well as any other constituents of concern specific to the wastewater being processed.

Table 1. Biosolids characterization parameters.*

Type of Biosolids	As defined by processing
Annual Product Volume	Gallons and dry tons
Total Solids	Percent
pH	Standard Units
Nutrients (dry weight basis)	Units
Total Nitrogen	mg/kg
Total Kjeldahl Nitrogen (TKN)	mg/kg
Total Ammonia-N	mg/kg
Nitrate-Nitrite N	mg/kg
Total Phosphorus	mg/kg
Total Potassium	mg/kg

* This list is subject to change, either due to modification to Part 503 or because of new knowledge regarding previously non-inventoried substances.

- Identify toxic inorganic compounds and discuss risk based limits, such as those listed in 40 CFR 503.13 (Table 2); the limits provided in the federal regulation are consistent with those DEQ uses when reviewing the adequacy of a biosolids management plan. Compounds present at concentrations exceeding a federal or state risk-based pollutant limit must be managed and disposed in a manner consistent with applicable law.

Table 2. Biosolids characterization parameters for heavy metals and trace inorganics.*

Trace Inorganics	Ceiling Concentration Limit (mg/kg)	Cumulative Pollutant Loading Rate Limit (kg/hectare)	Monthly Average Concentration Limit (mg/kg)	Annual Pollutant Loading Rate Limit (kg/hectare per 365 day period)
Arsenic	75	41	41	2
Cadmium	85	39	39	1.9
Copper	4300	1500	1500	75
Lead	840	300	300	15
Mercury	57	17	17	.85
Molybdenum	75	--	---	--
Nickel	420	420	420	21
Selenium	100	100	100	5
Zinc	7500	2800	2800	140

* This list is subject to change, either due to modification to Part 503 or because of new knowledge regarding previously non-inventoried substances. For the latest updates search http://www.gpo.gov/fdsys/ for *40 CFR 503.13*.

Biosolids that exceed the regulatory limits for inorganic constituents established in 40 CFR 503 should be evaluated as a solid waste and, potentially, a hazardous waste. Generators of solid waste are required by state and federal regulations to determine if their waste is hazardous. Please contact your DEQ regional office for assistance with solid waste and hazardous waste requirements.

- A discussion of expected variations in biosolids loading. If constituent concentrations are expected to vary over time, the plan should discuss how such variation will be accounted for to ensure compliance with regulatory limits.

- Identification of pathogens. Protecting public health includes reducing the pathogens in biosolids, so identification of pathogens must be a part of the biosolids characterization. The EPA document, *Environmental Regulations and Technology Control of Pathogens and Vector Attraction in Sewage Sludge* (EPA, 2003) provides further information:

  http://www.epa.gov/nrmrl/pubs/625r92013/625R92013.pdf

  Pathogen analysis should include the levels considered safe[4] for biosolids to be land applied according to Part 503 (Table 3).

Table 3. Pathogen limits for land application.*

Class A Pathogens	Units	Determination	Density Limit
Fecal coliform	CFU or MPN /g total solids (dry-weight basis)	Geometric mean of ≥7 individual grab samples taken over a 14 day period	<1,000 fecal coliform/g total solids
Salmonella sp.	CFU or MPN /g total solids (dry-weight basis)	Arithmetic mean of ≥7 individual grab samples taken over a 14 day period	< 3 MPN/4 g total solids
Enteric virus	PFU/4g total solids (dry-weight basis)	One composite sample of ≥7 individual grab samples taken over a 14 day period and the arithmetic mean of 4 duplicate analysis of the composite	< 1 PFU/4 g total solids
Viable helminth ova	Viable ova /4g total solids (dry-weight basis)	One composite sample of ≥7 individual grab samples taken over a 14 day period and the arithmetic mean of 4 duplicate analysis of the composite	< 1 viable ova/4 g total solids
Class B Pathogens	Units	Determination	Density Limit
Fecal coliform	CFU or MPN /g total solids (dry-weight basis)	Geometric mean of 7 individual grab samples taken over a 14 day period	≤2 million MPN/g total solids

* This list is subject to change, either due to modification to Part 503 or because of new knowledge regarding previously non-inventoried substances. For the latest updates, search http://www.gpo.gov/fdsys for *40 CFR 503*.32.

[4] This guidance references the pathogens as Class A or Class B, using the methods and classifications developed by EPA. In general, pathogens are not detectable in Class A biosolids, and Class B biosolids have detectable pathogens in amounts that do not pose a threat to public health and the environment. Class B biosolids will have conditions for their use and disposal.

- Identification of other constituents of concern. Additional federal statutes and regulations that may apply are listed in Table 4. DEQ will require a plan to identify constituents of concern that are regulated by other federal law and may require the plan to address compliance with such laws.

Table 4. Additional requirements that may apply

Safe Drinking Water Act (SDWA), which established Maximum Concentration Levels
Clean Water Act (CWA). Waste residuals that can create an impact to surface water bodies may require a National Pollution Discharge Elimination System (NPDES) permit from Region 10 of the U.S. Environmental Protection Agency, 1200 Sixth Avenue, Seattle, WA 98101. Telephone (206) 553-1200 http://cfpub.epa.gov/npdes/
Resource Conservation and Recovery Act (RCRA)
Atomic Energy Act (AEA, 1954), including *Standards for Protection Against Radiation* (10 CFR 20) and *Domestic Licensing of Source Material* (10 CFR 40).
Occupational Safety and Health Administration (OSHA) requirements, Title 49, Subtitle B of the Code of Federal Regulations (CFR): *Other Regulations Relating to Transportation.*

4.2 Site Selection Criteria

IDAPA 58.01.16.650.03.b requires that biosolids management plans include a discussion of site selection criteria. Site characteristics are instrumental in determining the site's potential for effective beneficial reuse of biosolids and in determining the potential for the transport of constituents from the site to surface or ground water.

When selecting a site, use the criteria listed in IDAPA 58.01.16.650.03.b, and consider the following:

- Land application of biosolids is to be evaluated as a soil augmentation system, not a disposal system. The objective is to utilize biosolids as soil augmentation and to prevent problems related to ground and surface water pollution and the creation of nuisance situations. Sites should be evaluated, and treatment systems should be designed for long-term sustainability, so that the site may be returned to other uses with minimal remedial activity if site closure becomes necessary.
- Evaluate the useful life of the site based upon the quality and characteristics of the biosolids and the frequency and manner in which the site is used. The site should have capacity to meet the limits defined in section 4.1 of this guidance. Will the site be usable for the period needed, and is there capacity available to meet both current and future regulatory limits?
- It is strongly recommended that local officials and the public be consulted during site selection. Due to the possible health and nuisance impacts that a soil augmentation site can create, the public and in particular neighbors to the proposed site can take great interest in such projects. Failure to include the public and local officials in the site selection process can result in poor relations and, in extreme cases, protracted and costly litigation. Ultimately, public awareness and acceptance of the project may help determine which sites may or may not be preferable or even viable.

Site selection shall address the following specific criteria required by IDAPA 58.01.16.650.03.b, providing a narrative for each.

4.2.1 Soils Description

IDAPA 58.01.16,650.03.b.i requires a description of the site soils.[5] The narrative should include details of the physical and chemical characteristics of the soil within the entire rooting zone (the upper five feet), including soil properties, soil thickness, and other considerations.[6]

Soils Properties

Describe soil properties instrumental to assessing the site's potential for accepting biosolids or the hydraulic loading capacity, including the following:

- available water holding capacity
- color
- depth
- horizons
- hydraulic conductivity
- infiltration
- internal drainage class
- leaching potential
- mottles
- nutrient availability (existing nutrients available in soil, including plant available nitrogen, phosphorus, and potassium)
- permeability
- pH
- shrink-swell potential
- structure
- texture
- traffic-ability
- existing heavy metal concentrations (specifically those listed in Table 2, page 8)

Some information on a site's soil types, characteristics, and depths may be obtained from the *Soil Survey* published by the U.S. Department of Agriculture (USDA, 2011) Natural Resource Conservation Service (NRCS):

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[5] Soil, which includes minerals, organic matter, water, and air, is the primary nutrient media for plants. Soil health involves the interactions between these components (for example, water can percolate through soils and transmit contaminants) so soils should act as a filtration system or a sorption media for attenuating contaminants.

[6] For more detailed information and guidance regarding soils, see the soils section of DEQ's water reuse guidance, available at http://www.deq.idaho.gov/media/516329-guidance_reuse_0907.pdf.

http://websoilsurvey.nrcs.usda.gov/app/

In areas with limited existing data, test pits or borings may be necessary to determine soil types and thicknesses. A map of the test pit and boring locations, along with the areal extent of the soils, should be provided.

Soil Thickness

Discuss the thickness of the soil. In general, the minimum soil thickness for filtration is two feet, but the actual thickness required depends on the soil type and the project. To ensure that pollutants will not have an easy conduit to ground water, the underlying substratum, to at least two feet, should not be rapidly draining.

Additional Considerations

Discuss any of the following that may apply:

- Do the soil's physical, chemical, and biological properties fluctuate with the seasons and use? For example, soil may be cold, warm, dry, or moist—all of which can affect the biological activity. Soil pH, soluble salts content, amount of organic matter, carbon-nitrogen ratio, numbers of microorganisms, soil fauna, temperature, and moisture all change with the seasons as well as with more extended periods of time and use. Soil health and vitality must be viewed from both the short-term and long-term perspectives.
- Has the site previously been used for biosolids application? Soils should be tested before application for background concentrations of constituents of concern identified in the biosolids characterization. At a minimum, soils should be tested for pH, nutrients, and metals concentrations to assess site loading every five years.

