

# Environment Act Licence Loi sur l'environnement Licence

Manitoba  
Conservation  
Conservation  
Manitoba



Licence No./Licence n° 2634  
Issue Date/Date de délivrance January 23, 2004

IN ACCORDANCE WITH THE ENVIRONMENT ACT (C.C.S.M. c. E235)  
THIS LICENCE IS ISSUED PURSUANT TO SECTION 11(1) TO:

## RURAL MUNICIPALITY OF SPRINGFIELD: "the licensee"

for the construction, operation and maintenance of the Development being wastewater collection systems, a wastewater treatment lagoon to serve the Rural Municipality of Springfield located in NE 11-11-5 EPM in the Rural Municipality of Springfield and forcemain connections between the wastewater collection systems of the Communities of Anola, Dugald and Oakbank and the wastewater treatment lagoon and with discharge from the wastewater treatment lagoon to a municipal drain that discharges into the Cooks Creek Diversion that discharges into the Red River Floodway, in accordance with the proposal filed under The Environment Act on December 3, 2002 and subsequent information provided in letters dated March 20, 2003 and August 12, 2003 and subject to the following specifications, limits, terms and conditions:

### DEFINITIONS

In this Licence,

"**accredited laboratory**" means an analytical facility accredited by the Standard Council of Canada (SCC) or accredited by another accrediting agency recognized by Manitoba Conservation to be equivalent to the SCC, or be able to demonstrate, upon request, that it has the quality assurance/quality control (QA/QC) procedures in place equivalent to accreditation based on the international standard ISO/IEC 17025, or otherwise approved by the Director;

"**affected area**" means a geographical area excluding the property of the Development;

"**approved**" means approved by the Director, or an assigned Environment Officer, in writing;

"**appurtenances**" means machinery, appliances, or auxiliary structures attached to a main structure to enable it to function, but not considered an integral part of it;

**\*\* A COPY OF THE LICENCE MUST BE KEPT ON SITE AT THE DEVELOPMENT AT ALL TIMES \*\***

**"as constructed drawings"** means engineering drawings complete with all dimensions which indicate all features of the Development as it has actually been built;

**"ASTM"** means the American Society for Testing and Materials;

**"bentonite"** means specially formulated standard mill grade sodium bentonite conforming to American Petroleum Institute Specification 13-A;

**"cut-off"** means a vertical-side trench filled with compacted clay or a wall constructed from compacted clay;

**"Director"** means an employee so designated pursuant to the Environment Act;

**"effluent"** means treated wastewater flowing or pumped out of the wastewater treatment lagoon;

**"fecal coliform"** means aerobic and facultative, Gram-negative, non-spore-forming, rod-shaped bacteria capable of growth at 44.5 °C, and associated with fecal matter of warm-blooded animals;

**"five-day biochemical oxygen demand"** means that part of the oxygen demand usually associated with biochemical oxidation of organic matter within 5 days at a temperature of 20°C;

**"flooding"** means the flowing of water onto lands, other than waterways, due to the overtopping of a waterway or waterways;

**"high water mark"** means the line on the interior surface of the primary and secondary cells which is normally reached when the cell is at the maximum allowable liquid level or the line of the exterior of the perimeter dykes which is reached during local flooding;

**"hydraulic conductivity"** means the quantity of water that will flow through a unit cross-sectional area of a porous material per unit of time under a hydraulic gradient of 1.0;

**"influent"** means water, wastewater, or other liquid flowing into a wastewater treatment cell;

**"in-situ"** means on the site;

**"low water mark"** means the line on the interior surface of the primary and secondary cells which is normally reached when the cell is discharged;

**"MPN Index"** means the most probable number of coliform organisms in a given volume of wastewater which, in accordance with statistical theory, would yield the observed test result with the greatest frequency;

**"noise nuisance"** means a continuous or repeated noise in an affected area, which is offensive, obnoxious, troublesome, annoying, unpleasant, or disagreeable to a person:

- a) residing in an affected area;