Generally, soil plays four major roles in the land application of biosolids:

- Providing a medium for plant growth. Soils provide anchorage for vegetation, supply nutrients and water, and enable the exchange of gases between plant roots and the aboveground atmosphere.
- Providing habitat for a multitude of organisms.
- Degrading and recycling organic materials. Soils have the capacity to assimilate large quantities of organic waste and convert the nutrients in the waste to forms that may be used by plants and animals.
- Influencing the quality of water passing over or through the soil. Contaminated water passing through the soil may be cleansed of its impurities through a variety of soil processes, including microbial digestion and filtration. Conversely, clean water passing through a contaminated soil may itself become impacted.

4.2.2 Geological Features

IDAPA 58.01.16.650.03.b.ii requires a discussion of the geologic features[7] of the site. Describe and discuss surface and subsurface features that characterize contaminant movement and

[7] Site-specific geology and hydrogeology help to determine the fate of water and constituents that leach through the soil and potentially enter ground water. The site should be on a stable geologic formation that is not subject to flooding or excessive runoff.

behavior. Identify all features that provide the potential for contaminants to reach ground water, and provide an indication of risk to existing beneficial uses of ground water from constituents in percolate.

4.2.3 Ground Water and Surface Water

IDAPA 58.01.16.650.03.b.iii requires the plan to include a description of the ground water characteristics of the site. Describe the area[8] potentially affected (chemically, physically, or biologically) by contaminant migration resulting from the proposed soil augmentation activities. Take into account advection, dispersion, and diffusion of contaminants in water.

Describe and discuss the following:[9]

- The potential impact of biosolids land application on aquifers underlying the site. The narrative should include the hydrogeologic parameters used to assess and predict contaminant movement in the aquifer.
- Seasonal water table elevations and ground water flow and direction(s) for all seasons. The minimum depth to ground water should not be less than four feet. Hydrographs and equipotential maps should be included if available.
- Water wells.[10] The location, construction details, and screened interval(s), depth, pumping rates, static water level, geologic information from drillers logs, and hydrogeologic position (up-gradient or down-gradient) of all water wells within a half mile of biosolids application sites should be obtained and evaluated.

Include a discussion of beneficial uses[11] of ground water that addresses the following:

- All existing and future beneficial uses of ground water that have the potential to be impacted by the facility's wastewater land treatment activity. The plan should provide assurance that a current or projected future beneficial use of the waters of the state will not be adversely affected. Beneficial uses of ground water can be evaluated by identifying land ownership, land use, zoning restrictions, and well water use in the surrounding area. Source water assessments for municipal drinking water systems, typically prepared by DEQ, should be consulted as available. For additional information, see the following:

  http://www.deq.idaho.gov/water-quality/source-water/assessments.aspx

[8] The size of the potentially affected area will depend upon biosolids quality, volume applied and rates of application, site characteristics and management, and aquifer characteristics including mixing characteristics. The responsible party can use flow, transport, and mixing zone modeling to help describe these areas.

[9] This information is important in interpreting ground water quality data and in predictive modeling, which may be necessary to make preliminary assessments of the feasibility of a proposed activity in a particular hydrogeological setting. California EPA (1995) has useful guidance about modeling for hydrogeological characterization, including identifying objectives, model selection, documentation, and interpretation of results. Other means to characterize contaminant transport include ground water age studies, analysis of common ion chemical signatures, and tracer studies.

[10] This information can be useful in characterizing local geologic and hydrogeological conditions and shallow or deep aquifers currently or previously used as a water source(s).

[11] Beneficial uses are defined in IDAPA 58.01.11, Ground Water Quality Rules as "various uses of ground water in Idaho including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, aquacultural water supplies, and mining. A beneficial use is defined as actual current or projected future uses of ground water."

- The physical characteristics of the site, nearby wells or potential future wells, and the existing ground water quality.
- Potential changes in water quality resulting from the introduction of wastewater into an aquifer by infiltration.
- Impairment of interconnected surface water uses as well as ground water uses. Characterizing initial ground water quality and beneficial uses is needed for this analysis.

Discuss how ground water contamination will be prevented.[12] The discussion should address the following:

- Procedures to prevent percolation of excess nutrients. To prevent contamination of ground water,[13] loading rates for constituents need to be calculated, including accumulation and leaching.
- All sources of residual nutrients in the soil, such as previous crops, prior applications of biosolids, or fertilizers. The accumulation period should be based on the most limiting loading rate.
- Contaminant migration to ground water, surface water impact, and accumulations in soil[14].
- Impact on drinking water supplies.[15] It should be clearly identified that the biosolids application will not contaminate drinking water supplies. If monitoring is required, a minimum of one up-gradient and two down-gradient wells are generally necessary.

The Idaho Environmental Protection and Health Act (I.C. § 39-126) mandates that state and local governments incorporate policies from the Idaho Ground Water Quality Plan into their programs. It also states that cities, counties, and other political subdivisions are authorized and encouraged to implement ground water quality protection policies within their jurisdictions. Check with your local government to identify policies that may affect siting decisions.

Discuss how surface water contamination will be prevented:

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[12] It is important to be aware of the Ground Water Quality Protection Act of 1989, which states that it is the policy of the state to prevent contamination of ground water from any source to the maximum extent practical. Furthermore, the discovery of any contamination that poses a threat to existing or projected future beneficial uses of ground water will require appropriate actions to prevent further contamination. DEQ rules contain provisions to ensure protection of ground water. To help ensure that your project is consistent with ground water quality rules—including IDAPA 58.01.11, Ground Water Quality Rule, and IDAPA 58.01.16, Wastewater Rules,—the plan needs to consider preventative measures.

[13] IDAPA 58.01.11.400.01, Ground Water Quality Rules, states that "No person shall cause or allow the release, spilling, leaking, emission, discharge, escape, leaching, or disposal of a contaminant into the environment in a manner that causes a ground water quality standard to be exceeded; injures a beneficial use of ground water; or is not in accordance with a permit, consent order or applicable best management practice, best available method or best practical method."

[14] If DEQ determines the application rate proposed could cause an adverse impact on ground water quality, the application rate may need to be reduced or a ground water quality protection program may be required, and monitoring wells may be required around dedicated sites to detect any changes in ground water quality. The extent of ground water monitoring would be dependent on the area soil types and geology, depth to ground water, biosolids application rates, and irrigation practices.

[15] Impacts to drinking water supplies must be evaluated based upon the maximum contaminant limits. Additional guidance for protecting drinking water sources in Idaho can be found at http://www.deq.idaho.gov/media/499488-drinking_water_protection_guidance.pdf.

- In addition to ground water, nutrient percolation prevention must consider surface runoff, erosion, and potential transport to streams and lakes. IDAPA 58.01.11, Ground Water Quality Rule, sets limits for many constituents, but it does not set limits for nutrients, such as phosphorus.
- The possible interaction between surface and ground water should be assessed for the potential of impacted ground water contaminating surface water.

4.2.4 Land Use

IDAPA 58.01.16.650.03.b.iv requires that land use surrounding the site be described in the plan. This information allows assessment of potential health and environmental risks specific to the area and any sensitive populations.

Provide a land use map that includes the following:

- Locations of potential contaminant sources.
- Known sources or contaminant plumes.
- Land use structures (such as buildings, roads, etc.)
- Public land ownership.
- Land use areas, including vegetation type, such as irrigated agriculture, dry agriculture, urban, etc. County land use maps, tax code maps, or comprehensive plans may be a resource.
- All residential and building locations within a 1-mile radius of the site.[16]

Describe past, present, and projected future land use and related structures at the site:

- Indicate if the site is currently used or has been used for a landfill or feedlot; if so, residual contaminants might exist in the area. Information on such contaminants can be obtained from local knowledge, GIS coverages, and a site survey. Consult with your local governments regarding projected future land use.
- Previous land use should be identified to determine if any contaminants are present in the subsurface. Previous ownership records can provide historic land use activities and can be obtained from the local county assessor's office.
- Consideration should be given to those activities that have a potential to mobilize contaminant constituents already present in the environment.
- If land use changes occur during the life of the project, the plan should be updated to reflect such changes and to avoid a potential enforcement action.

[16] Application of biosolids on land that is in close proximity to residential areas may be problematic. The Rules for the Control of Air Pollution in Idaho, IDAPA 58.01.01.776, state, "No person shall allow, suffer, cause, or permit the emission of odorous gases, liquids, or solids into the atmosphere in such quantities as to cause air pollution." Also, a biosolids activity may cause or contribute to a nuisance condition; land application biosolids carries with it the potential for nuisance odors. Odors are a concern for Idahoans and a frequent source of citizen complaints to state and local government agencies.

4.2.5 Topography

IDAPA 58.01.16.650.03.b.v requires that information on the topography[17] of the site must be provided in the plan. Topographic information[18] can be included on the land use map described in the previous section. Topography of the site should be suitable to allow normal agricultural operations; the plan should include the following

- A discussion of runoff and erosion control measures that should be constructed.
- A discussion of slopes:
  - In general, liquid biosolids should not be surface applied on bare soils where the ground slope exceeds 12 percent.
  - In general, avoid application on steep slopes. Well-vegetated sites with slopes up to 30 percent may be used for dewatered or dried biosolids or for liquid biosolids application with appropriate management to prevent runoff.
- A discussion of any slope orientation factors that apply. Slope orientation affects erosion, runoff potential, biosolids drying, crop growth, and other factors.
- A 7.5-minute topographic site map that includes the following:
  - Site plans drawn to approximate scale
  - Property lines
  - Buildings
  - Structures
  - Wells
  - Other underground conveyance systems, such as underground storage tanks, septic systems, water lines, gas lines, etc.
  - Geologic borings
  - Topography
  - Land ownership or uses of the adjacent property
  - Any other relevant information
- Other areas of designation may need to be identified, such as the following:
  - Idaho Department of Water Resources (IDWR) Ground Water Management Areas
  - DEQ Nitrate Priority Areas
  - Sole Source Aquifers

[17] Topography refers to the configuration of the land surface and may be described in terms of elevation, slope, relief, aspect, and landscape position.

[18] The purpose of topographic information is to address surface shape, relief, and features to assist in understanding how contaminates could migrate from the site. Topography is also important in land application practices because topographic low positions accumulate water from higher adjacent areas and may have higher moisture contents, shallow ground water, and greater salinity. The natural horizontal movement of ground water usually follows the ground slope; erosion and runoff potential increase with increasing slope.

- Sensitive Resource Aquifers
- Wellhead or Source Water Assessment Areas
- Critical Aquifer Recharge Areas
- Surface water bodies, including lakes, reservoirs, wetlands, streams, and the 25-year flood plain should be delineated within a 1 mile radius of the site.

4.2.6 Climate

IDAPA 58.01.16.650.03.b.vi requires information on the climate[19] of the site. Discuss site climate, including the following:

- Analysis of precipitation data. Precipitation data necessary for site suitability and biosolids application considerations should include the following:
  - Total mean annual precipitation
  - Mean monthly precipitation
  - Peak storm event precipitation
  - Effects of snow on year round application systems. For example, snow might require additional biosolids storage capacity for those times when snow covers the ground and biosolids cannot be applied.
- Temperature (seasonal)
- Prevailing wind direction
- Wind velocity
- Other climatic factors that may be considered in site selection, such as flooding or drought

Weather and climate data for a specific area can be obtained from the National Oceanic and Atmospheric Association (NOAA, 2011):

http://www.crh.noaa.gov

4.3 Application of Biosolids

IDAPA 58.01.16.650.03.c requires a description of the biosolids land application process in the plan. This description should include all sites that will receive biosolids and the complete process for application at each site. The description should incorporate the information determined necessary from the pre-project consultation.

At a minimum, the plan should discuss the following:

- Biosolids generation, volume, and storage (if required)

[19] Climate, the average weather of an area over a period of at least 30 years, including seasonal variations and weather extremes, is important because it affects the rates of physical, chemical, and biological weathering processes over a large geographic area. Climate influences soil properties; it determines the types of vegetation or agricultural crops that may be grown along with the rates of evaporation, and it determines the amount of precipitation that must be accounted for during site evaluation and application process design. (Many sites are used seasonally depending upon climatic conditions.)

- Management practices appropriate to the site conditions
- Testing and sampling
- Transportation and handling, including specific equipment to be used
- Reports and record keeping
- Emergency planning procedures, including worker safety

Each of the above is discussed in more detail in the following sections.

4.3.1 Biosolids Generation, Volume, and Storage

Describe wastewater sources and volumes and related biosolids and volumes:

- Wastewater sources and volumes:
  - Municipal
  - Industrial
  - Commercial
  - Other
- Biosolids sources and volumes:
  - Primary
  - Secondary (Waste Activated Sludge)
  - Other

Discuss storage needs. Because biosolids may need to be stored, appropriate measures should be in place to ensure that storage structures are adequate. Storage management and storage facility design considerations provided in the plan should include the following:

- The quantity of raw and stabilized solids volumes generated annually and the potential need for storage.
- The need for biosolids storage, use, and volume, including contingency planning if biosolids generated cannot be land applied.
- The location of the storage site(s), the projected use after storage, and the maximum volume of biosolids that could be stored during non-application periods.
- A description of expected biosolids stability prior to storage, biosolids water content, the season(s) for storage, the storage period, and biosolids stability after the planned period of storage. Additional treatment that occurs during storage should be described.
- Other factors. Discuss odor generation, water quality impacts (from precipitation, runoff, or leaching), pathogens, and vector attraction. The EPA *Guide to Field Storage of Biosolids* (EPA, 2000) provides a source for more information:

http://water.epa.gov/scitech/wastetech/biosolids/

The biosolids storage method selected involves consideration of biosolids characteristics and site-specific considerations. There are many alternatives, including field stockpiles or

constructed facilities. Some guidance on how to properly store biosolids is provided by existing state rules not directly applicable to biosolids activities. A plan that demonstrates compliance with the provision of either of these rules would be considered adequate with respect to biosolids storage:

- IDAPA 58.01.16.519, Facility and Design Standards for Municipal Wastewater Treatment or Disposal Facilities—Septage Transfer Stations
- IDAPA 58.01.16.493, Facility and Design Standards for Municipal Wastewater Treatment or Disposal Facilities—Wastewater Lagoons

4.3.2 Management Practices

Describe management practices as they apply to the following:

- Site management
- Application rates
- Prevention of vectors and nuisance conditions
- Buffer zones
- Application of liquid biosolids
- Grazing, crop production, and public access

Each of the above is discussed in more detail in the following sections. As noted in section 2.1.2 of this guidance, management practices should be kept current and the method of keeping them current should be addressed in the plan.

Management Practices for the Site

Biosolids management at an application site should maintain or improve soil productivity. Discuss how the biosolids will provide soil augmentation and how reduction of soil productivity will be prevented, as required by IDAPA 58.01.16.650.03.d. Discussion of the loss of soil productivity may include the following topics:

- Acidification
- Contamination
- Desertification
- Erosion
- Mineralization
- Salination

The information collected in site selection should be incorporated into this narrative. For example, management practices should consider wet soils, high water tables, rainfall, and irrigation needs. Applications on saturated soils where runoff is excessive, or on shallow or extremely well drained (coarse) soils, will potentially result in water quality violations and enforcement. Such sites should be avoided. Sites with saline or sodic soils should also be avoided.

Management Practices for Application Rates

Discuss application rates and methods.[20] Biosolids should be applied at rates and by methods that prevent the occurrence of runoff, erosion, leaching, and nuisance conditions. The application rate for biosolids should be based on the following:

- Initial soil concentrations of nutrients and other constituents of concern
- Concentrations of nutrients, organics, and inorganics in the biosolids
- Total loadings applied in pounds or tons per acre
- Any losses (i.e. through leaching) in pounds or tons per acre
- Crop uptake

The annual application rate is often based upon the crop agronomic nutrient (i.e. nitrogen) requirements and the nutrient content of the biosolids. Nutrient management planning ensures that the appropriate quantity and quality of biosolids are land applied. The biosolids application rate should be specifically calculated to match the nutrient uptake requirements of the particular crop. The calculation of an application rate should include an accounting for crop type, crop yield, management practices, fertilizer applications, irrigation, and frequency and timing of biosolids applications.

The following resources may be of assistance:

- Worksheet for Calculating Biosolids Application Rates in Agriculture (Cogger and Sullivan, 2007), available in PDF and Excel format:

  http://www.puyallup.wsu.edu/soilmgmt/biosolids.htm

- Managing Nitrogen from Biosolids (Henry, 1999):

  http://www.nwbiosolids.org/pubs/ManagingNitrogen.pdf

Discuss any of the following that apply:

- The potential for nitrate contamination of ground water and phosphorus buildup in soils.
- Adjustments in pH needed for biosolids containing a significant amount of lime.
- Impacts of identified metals and their accumulations. For example, metals such as copper and zinc are micronutrients in low doses, but, at higher doses, they can harm certain crops.
- Acidic conditions that promote leaching of various compounds, including heavy metals. When biosolids contain elevated metal levels, soil pH should be maintained near 6.5-7 to avoid leaching.
- Contaminant accumulation (i.e. metals or toxic chemicals) after repeated application of biosolids. Such accumulations may become toxic to crops, and nutrients may not be taken up through the root systems. Crops impacted by contaminants may also be toxic to animals and humans.

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[20] Biosolids applied at an agronomic rate, matching the nutrients in the biosolids to the crop requirements, minimizes the amount of nitrogen and phosphorus that pass through the root zone into ground water. Crops and crop assimilative capacity, fertilizer and irrigation practices, timing of crop harvest, waiting periods, and nutrient management should all be addressed.

Management Practices for Prevention of Vectors and Nuisance Conditions

IDAPA 58.01.16.650.03.f requires that the plan include a discussion of the practices necessary to prevent vectors[21] and nuisance conditions. The plan must include a narrative description of the sampling methods that will be used to identify all potential pathogens that may be present because of the land application activities and that may be spread by vectors at the site.

Describe how a reduction in pathogens in the biosolids will be achieved and how vector attraction will be prevented:

- Prevention plans should include design considerations aimed at reducing the health risks associated with vector attraction to biosolids.
- In addition to the methods and strategies that will be employed to reduce vector attraction, the plan should identify a manner in which to evaluate the effectiveness of vector reduction methods and strategies.