- b) working in an affected area; or
- c) present at a location in an affected area which is normally open to the members of the public;

if the noise

- d) is the subject of at least 5 written complaints, received by the Director in a form satisfactory to the Director, and within a 90 day period, from 5 different persons falling within clauses a), b), or c), who do not live in the same household; or
- e) is the subject of at least one written complaint, received by the Director in a form satisfactory to the Director, from a person falling within clauses a), b) or c), and the Director is of the opinion that if the noise had occurred in a more densely populated area there would have been at least 5 written complaints received within a 90-day period, from 5 different persons who do not live in the same household;

**"odour nuisance"** means a continuous or repeated odour, smell or aroma in an affected area which is offensive, obnoxious, troublesome, annoying, unpleasant or disagreeable to a person:

- a) residing in an affected area;
- b) working in an affected area; or
- c) present at a location in an affected area which is normally open to members of the public;

if the odour, smell or aroma

- d) is the subject of at least 5 written complaints received by the Director in a form satisfactory to the Director and within a 90 day period, and from 5 different persons falling within clauses a), b) or c) who do not live in the same household; or
- e) is the subject of at least one written complaint, received by the Director in a form satisfactory to the Director, from a person falling within clauses a), b) or c) and the Director is of the opinion that if the odour, smell or aroma had occurred in a more densely populated area there would have been at least 5 written complaints received within a 90 day period from 5 different persons who do not live in the same household;

**"primary cell"** means the first in a series of cells of the wastewater treatment lagoon system and which is the cell that receives the untreated wastewater;

**"rip rap"** means small, broken stones or boulders placed compactly or irregularly on dikes or similar embankments for protection of earth surfaces against wave action or current;

**"SAR"** means sodium adsorption ratio;

**"secondary cell"** means a cell of the wastewater treatment lagoon system which is the cell that receives partially treated wastewater from the primary cell;

**"septage"** means the sludge produced in individual on-site wastewater disposal systems such as septic tanks;

"**sewage**" means household and commercial wastewater that contains human waste;

"**sludge solids**" means solids in sludge;

"**sludge**" means accumulated solid material containing large amounts of entrained water, which has separated from wastewater during processing;

"**Sodium adsorption ratio**" means the dimensionless value where:

$$\text{SAR} = \frac{0.044 \times \text{Sodium concentration}}{\sqrt{(0.025 \times \text{Calcium concentration}) + (0.041 \times \text{Magnesium concentration})}};$$

"**Standard Methods for the Examination of Water and Wastewater**" means the most recent edition of Standard Methods for the Examination of Water and Wastewater published jointly by the American Public Health Association, the American Waterworks Association and the Water Environment Federation;

"**total coliform**" means a group of aerobic and facultative anaerobic, Gram-negative, nonspore-forming, rod-shaped bacteria, that ferment lactose with gas and acid formation within 48 hours at 35 °C, and inhabit predominantly the intestines of man or animals, but are occasionally found elsewhere and include the sub-group of fecal coliform bacteria;

"**wastewater**" means the spent or used water of a community or industry which contains dissolved and suspended matter;

"**wastewater collection system**" means the sewer and pumping system used for the collection and conveyance of domestic, commercial and industrial wastewater; and

"**wastewater treatment lagoon**" means an impoundment into which wastewater is discharged for storage and treatment by natural oxidation.

### GENERAL TERMS AND CONDITIONS

This section of the Licence contains requirements intended to provide guidance to the Licencee in implementing practices to ensure that the environment is maintained in such a manner as to sustain a high quality of life, including social and economic development, recreation and leisure for present and future Manitobans.

1. The Licencee shall direct all sewage generated within the Communities of Anola, Dugald and Oakbank and the surrounding areas toward the wastewater treatment lagoon or other approved sewage treatment facilities.