Describe how nuisance conditions, such as the generation of odors[22] and unsightliness, will be addressed. Include response plans for dealing with nuisance conditions and complaints. DEQ strongly recommends that an odor control management practice include the following:

- Equipment design that accounts for odor minimization. For instance, all transfer lines should be designed to prevent wastewater and biosolids from turning anaerobic.
- Continuous operation and maintenance protocols that address probable or potential sources of odor of nuisance conditions.
- Proactive outreach to adjacent property owners and the community to inform them of activities at the site. Effective outreach may consist of facility tours or requesting input to jointly resolve a potential nuisance condition before it becomes a major issue.

Management Practices for Maintaining Buffer Zone Distances

Define planned buffer zone distances. A buffer strip large enough to prevent nuisance odors or wind drift (i.e. for odors and pathogens) is needed for surface waters, wells, and property lines.

Buffer zone distances will be determined by DEQ on a case-by-case basis and will depend upon the method of application used, biosolids characterization, and proximity to sensitive areas. Table 5 provides buffer zone distances that have typically been accepted in the past.

Table 5. Generally acceptable buffer distances.

Residences	300 feet
Public roadways, drainage ditches or surface water	50 feet
Private water supply wells	500 feet
Community water supply well	1000 feet

[21] Vectors are insects and other living organisms that can transport biosolids pathogens away from the land application site. Vectors, such as flies, rodents, or birds, have the potential to transmit pathogens, such as viruses, protozoa, parasites, and bacteria. Sampling, as discussed in section 4.3.3 of this guidance, determines the scope of potential pathogens that need to be addressed.

[22] Biosolids may have their own distinctive odor depending on the type of treatment used. Some biosolids may have only a slight musty, ammonia odor while others may have a stronger odor that may be offensive to some people. Much of the odor is caused by compounds containing sulfur and ammonia, both of which are plant nutrients (http://water.epa.gov/polwaste/wastewater/treatment/biosolids/genqa.cfm).

It is recommended that the site be placed out of flood plains. If periodic flooding cannot be avoided, the period of application should be restricted.

Application methods may increase or decrease the buffer distance, depending on site-specific conditions. A narrative that takes into account the land application method and that accounts for the location and distance to structures and sensitive receptors should be included. All structures and sensitive receptors should also be identified on the land use map referenced in section 4.2.4 of this guidance.

Management Practices for Application of Biosolids as a Liquid

Generally, biosolids are dewatered and dried or granulated. They are then land applied by surface spreading and tilled into the root zone. However, in instances where even distribution is needed, liquid biosolids may be applied by truck spreading, sprinklers, furrows, subsurface injection, truck spraying, or other methods, as approved by DEQ. Potential advantages of direct injection of liquid biosolids include avoidance of odors and surface run-off, creation of a soil barrier between the biosolids and livestock or wildlife, and reduction of ammonia loss.

Permanent infrastructure for application must comply with additional regulations outside the scope of this guidance. Please contact DEQ for additional guidance.

When applying biosolids that are liquid in nature, the following conditions should be avoided:

- Application when standing water is present at the site
- Application within the 100 year flood plain
- Application on snow covered ground
- Application on frozen ground
- Application on slopes greater than 6 percent

The depth to permanent ground water should be at least four feet, and the depth to temporary ground water should be at least one foot. For more detailed guidance, see the soils section of DEQ's water reuse guidance (DEQ, 2007):

http://www.deq.idaho.gov/media/516329-guidance_reuse_0907.pdf

Sites approved for year-round application should be evaluated carefully to ensure that separation distances are protective of ground water, taking into account climatic conditions during all four seasons.

Additionally, best management practices to prevent soil compaction should be identified in the plan. Application methods, equipment weight, crops, and soil management practices should prevent soil compaction at the site.

Management Practices Related to Grazing, Crop Production, and Public Access

Animals should not be grazed on an active biosolids application site unless it can be demonstrated that public health and the environment are protected. Site-specific management practices for grazing on lands that accept biosolids may be considered. Site restrictions for animal grazing as defined by 40 CFR Part 503 would be considered acceptable by DEQ. (For example, not grazing animals on land for at least 30 days after application of Class B biosolids.)

Food and feed crop should not be grown on an active biosolids application site unless it can be demonstrated that public health and the environment are protected. Site-specific management practices for growing crops on lands that accept biosolids may be considered with biosolids management plans. Site restrictions for crops as defined by 40 CFR Part 503 would be considered acceptable by DEQ.

Protecting public health includes controlling public access to the site. Site restrictions for public access as defined by 40 CFR Part 503 would be considered acceptable by DEQ.

4.3.3 Sampling and Analysis

Describe how all samples will be collected, handled, stored, and analyzed to support data accuracy. This discussion should include sampling methods, sampling locations, frequency of sampling[23] and analytical methods. Include a sampling and monitoring schedule to ensure that the biosolids characteristics assumed in the plan accurately represent actual conditions. In general, sampling and monitoring frequencies for biosolids as described in 40 CFR Part 503 would be deemed adequate by DEQ.

4.3.4 Transportation and handling

Transportation and handling should be achieved in a manner that prevents leaking or spilling of the solids onto highways, streets, roads, other land surfaces, or waterways not approved for solids application or disposal. The plan should discuss accessibility to the site, haul distances, methods of transportation, cleaning, and remediation protocols in the event of a spill.

4.3.5 Reports and Record Keeping

Reporting and record keeping requirements may be needed to assess whether ongoing activities are adequately protective of human health and the environment. Each biosolids management plan may require different reporting and record keeping requirements necessary for that site. In general, a record-keeping plan should define the following:

- How, where, and for how long records are maintained
- Site management practices to be implemented at all new sites (e.g., staging, access restrictions, how setbacks are achieved)
- Sample analyses for each type of material collected
- Dates land application occurred if a site was used, the application methods, and amount of biosolids dispersed
- Site crops, including acreage of each crop, agronomic rate limitations (e.g., nitrogen loading limits), and cropping management practices

As part of plan approval, DEQ will require that records be maintained and made available to DEQ for inspection. Failure to maintain records in accordance with an approved plan may result in an enforcement action. Reporting and record keeping performed in accordance with 40 CFR

[23] Site-specific conditions will determine monitoring frequency. The schedule should include frequent monitoring so that sampling represents the constituents of concern (i.e. metals, toxic chemicals), pathogens, and vector attraction potential of the biosolids application site. Appropriate monitoring frequency ensures that soils will not receive concentrations of constituents of concern that violate 40 CFR Part 503 requirements or pose a threat to ground water quality.

Part 503 would be deemed adequate by DEQ. Please provide all reports directly to DEQ, including all annual reports required by EPA.

4.3.6 Emergency Planning Procedures

Identification and planning for potential emergencies (i.e. treatment failure or spills) and response/remediation procedures should be included in the plan.

As part of plan approval, DEQ requires that any emergency and non-compliance incidents that could endanger the public health or the environment be reported to the Idaho Emergency Medical Services Communications Center at 1-800-632-8000 in accordance with IDAPA 15.13.01.200.04 and other applicable law. Emergency and non-compliance will be reported to DEQ in writing within five (5) days of the date of occurrence.

The plan should include contingencies for the following events:

- A solids treatment process failure (e.g., digester breakdown or upset)
- A solids spill at the wastewater treatment facility or solids generating source
- A biosolids spill between the generating source and land application site or receiving facility (e.g., solids transferred from one facility to another where they would be processed)

4.4 Protective Planning

IDAPA 58.01.16.650.03.d states that the application of biosolids should enhance soil productivity while restricting percolation of excess nutrients. This guidance discusses these requirements in the previous sections. Ensure that the plan includes preventative measures to restrict percolation of excess nutrients.

4.5 Identification of Potential Adverse Health Effects

Potential adverse health effects resulting from the land application activities must be identified in the biosolids management plan in accordance with IDAPA 58.01.16.650.03.e. This guidance discusses the characterization of the biosolids and health effects in the previous sections. Ensure that the identification of health affects in the plan is accurate and complete.

4.6 Alleviation or Elimination of Adverse Health Effects

Delineation of methods used to alleviate or eliminate adverse health effects must be identified in the biosolids management plan in accordance with IDAPA 58.01.16650.03.f. This guidance discusses characterization of the biosolids and elimination and minimization of adverse health effects in the previous sections. Ensure that these discussions are accurate and complete.

5. References

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U.S. Environmental Protection Agency (EPA). 2003. Environmental Regulations and Technology Control of Pathogens and Vector Attraction in Sewage Sludge (EPA 625 R-92013). Accessed 6/7/2011 at http://www.epa.gov/nrmrl/pubs/625r92013/625R92013.pdf.

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Appendix A: Information Checklist for the Biosolids Management Plan Pre-Project Consultation

Your project schedule should ensure sufficient time for DEQ to review the submitted plan. Participating in a pre-project consultation with DEQ will help minimize the use of resources and will help ensure that DEQ's review time goal can be met. (DEQ aims to complete most reviews within 45 days.) Note that the site characteristics, scale of the project, and land application methods will influence the detail required in a plan and the review time needed. Use of this checklist in advance of and during the pre-project consultation is strongly recommended.