2. In addition to any of the limits, terms and conditions specified in this Licence, the Licencee shall, upon the request of the Director:
  - a) sample, monitor, analyze and/or investigate specific areas of concern regarding any segment, component or aspect of pollutant storage, containment, treatment, handling, disposal or emission systems for such pollutants or ambient quality, aquatic toxicity, leachate characteristics and discharge or emission rates, for such duration and at such frequencies as may be specified;
  - b) determine the environmental impact associated with the release of any pollutant(s) from the Development; or
  - c) provide the Director, within such time as may be specified, with such reports, drawings, specifications, analytical data, descriptions of sampling and analytical procedures being used, bioassay data, flow rate measurements and such other information as may from time to time be requested.
3. The Licencee shall, unless otherwise specified in this Licence:
  - a) carry out all preservations and analyses on liquid samples in accordance with the methods prescribed in "Standard Methods for the Examination of Water and Wastewater" or in accordance with an equivalent analytical methodology approved by the Director;
  - b) have all analytical determinations undertaken by an accredited laboratory; and
  - c) report the results to the Director, in writing or in a format acceptable to the Director, within 60 days of the samples being taken.
4. The Licencee shall, in case of physical or mechanical breakdown of the wastewater collection and/or treatment system:
  - a) notify the Director immediately;
  - b) identify the repairs required to the wastewater collection and/or treatment system;
  - c) undertake all repairs to minimize unauthorized discharges of wastewater; and
  - d) complete the repairs in accordance with any written instructions of the Director.
5. The Licencee shall not cause or permit a noise nuisance to be created as a result of the construction, operation or alteration of the Development, and shall take such steps as the Director may require to eliminate or mitigate a noise nuisance.
6. The Licencee shall not cause or permit an odour nuisance to be created as a result of the construction, operation or alteration of the Development, and shall take such steps as the Director may require to eliminate or mitigate an odour nuisance.
7. The Licencee shall, during construction and operation of the Development, report spills of fuels or other contaminants to an Environment Officer in accordance with the requirements of *Manitoba Regulation 439/87* respecting *Environmental Accident Reporting* or any future amendment thereof.

8. The Licencee shall comply with the provisions of the Department of Fisheries and Oceans Canada/Manitoba Natural Resources publication, "*Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat*" (May, 1996).
9. The Licencee shall obtain all necessary provincial and federal permits and approvals for construction of relevant components of the Development prior to commencement of construction.

**SPECIFICATIONS, LIMITS, TERMS AND CONDITIONS**

10. The Licencee shall notify the assigned Environment Officer no less than two weeks prior to beginning construction of the Development. The notification shall include the intended starting date of construction.
11. The Licencee shall:
  - a) conduct all ditch related work activities during no flow or dry conditions and not during the April 1 to June 15 fish spawning and incubation period;
  - b) not construct the wastewater treatment lagoon or wastewater collection system during periods of heavy rain;
  - c) place and/or isolate all dredged and construction material where it will not erode into any watercourse;
  - d) implement effective long term sediment and erosion control measures to prevent soil-laden runoff, and/or silt from entering any watercourse during construction and until vegetation is established;
  - e) routinely inspect all erosion and sediment control structures and immediately complete any necessary maintenance or repair; and
  - f) maintain stream beds and banks of watercourses associated with lagoon operation and repair erode and physically unstable streambeds and banks associated with the wastewater treatment lagoon, the discharge route and associated watercourses such that they are able to perform the operations for which they were designed and constructed.
12. The Licencee shall during construction of the wastewater treatment lagoon, operate, maintain and store all materials and equipment in a manner that prevents any deleterious substances (fuel, oil, grease, hydraulic fluids, coolant, paint, uncured concrete and concrete wash water, etc.) from entering the wastewater treatment lagoon, the discharge route and associated watercourses.
13. The Licencee shall construct waterway crossings by augering, tunneling or boring. Open cut waterway crossings shall not be made unless prior consultation with Manitoba Conservation staff and Department of Fisheries and Oceans staff has occurred and the prior written approval of the Director has been obtained. This condition applies on continuously flowing watercourses at all times, and on intermittent streams and artificial drainage channels only when flow is occurring.
14. The Licencee shall revegetate soil exposed during the construction of the Development with native or introduced grasses or legumes. Native species shall be used to revegetate areas where native species existed prior to construction. Revegetation is not required for pipelines installed by chain trenching or

ploughing on previously disturbed ground including road allowances or on the floors of the wastewater treatment lagoon.

15. The Licencee shall not alter local drainage patterns by the construction of the Development, including inflows and outflows from small wetlands adjacent to the route of pipelines.
16. The Licencee shall, where open cut stream crossing techniques are used on intermittent waterways and artificial drainage channels, minimize disturbance to riparian areas and restore the bottom and banks of the waterways to their original elevations and shapes.
17. The Licencee shall separate and replace topsoil from backhoe and trenching operations in accordance with the methodology described in figures 2 and 3 attached to this Licence. This requirement is not applicable where the topsoil has been previously disturbed due to the construction of roads or drains.
18. The Licencee shall, prior to the construction of the dykes for the expansion to the wastewater treatment lagoon:
  - a) remove all organic topsoil from the area where the dykes will be constructed; or
  - b) remove all organic material to a depth of 3 metres and a width of 3.0 metres from the area where the liner will be constructed.
19. The Licencee shall construct and maintain the cells of the wastewater treatment lagoon with continuous liners, including cutoffs, under all interior surfaces of the cells in accordance with the following specifications:
  - a) the liners shall be made of clay;
  - b) the liners shall be at least one metre in thickness;
  - c) the liners shall have a hydraulic conductivity of  $1 \times 10^{-7}$  centimetres per second or less at all locations; and
  - d) the liners shall be constructed to an elevation of 2.5 metres above the floor elevation of each of the primary and secondary cells.
20. The Licencee shall not discharge effluent from the wastewater treatment lagoon:
  - a) where the organic content of the effluent, as indicated by the five day biochemical oxygen demand, is in excess of 30 milligrams per litre;
  - b) where the fecal coliform content of the effluent, as indicated by the MPN index, is in excess of 200 per 100 millilitres of sample;
  - c) where the total coliform content of the effluent, as indicated by the MPN index, is in excess of 1500 per 100 millilitres of sample;
  - d) between the 1st day of November of any year and the 15th day of June of the following year;
  - e) when flooding from any cause is occurring along the effluent drainage route; or
  - f) when such a discharge would cause or contribute to flooding in or along the effluent drainage route.

21. The Licencee shall:
  - a) advise the Director of the commissioning date of the wastewater treatment lagoon;
  - b) fill the primary and secondary cells with water, to an elevation of 0.75 metres above the floor elevation of each respective cell, after all required soil sampling and testing requirements have been met and within 8 months of the commissioning date for the wastewater treatment lagoon;
  - c) after the wastewater treatment lagoon has been commissioned for a period of 8 months, maintain the liquid depth in the primary cells at an elevation of not less than 0.75 metres above the floor elevation of primary cells at all times; and
  - d) after the wastewater treatment lagoon has been commissioned for a period of 8 months, maintain the liquid depth in the secondary cells at an elevation of not less than 0.3 metres above the floor elevation of secondary cells at all times.
22. The Licencee shall operate and maintain the wastewater treatment lagoon in such a manner that:
  - a) the organic loading on each primary cell, as indicated by the five-day biochemical oxygen demand, is not in excess of 56 kilograms per hectare per day; and
  - b) the depth of liquid in the primary cells or secondary cells does not exceed 1.5 metres.
23. The Licencee shall install and maintain a fence around the wastewater treatment lagoon to limit access. The fence shall be a minimum of 1.2 meters high and have a locking gate, which shall be locked at all times except to allow access to the wastewater treatment lagoon.
24. The Licencee shall construct and maintain an all-weather access road and a sewage dumping station for truck handled sewage. The dumping facility shall have a surface splash ramp with a smooth hard surface that can be easily washed free of solids.
25. The Licencee shall not discharge septage into the wastewater treatment lagoon between the 1<sup>st</sup> day of October of any year and the 1<sup>st</sup> day of June of the following year.
26. The Licencee shall, if in the opinion of the Director, significant erosion of the interior surfaces of the dykes occurs, repair the dyke and install rip rap as necessary. The rip rap shall be placed on the interior dyke surfaces from 0.6 metres above the high water mark to at least 0.6 metres below the low water mark to protect the dykes from wave action.
27. The Licencee shall provide and maintain a grass cover on the dykes of the wastewater treatment lagoon and shall regulate the growth of the vegetation so that the height of the vegetation does not exceed 0.3 metres on all dykes.



28. The Licencee shall annually remove by mechanical methods all reeds, rushes and trees located above the low water mark in every cell of the wastewater treatment lagoon.
29. The Licencee shall implement an ongoing program to remove burrowing animals from the site of the wastewater treatment lagoon.
30. The Licencee shall locate all fuel storage and equipment servicing areas established for the construction and operation of the Development at a minimum distance of 100 metres from any waterbody, and shall comply with the requirements of *Manitoba Regulation 188/2001* respecting *Storage and Handling of Petroleum Products and Allied Products Regulation* or any future amendment thereof.
31. The Licencee shall actively participate in any future watershed-based management study, plan and/or nutrient reduction program approved by the Director, for the Cooks Creek Diversion, the Red River Floodway, the Red River and/or associated waterways and watersheds.