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Generally, the biosolids management plan should consider and/or include the following:

Biosolids Management Plan Checklist

- ☐ Site ownership information
- ☐ Site location for all sites proposed in the plan (Township, Range, Section, Address)
- ☐ Site life

- ☐ Biosolids characterization and stabilization including:
  - ☐ Description of the wastewater treatment
  - ☐ Method of biosolids removal and treatment
  - ☐ Biosolids characterization

- ☐ Site selection
  - ☐ Soil description including:
    - ☐ Soil properties (i.e. physical and chemical characteristics)
    - ☐ Soil depths
  - ☐ Geological features including:
    - ☐ Geologic formation of site: surface features
    - ☐ Subsurface features (i.e. fractures, sinkholes, cavities)
    - ☐ Geologic parameters that can affect contaminant movement
  - ☐ Ground water characteristics including:
    - ☐ Aquifer types underlying site
    - ☐ Existing quality of ground water
    - ☐ Water table elevations
    - ☐ Direction and flow of ground water
    - ☐ Hydrographs and equipotential maps if possible
    - ☐ Beneficial Uses
  - ☐ Land use map for site and surrounding area that includes:
    - ☐ Topography
    - ☐ Ground water uses and existing wells
    - ☐ Identification of private, public, and irrigation water supply wells
    - ☐ Public roadways, drainage ditches, and surface water
    - ☐ Residences and buildings
    - ☐ Flood plains
  - ☐ Climate information including:
    - ☐ Mean annual and monthly precipitation
    - ☐ Peak storm event precipitation
    - ☐ Snow effects on year-round application systems
    - ☐ Temperatures
    - ☐ Wind

- ☐ Biosolids land application:
  - ☐ Annual biosolids volumes
  - ☐ Biosolids storage evaluation
  - ☐ Narrative on site-specific management based upon above information
  - ☐ Agronomic biosolids application rates and methods
  - ☐ Practices to prevent vectors and nuisance conditions
  - ☐ Buffer zones
  - ☐ Testing and sampling
  - ☐ Transportation and handling
  - ☐ Reports and record keeping
  - ☐ Emergency planning

Appendix B: Example Biosolids Management Plans

A biosolids management plan that follows the format suggested by section 4 of this guidance should expedite DEQ review.

The following examples may be used for reference when preparing a biosolids management plan. Three general types of plans are provided:

- A one-time application of biosolids to a farmed field having no site-specific issues.
- Repeat applications of biosolids to a farmed field having no site-specific issues.
- A general biosolids management plan with no site identification. This approach, which allows the responsible party to submit additional site-specific plans at a later date, may benefit large programs and those programs in a state of transition (such as lagoons where biosolids removal and land application are not currently under way). The plan provides advance notice to the regulatory authorities and to the public. Once specific sites are selected, site-specific plans are submitted for review and approval prior to use.

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Example Outline: Single Application Biosolids Management Plan

This example is a partial outline of a biosolids management plan to be used toward developing a site-specific single-application biosolids management plan. This example is fictitious.

Biosolids Management Plan for XYZ Sewer District

City of XYZ Sewer District

Biosolids Management Plan

Prepared by
XXXX
For
Idaho Department of Environmental Quality

Date

Introduction

The City of XYZ Sewer District intends to land apply biosolids generated from its municipal wastewater treatment system. This biosolids management plan will address the elements required by the Wastewater Rules and show how human health, the environment, and ground water will be protected from contamination by the land application of the biosolids.

Ownership information

XYZ Sewer District owns and operates a municipal wastewater treatment system and the wastewater is primarily of domestic origin from 10,000 people. This plan is for the land application of biosolids from XYZ Sewer District lagoon biosolids to agricultural lands owned by XXXX Farming Company. A copy of the landowner agreement for acceptance of biosolids is included in Appendix A; Table 1 shows the responsible parties.

Table 1. Responsible parties and ownership Information

Owner and Responsible Parties Information	**Address and/or contact information**	**Site Address (if different than mailing location)**
Party requesting biosolids management plan approval	Name Mailing Address Phone number	
Biosolids generator	Name Mailing Address Address Phone number	
Biosolids transportation company	Name Mailing Address Address Phone Number	

Land owner of site to which biosolids will be applied	Name Mailing Address Address Phone Number

Wastewater and Biosolids Treatment and Biosolids Characterization

The City of XYZ Sewer District uses a series of lagoons to treat wastewater. Sludge was removed from the lagoons and has been dewatered in sludge drying beds for 4 months.

The biosolids have been inventoried and analyzed for metals, nitrogen, phosphorus, percent solids, and fecal coliform. Analytical results are reported in Appendix C.

The biosolids meet Class B biosolids requirements based upon federal 40 CFR 503 regulations. The metal concentrations are less than the Table 3 concentration shown in 40 CFR Part 503.13. For pathogens, the geometric mean of the seven fecal coliform samples is XX CFU/gram, which demonstrates compliance with the 2,000,000 CFUs/gram dry-weight limit. The biosolids were dried in basins for 4 months during which the ambient average daily temperatures were above 23° F.

Land Application Site Suitability

The land application site and its characteristics, as described in the following sections, indicate that this site is suitable for biosolids land application. The biosolids land application site is XXX acres in size. There is only one unit to consider at this site.

Site Map

A map for the site(s) is provided in Appendix B and has the following information:

- A legend.
- The location and means of access.
- Specific areas of the site where biosolids may be applied. If there is more than one site or more than one application unit within a site, a site or unit ID number should be included.
- The number of acres in the site or in any distinct application unit within a site.
- Location and extent of any wetlands on the site.
- A topographic relief of the application site and surrounding area.
- Adjacent buildings, properties and uses, and their zoning classification.
- Any surface water bodies (including ephemeral) located on the site.
- The location of any wells located on the site or within 1/4 mile of the site, labeled for use: domestic, irrigation, or other purposes.
- Buffer zones to features such as surface waters, wells, property boundaries, and roadways and the width of the buffer zones.
- The location and size of any areas that will be used to store biosolids

Soils

Soil texture types at this site are XXX (i.e. sandy loam) and are about XXX feet deep over bedrock. This soil is suitable because….

Geologic Features

Geological features are listed on the site map in Appendix B. The geological features of concern are . . . and the biosolids management plan addresses this concern in the method of application to control nutrient overloading of the site.

Ground water

There are two aquifers in this general area: a shallow aquifer at 10-50 feet and then a deep aquifer 500 feet deep. At this site, there are no known domestic wells within 5 miles. All irrigation wells are marked on the map in Appendix B.

Topography

Topographic features are presented on the site map in Appendix X. The topographic feature of concern is . . . and the biosolids management plan addresses the issue in the method of application. Slopes on the site range from X to Y percent in the application area.

Climate

The site has seasonal weather that includes snow and rain. This once time application will occur during the summer.

Land Use

Land use around the site is presented on the site map in Appendix B. This site has never been used for biosolids before.

Application of Biosolids

Biosolids Generation and Storage

Approximately 48 cu yards of biosolids will be applied to the land. The biosolids will be temporarily stored for up to 8 hours in a staging area on the farm.

Transportation and method(s) of application

Biosolids will be removed from the lagoon, using XXX, and pumped to a portable belt filter press and dewatered to XXX percent solids. The dewatered solids will be hauled from the treatment facility to the agricultural field by a pumper truck.

The farmer will apply the biosolids to the land by evenly spreading the biosolids to the top of the ground using a manure spreader. To meet vector attraction requirements, the biosolids will be incorporated into the soil within 6 hours of land application.

During transportation and in the event of a spill, the spill area will be fenced off and the area posted if there is potential for public exposure. The

spilled biosolids will be removed with a shovel or front end loader. The spill area will then be covered with dry lime and sand. The spilled biosolids will be transported to a DEQ authorized disposal site.

Seasonal and daily timing of biosolids applications

The biosolids will be applied only once at this site during late summer.

Site Restrictions

Public access is limited by gates and fences. The fenced site is posted with private property no trespassing signs. The road to the field has a gate that will be closed to restrict access to the property during and at minimum for a week after biosolids application.

Ground water and surface water impacts

A shallow well exists on site, and historical data indicates the seasonal high depth to ground water is 10 feet below surface. The biosolids will be applied at agronomic rates and this fact, combined with the 10 foot depth to ground water, will be protective of ground water as loading rates will not result in excessive amounts of nutrients leaching into the ground water. Additionally, soil sampling test results will be considered in calculating the final loading rates.

Crops

Alfalfa has historically been grown on site. Alfalfa will be grown on this site using biosolids as a soil amendment, and biosolids will be applied at 100% of agronomic uptake for nitrogen. Crops will not be harvested until the following year.

Annual loading rates

Calculations are provided in Appendix C.

The biosolids available nitrogen is XXX mg/kg

The soil available nitrogen is XX mg/kg

The supplemental nitrogen demand (crop nitrogen requirement - soil nitrogen available) = XX kg biosolids/acre

Area required for land application= XX acres

The XXX cubic yards of biosolids applied to the XX acres results in available nitrogen (based upon the biosolids addition and the nitrogen in the soil) of XX pounds of N/acre. Recommended fertilizer rates for sites such as this is estimated to be XX pounds of N/acre, so the application rate is less than the nitrogen demand.

Buffer Zones and Grazing

Grazing on the site will not be permitted for at least 30 days after the application of the biosolids. The fodder crop will not be harvested until the next growing season after application. Biosolids will not be applied to the land if the land is flooded, frozen or snow covered. There are no surface water bodies on or near this site. There are no residences or other structures that require additional buffer zones. The site will have a 50 foot buffer between the land application and roadways of the site.

Emergency and out of compliance with plan reporting

Emergency and non-compliance incidents will be reported to the DEQ regional office orally within twenty four (24) hours of the occurrence any noncompliance that could endanger public health or the environment. The report will be made using the Emergency 24 Hour Number: 1-800-632-8000. These incidents will also be reported to DEQ in writing within five (5) days of the date of occurrence.

Appendix A: Copy of the landowner agreement

Appendix B: Site Map

Appendix C: Analytical Results

Appendix D: Calculations

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Example Outline: Multiple Application Biosolids Management Plan

This example is a partial outline of a biosolids management plan for general reference to be used toward developing your site specific biosolids management plan at a site used for multiple biosolids applications. This example is fictitious.

Biosolids Management Plan for ABC Sewer District

City of ABC Sewer District
Biosolids Management Plan

Prepared by
XXXX
For
Idaho Department of Environmental Quality

Date

Introduction

The City of ABC Sewer District intends to land apply biosolids generated from its municipal wastewater treatment system for the next 20 years. This biosolids management plan will address the elements required by the Wastewater Rules and show how human health, the environment and the ground water will be protected from contamination by the land application of the biosolids.

Ownership information

City of ABC Sewer District owns and operates a municipal wastewater treatment system and the wastewater is primarily of domestic origin from 50,000 people. The Sewer District is located at XXXX and the treatment system is located at XXXX. The designed average flow is XX MGD and peak flow design is XX MGD. The origin of the wastewater process is XX percent domestic, XX percent commercial, and XX percent industrial.

This plan is for the land application of biosolids from XYZ Sewer District lagoon biosolids to agricultural lands owned by XXXX Farming Company. A copy of the landowner agreement for acceptance of biosolids is provided in Appendix A. Table 1 shows the responsible parties.

Table 1. Responsible parties and ownership information

Owner and Responsible Parties Information	**Address and/or contact information**	**Site Address (if different than mailing location)**
Party Requesting Biosolids Management Plan Approval	Name Mailing Address Phone number	
Biosolids Generator	Name Mailing Address Address Phone number	
Biosolids transportation company	Name Mailing Address Address	

	Phone Number
Land Owner of site	Name
Biosolids will be applied	Mailing Address
	Address
	Phone Number

Biosolids Stabilization

Wastewater and Biosolids Sources

The City of ABC Sewer District wastewater and biosolids sources are presented in Table 2; Table 3 provides projections for future years.

Table 2. Wastewater sources and volumes for 2011

Wastewater Sources and Volumes	
Source	**Million Gallons/Year**
Municipal	300
Industrial	7
Commercial	43
Misc.	10
Total Sources	**360**

Table 3. Future biosolids sources and volumes summarized by year

Projected Year	Biosolids Sources and Volumes (dry tons/year)			
	Primary	Secondary (WAS)	Other	Total Sources
2012	250	240	10	500
2017	260	250	12	522
2022	270	260	15	545
2027	275	265	15	555
2032	285	275	17	577

Wastewater treatment methods

The City of ABC uses an activated sludge wastewater treatment plant. The treatment capacity is XXX MGD, and the average daily flow is currently XXX MGD.

Biosolids removal and treatment

The primary and secondary sludge are blended together in a blending tank, thickened, and sent to a digester.

Biosolids characterization

The biosolids are characterized prior to land application. The first application of biosolids to be land applied have been inventoried and analyzed for metals, nitrogen, phosphorus, percent solids, and fecal coliform. It is expected that biosolids samples in the future will be similar. Analytical results are reported in Appendix C.

The biosolids meet Class B biosolids requirements based upon federal 40 CFR 503 regulations. Class B biosolids receive treatment but are not considered pathogen-free. The City of ABC Sewer District used XXXX and YYYY to reduce pathogens to comply with Pathogen Reduction Class B. For pathogens, the geometric mean of the seven fecal coli form samples is XX CFU/gram, which demonstrates compliance with the 2,000,000 CFUs/grams dry-weight limit. The biosolids were dried in basins for 4 months during which the ambient average daily temperatures were above 23° F.

The metal concentrations are less than concentrations limits given in Table 3 of 40 CFR Part 503.13. Metals did not exceed pollutant concentration limits, as shown in Table 4.

Table 4.Metal concentrations

Metal	**Mg/kg (ppm) based on dry weight**	**40 CFR 503.13 Pollutant Concentration Limits (mg/kg)**	**Analytical Methodology**
As	< 1	41	EPA 6020
Cd	< 1	39	EPA 6020
Cr	5	-	EPA 6020
Cu	125	1500	EPA 6020
Pb	35	300	EPA 6020
Hg	<.4	17	EPA 7471 A
Mo	<7	-	EPA 6020
Ni	6	420	EPA 6020
Se	4.3	100	EPA 6020
Zn	314	2800	EPA 6020

Nutrients were analyzed, and the results are shown in Table 5.

Table 5. Nutrient concentrations

Parameter	**Mg/kg (ppm) based on dry weight**	**Analytical Methodology**
TKN	6	EPA 351.2
NO3-N	< .0014	EPA 300
NH4-N	.5	EPA 350.1
P	1.37	EPA 6010 B
K	35	EPA 6010 B
pH	.24	
TS	17.6%	EPA 160.3
VS	12.5%	EPA 160.4

Land Application Site Suitability

The land application site and its characteristics, as described in the following sections, indicate that this site is suitable for biosolids land application. The land application site is 130 acres with three site application units as described in Table 6.

Table 6. Land Application site units

Site Application Unit	Acres	Location	Site Slopes
1A	30		1-2%
1B	40		2%
2	60		1-4%
Total Acres	130		

Site Map

A map for the site(s) is contained in Appendix A and has the following information:

- A legend.
- The location and means of access.
- Specific areas of the site where biosolids may be applied. If there is more than one site or more than one application unit within a site, a site or unit ID number should be included.
- The number of acres in the site or in any distinct application unit within a site.
- Location and extent of any wetlands on the site.
- A topographic relief of the application site and surrounding area.
- Adjacent buildings, properties and uses, and their zoning classification.
- Any surface water bodies (including ephemeral) located on the site.
- The location of any wells located on or within 1/4 mile of the site labeled for use as domestic, irrigation, or other purposes.
- Buffer zones to features such as surface waters, wells, property boundaries, and roadways, and the width of the buffer zones.
- The location and size of any areas that will be used to store biosolids

Site Selection Criteria

Soils

Soil texture types at this site are XXX (i.e. sandy loam) and are about XXX feet deep over bedrock. The details are presented in Table 7.

Table 7. Site soil characteristics within rooting zone

Soils on Site	Depth	Texture

These soils are suitable for biosolids land application because . . .

Geologic Features

Geological features are listed on the site map in Appendix B. The geological features of concern are . . ., and the biosolids management plan addresses this concern in the method of application to control nutrient overloading of the site.

Ground water

There are two aquifers in this general area: a shallow aquifer at 10-50 feet and then a deep aquifer 500 feet deep. There are no known domestic wells within 5 miles. All wells are identified on the map in Appendix B and Table 8.

Table 8. Wells in the area of the land application site

Well Description	Well type	Depth to ground water (feet)
GW-00XY01	Monitoring well	50
GW-00HJYO9	Irrigation well	10

Topography

Topographic features are presented on the site map in Appendix B. The topographic feature of concern is . . . The nearest surface waters are listed in Table 9. The biosolids management plan addresses the issue regarding the ephemeral stream in the method of application.

Table 9. Topographic features of concern

Nearby surface waters	Distance from Site	Beneficial Use
XX Creek - an ephemeral stream	Located on site 1B	None- flows seasonally in spring
XY River	2 miles away	Agricultural irrigation, recreation

Climate

The site has seasonal weather that includes snow and rain. The climate considerations will be addressed in the application methods section.

Land Use

Land use around the site is presented on the site map in Appendix B.

Site History

Discuss if the site has been used for biosolids before. If it has, then:

- The date(s) when the biosolids were applied (if known).
- The amount of biosolids applied (if known).
- The concentrations of the pollutants in the biosolids (if known).
- The area(s) of the site to which the biosolids were applied (if known).

Discuss if the Cumulative Pollutant Loading Rates (CPLR) have been evaluated and what the results of that evaluation indicate.

Application of Biosolids

Annual volumes generated, stability and characterization of biosolids

XX tons of Class B biosolids will be generated yearly. The three application units will be rotated throughout the year, as shown in Table 10.

Table 10. Land application site rotation scheme

Biosolids type	Amount Generated yearly	Site Unit	Monthly application
Class B	XX Tons	1A	X tons March-September
		1B	X tons March-September
		2	X tons October-April

Biosolids storage

A description of how biosolids will be stored that includes:

- Storage Site Location and Suitability
- Design
- Length of Storage
- Changes in Biosolids Characteristics (when is retesting needed?)
- Planning and Monitoring
- Odor Prevention and Mitigation

Table 11 represents the storage capacity of the different units.

Table 11. Biosolids storage units and capacities

Structure	Number of Units	Total Volume	Storage
Lagoon	2	400,000 gallons	1.00 months
Stabilized sludge holding cell	4	123,000 gallons	.25 months
WAS sludge holding	1	100,000 gallons	.25 months
Cake storage	1	500 cubic yards	2.00 months
Total			3.50 months

Transportation and Handling Process

Transfer and Transport

City staff load the biosolids cake from the lined storage facility with a skid steer that scoops up ¾ cubic yard per dump to fill the 12-Yard dump truck for transport.

Method(s) of application

On site, the material is spread with the 12 yard dump truck or with a manure slinger

The dewatered solids will be hauled from the treatment facility to the agricultural field by a watertight truck with a sludge slinger, which applies the biosolids at a controlled rate of XXX pounds/hour. The farmer will apply the biosolids to the land by evenly spreading the biosolids to the top of the land. To meet vector attraction requirements, the biosolids will be incorporated into the soil within 6 hours of land application.

During transportation and in the event of a spill, the spill area will be fenced off and the area posted if there is potential for public exposure. The spilled biosolids will be removed with a shovel or frontend loader. The spill area will then be covered with dry lime and sand. The spilled biosolids will be transported to a DEQ authorized disposal site.

Seasonal and daily timing of biosolids applications

The biosolids will be applied at this site when road conditions are dry on the dirt roads to prevent soil erosion and loss. Weather will influence application such that no application will occur if:

- There is standing water present on the field.
- There is snow on the field.
- The ground is frozen.

Agronomic Application of Biosolids

Crops

The crops that will be grown on the biosolids land application site are listed in Table 12. Crops will be rotated every year at each of the three land application units.

Annual loading rates

The annual loading rates are ___ and ___ is how the agronomic rates are determined during the life of the site. Detailed calculations are provided in Appendix C.

The biosolids available nitrogen is XXX mg/kg

The soil available nitrogen is XX mg/kg

The supplemental nitrogen demand (crop nitrogen requirement - soil nitrogen available) = XX kg biosolids/acre

Area required for land application= XX acres

The XXX cubic yards of biosolids applied to the XX acres results in available nitrogen (based upon the biosolids addition and the nitrogen in the soil) of XX pounds of N/acre. Recommended fertilizer rates for sites such as this is estimated to be XX pounds of N/acre, so the application rate is less than the nitrogen demand.

Table 12 Crops Grown and Constituent Loading Limits

Site Unit	Crops grown	Expected end use for crop	Constituent loading (from all sources)		
			Nitrogen (lb./acre)	Phosphorus/ Salt (lb./acre)	Any other parameter of importance as determined by biosolids characterization
1A	Alfalfa		100% of crop uptake	XX	
1B	Hay, small grain, silage corn		100% of crop uptake	XX	
2	Hay, small grain, silage corn		100% of crop uptake	XX	

Buffer Zones and Grazing

Buffer zones and grazing information are presented in Table 13. Biosolids will not be applied to the land if the land is flooded, frozen, or snow covered. There are no surface water bodies on or near this site. There are no residences or other structures that require additional buffer zones. The site will have a minimum 50 foot buffer between the land application and roadways of the site, as indicated on the site map. There are no private or community water supplies to consider in the area.

Grazing on the site will not be permitted for at least 30 days after the application of the biosolids. The fodder crop will not be harvested until the next growing season after application.

Table 13. Buffer zones and grazing restrictions

Site Unit	Buffer Zones (in feet) from land application site				Grazing
	Residences	Public roadways, drainage ditches or surface water	Private Water supply wells	Public water supply well	
1A	None on site	50	None on site	None on site	None
1B	None on site	50	None on site	None on site	Not allowed
2	None on site	50	500	None on site	Minimum 30 days after application

Site Restrictions

Public access will be restricted by gates and fences. The entire acreage of the site is fenced with private *property no trespassing* signs. The road to the site has a gate that remains closed to restrict access to the property.

Monitoring, Sampling and Analyses

Monitoring, sampling, and analysis of the ground water and the soil will be done in addition to the biosolids characterization. To provide a consistent method of sampling for the City of ABC Sewer District, the Quality Assurance/Quality Control (QA/QC) Plan for sample collection found in Appendix E will be followed.

Ground Water Monitoring

The ground monitoring information can be found in Tables 14 and 15. Samples are collected using XXXX methods to ensure a good sample. The details of the sampling are in the appendix and will be used to provide a consistent method of ground water sampling biosolids for the City of ABC Sewer District

Table 14. Ground water monitoring point descriptions

Monitoring point serial number	Common designation	Well type	Gradient location
GW-00XY01	MW 1	Monitoring well	Up-gradient
GW-00XY02	MW 2	Monitoring well	Down-gradient

Table 15. Ground water monitoring, sampling, and analysis

Monitoring point	Sample type / Frequency	Constituents
MW 1 MW 2	Grab sample / Quarterly: Jan, April, July, Oct	- water table elevation - water table depth - nitrate-nitrogen - total phosphorus - total dissolved solids - chloride - dissolved iron - dissolved manganese - pH - specific conductance - temperature - COD
GW-00XY01 GW-00XY02	Grab sample / April of first permitting year; and April of last permitting Year	- sodium - potassium - calcium - magnesium - sulfate - alkalinity

Soil Monitoring

Table 16 presents soil monitoring points to be used. Table 17 describes the type and frequency of testing planned.

Table 16. Soil unit monitoring point descriptions

Monitoring point serial number	Description	Associated Site Unit
SU-00XY01	Pivot 1N	1A
SU-00XY02	Pivot 2N, west half	1B

Table 17. Soil monitoring, sampling and analysis

Monitoring point serial number	Sample type	Sample frequency	Constituents
SU-00XY01 SU-00XY02	Composite samples	Annually March	- electrical conductivity - nitrate-nitrogen - ammonium nitrogen - plant available phosphorus - percent organic matter - potassium
	Composite samples	March every five years	- DTPA iron - DTPA Manganese - sodium adsorption ratio - pH
	Composite samples	March every five years	- cation exchange capacity - soil texture

Plant Tissue Monitoring

Table 18 describes planned plant tissue monitoring.

Table 18. Plant tissue monitoring

Monitoring point serial number	Sample type	Sample frequency	Constituents
PT-00XY01	Composite samples of harvested portion of crop	Annually for annually harvested crops. Each cutting for forage crops.	- nitrate-nitrogen - total Kjeldahl nitrogen - total phosphorus - ash - percent moisture

Site Management

Site management provides consistency for operating the site in a manner that is protecting of human health, the environment, and the ground water. The climatic and weather conditions that need to be addressed are X, X, and X. The issues that could arise are X and X. Management plans to address preventing those issues include XXX.

Vectors and Nuisance Conditions

Managing odor, vector attraction

The farmer will apply the biosolids to the land by evenly spreading the biosolids to the top of the land and to meet vector attraction requirements the biosolids will be incorporated into the soil within 6 hours of land application.

Reports and Record Keeping

Reports and record keeping will be performed in accordance with 40 CFR Part 503. All annual reports and correspondence to EPA will be copied to DEQ. The operation and maintenance along with all records, reports, and sample analyses will be maintained and kept on file at XXXX until the site is officially closed. The following will be available to DEQ on demand and during an inspection:

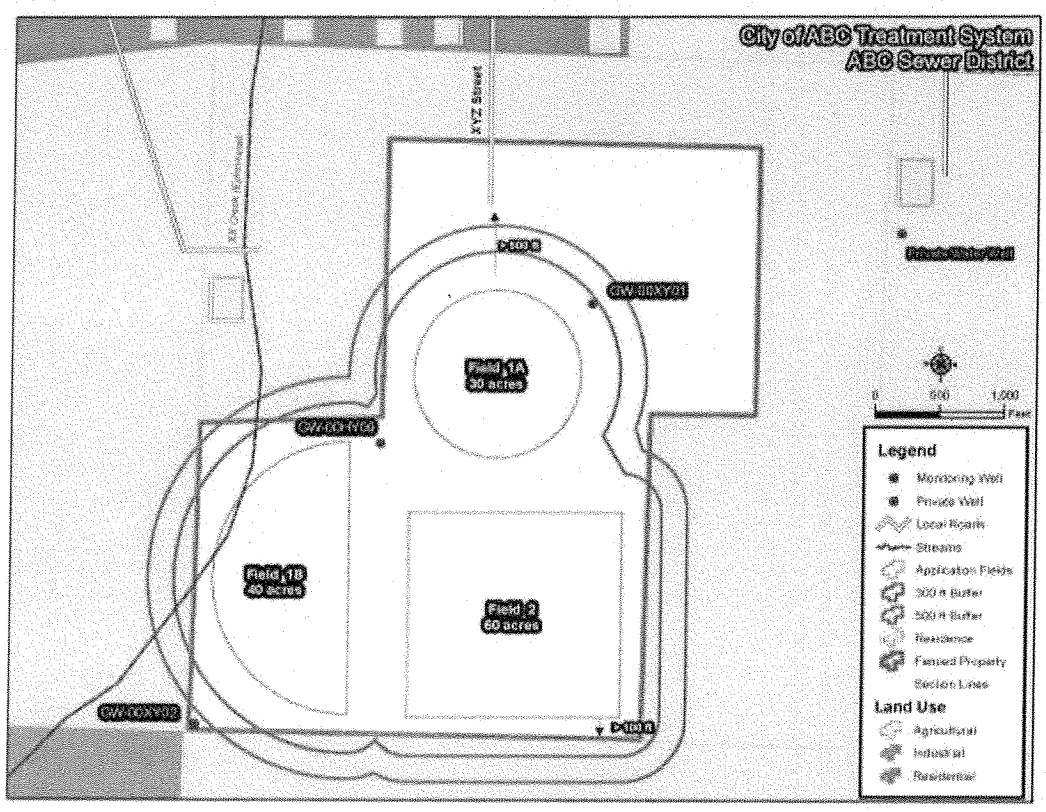
- Dates land application occurred, the site used, the application method, and the amount of biosolids land applied will be in these records.
- Soil and ground water monitoring reports in accordance with the biosolids management plan.
- Site crop information, which includes acreage of each crop, agronomic loading and cropping management practices used.

Emergency and out of compliance with plan reporting

Emergency and non-compliance incidents will be reported to the DEQ Regional Office orally within twenty four (24) hours of the occurrence any noncompliance that could endanger public health or the environment. The report will be made using the Emergency 24 Hour Number: 1-800-632-8000. These incidents will also be reported to DEQ in writing within five (5) days of the date of occurrence.

Appendix A: Copy of the landowner agreement

Appendix B: Site Map



Appendix C: Analytical Results

Appendix D: Calculations

Appendix E: Quality Assurance/Quality Control (QA/QC) Plan for Sampling

Appendix F: Site Management Plan

Example Outline: Level Three General Biosolids Management Plan

A general land application plan is required when all biosolids sites are not identified in the biosolids management plan submitted for coverage. The information provided for the biosolids management plan must, at a minimum, include the following:

- A description of the geographical area covered by the plan, including the names of all counties and water resource inventory areas where biosolids may be applied.
- Identification of site selection criteria.
- A description of how sites will be managed.
- A plan to submit proposed land application sites to DEQ at least 30 days prior to biosolids land application.

This example is a partial outline of a biosolids management plan, for general reference, to be used toward developing your site specific biosolids management plan with options to specify land application sites later. This example is fictitious.

General Biosolids Management Plan for QRS Sewer District

City of QRS Sewer District

Biosolids Management Plan

Prepared by

XXXX

For

Idaho Department of Environmental Quality

Date

Introduction

The QRS Sewer District Sewer intends to land apply biosolids generated from its municipal wastewater treatment system. This biosolids management plan addresses the elements required by the Wastewater Rules and shows how human health, the environment, and ground water will be protected from contamination by the land application of the biosolids. This general plan covers the biosolids stabilization, including pathogen and vector considerations, but does not identify specific sites for land application. Specific sites for land application will be identified later, as explained in . . .

Ownership information

QRS Sewer District, located at XXX in XXX County, owns and operates a municipal wastewater treatment system, and the wastewater is primarily of domestic origin. The designed average flow is XX MGD, and peak flow design is XX MGD. The origin of the wastewater process is XX percent domestic, XX percent commercial, and XX percent industrial. Responsibilities and ownership

are listed in Table 1; Appendix A will be modified to provide site information, including land ownership, as each land application site is identified.

Table 1. Responsible parties and ownership information

Owner and Responsible Parties Information	Address and/or contact information	Site Address (if different than mailing location)
Party Requesting Biosolids Management Plan Approval	Name Mailing Address Phone number	
Biosolids Generator	Name Mailing Address Address Phone number	
Biosolids transportation company	Name Mailing Address Address Phone Number	

Biosolids Stabilization

Wastewater and Biosolids Sources

The QRS Sewer District wastewater and biosolids sources are show in Tables 2 and 3.

Table 2. Wastewater Sources and Volumes

Source	Million Gallons/Year
Municipal	300
Industrial	7
Commercial	43
Misc.	10
Total Sources	**360**

Table 3. Biosolids Sources and Volumes

Source	Dry Tons/Year
Primary	250
Secondary (WAS)	240
Other	10
Total Sources	**500**

Wastewater treatment methods

The QRS Sewer District uses an activated sludge wastewater treatment plant.

Biosolids removal and treatment

The primary and secondary sludge are blended together in a blending tank, thickened, and sent to a digester.

Biosolids characterization

The biosolids have been inventoried and analyzed for metals, nitrogen, phosphorus, percent solids, and fecal coliform. Analytical results are reported in Appendix B. The biosolids have meet Class B biosolids requirements based upon federal 40 CFR 503 regulations. The metal

concentrations are less than 40 CFR Part 503.13 Table 3 concentrations. For pathogens, the geometric mean of the seven fecal coliform samples is XX CFU/gram, which demonstrates compliance with the 2,000,000 CFUs/gram dry weight limit. The biosolids were dried in basins for 4 months during which the ambient average daily temperatures were above 23° F.

Pathogen Reduction:

The City of ABC Sewer District used XXXX and YYYY to reduce pathogens to comply with Pathogen Reduction Class B.

Metals did not exceed pollutant concentration limits, as shown in Table 4

Table 4. Metal concentrations

Metal	Mg/kg (ppm) based on dry weight	40 CFR 503.13 Pollutant Concentration Limits (mg/kg)	Analytical Methodology
As	< 1	41	EPA 6020
Cd	< 1	39	EPA 6020
Cr	5	-	EPA 6020
Cu	125	1500	EPA 6020
Pb	35	300	EPA 6020
Hg	<.4	17	EPA 7471 A
Mo	<7	-	EPA 6020
Ni	6	420	EPA 6020
Se	4.3	100	EPA 6020
Zn	314	2800	EPA 6020

Nutrients were analyzed, and the results are shown in Table 5.

Table 5.Nutrient concentrations

Parameter	Mg/kg (ppm) based on dry weight	Analytical Methodology
TKN	6	EPA 351.2
NO3-N	< .0014	EPA 300
NH4-N	.5	EPA 350.1
P	1.37	EPA 6010 B
K	35	EPA 6010 B
pH	.24	
TS	17.6%	EPA 160.3
VS	12.5%	EPA 160.4

Land Application Site Suitability

Potential Site Area

The general land application plan will only include sites in XXX County. The following information will pertain to that county, and details of the specific sites will be provided to DEQ for approval prior to biosolids application. For specific land application sites, the following information will be provided:

- Site selection criteria we will use for new sites.
- How that site will be managed.

Sites will be submitted to DEQ for approval at least 30 days prior to land application.

Area Map

A map for the County(s) is contained in Appendix A and has the following information:

- A legend.
- A description of the geographical area covered by the plan, including the names of all counties and water resource inventory areas (such as Source Water Assessments and Nitrogen Priority Areas) where biosolids may be applied.
- A topographic relief of the area.
- The locations of any surface water bodies.

Soils

Soils in this country range from _____ to ___. This type would be the most suitable for biosolids applications. The soils range in type and depth from 6 inches to 5 feet in general with clays, then bedrock, ...

Geologic Features

Geological features of the county are listed on the site map in Appendix A. The geological features of general concern are surface waters, and the biosolids management plan addresses this concern through consideration of buffer zones and consideration of ground water to surface water impacts. The method of application will control nutrient overloading of the site.

Ground water

There are two aquifers in this general area: a shallow aquifer at 10-50 ft and then a deep aquifer 500 feet deep.

Topography

Topographic features are presented on the site map in Appendix A. The topographic feature of concern for farming would be slopes.

Climate

The site has seasonal weather that includes snow and rain. The application method will discuss how the seasonal weather will be addressed.

Land Use

Land use around the site is presented on the site map in Appendix A. Additionally, the local government has been made aware of the biosolids management plan; a copy of the letter informing them of this operation and their response letter is included in Appendix A.

Site Selection Criteria

Discuss the details of the site management that need to be provided during the pre-project consultation with your regional office.

Site History

The site history for each site will be evaluated to determine if the site was previously used for biosolids land application. If biosolids have been applied previously, the following data will be collected and cumulative pollutant loading rates may be evaluated:

- The date(s) when the biosolids were applied (if known).
- The amount of biosolids applied (if known).
- The concentrations of the pollutants in the biosolids (if known).
- The area(s) of the site to which the biosolids were applied (if known).

Site Management

Discuss the details of the site management that need to be provided during the pre-project consultation with your regional office.

Vectors and Nuisance Conditions--Managing odor, vector attraction

The farmer will apply the biosolids to the land by evenly spreading the biosolids to the top of the land, and, to meet vector attraction requirements, the biosolids will be incorporated into the soil within 6 hours of land application

Reports and Record Keeping

Reports and record keeping will be performed in accordance with 40 CFR Part 503. All annual reports and correspondence to EPA will be copied to DEQ. The operation and maintenance, along with all records, reports, and sample analyses will be maintained and kept on file at XXXX location. The following will be available to DEQ on demand and during an inspection:

- Dates land application occurred, the site used, the application method and the amount of biosolids land applied will be in these records.
- Soil and ground water monitoring reports in accordance with the biosolids management plan.
- Site crop information, which includes acreage of each crop, agronomic loading and cropping management practices used.

Emergency and out of compliance with plan reporting

Emergency and non-compliance incidents will be reported to the DEQ Regional Office orally within twenty four (24) hours of the occurrence any noncompliance that could endanger public health or the environment. The report will be made using the Emergency 24 Hour Number: 1-800-632-8000. These incidents will also be reported to DEQ in writing within five (5) days of the date of occurrence.