#### MONITORING AND REPORTING

32. The Licencee shall prior to each effluent discharge campaign obtain grab samples of the treated wastewater and have them analyzed for:
  - a) the organic content as indicated by the five day biochemical oxygen demand and expressed as milligrams per litre;
  - b) the fecal coliform content as indicated by the MPN index and expressed as MPN per 100 millilitres per sample; and
  - c) the total coliform content as indicated by the MPN index and expressed as MPN per 100 millilitres per sample.
33. The Licencee shall:
  - a) during each year maintain records of:
    - i) wastewater sample dates;
    - ii) original copies of laboratory analytical results of the sampled wastewater;
    - iii) effluent discharge dates;
  - b) make the records being maintained pursuant to sub-Clause 33 a) of this Licence available to an Environment Officer upon request; and
  - c) keep the maintained records of any one calendar year available for inspection for a period of three years following the respective calendar year in which they were recorded.
34. The Licencee shall maintain a record of all septage, sewage and wastewater hauled to the wastewater treatment lagoon, including the number of loads on a daily and weekly basis, the volume of each load, the name of the hauler, and the source of the contents of each load according to the type of waste and the name and location of each property serviced. The Licencee shall submit an annual report of all the waste hauling information to the Director by the 15th of January of the following year.

35. The Licencee shall, prior to each effluent discharge campaign, notify the Manitoba Department of Transportation and Government Services regional maintenance supervisor.
36. The Licencee shall conduct a monitoring program for the Sodium Adsorption Ratio (SAR) of effluent, prior to each discharge, for a minimum of three
37. The Licencee shall, not less than 30 days after the results of the sample analysis are available, submit to the Director the results of the monitoring program carried out pursuant to Clause 36.
38. The Licencee shall, as may be requested by the Director, propose a plan, for approval by the Director, that the Licencee will implement to reduce the concentrations of effluent constituents that create SAR levels that exceed SAR levels of Manitoba Water Quality Standards, Objectives, and Guidelines.
39. The Licencee shall arrange with the designated Environment Officer a mutually acceptable time and date for any required soil sampling between the 15th day of May and the 15th day of October of any year.
40. The Licencee shall take and test soil and sediment samples, in accordance with Schedule "A" attached to this Licence, from the liner of the wastewater treatment lagoon; the number and location of samples and test methods to be specified by the designated Environment Officer up to a maximum of 120 samples.
41. The Licencee shall, not less than 2 weeks before the wastewater treatment lagoon is placed in operation, submit to the Director the results of the tests carried out pursuant to Clause 40 of this Licence.
42. The Licencee shall, after the completion of construction:
  - a) monitor the site where work occurred to evaluate the effectiveness of erosion control and sediment control measures and the physical stability of roadside ditches and watercourse crossings; and
  - b) where monitoring identifies any problems, immediately take appropriate action to rectify the situation and advise the Department of Fisheries and Oceans, Winnipeg District of the situation and any corrective measures taken.
43. The Licencee shall:
  - a) prepare updated "as constructed drawings" for the Development and shall label the drawings "As Constructed"; and
  - b) provide to the Director, on or before 30<sup>th</sup> day of November, 2005, two sets of "as constructed drawings" of the wastewater treatment lagoon.

**DECOMMISSIONING OF EXISTING WASTEWATER TREATMENT LAGOONS**

44. The Licencee shall, after placing the Development into operation, prevent any additional wastewater or septage from being discharged into the wastewater treatment lagoons associated with the Community of Dugald located on SW 3-11-5 EPM, and that associated with the Community of Oakbank located on NE 22-11-5 EPM, in the Rural Municipality of Springfield, Manitoba.
45. The Licencee shall, within one year of placing the Development into operation,;
- remove the wastewater from each of the Communities of Dugald and Oakbank wastewater treatment lagoons, located on SW 3-11-5 EPM and on NE 22-11-5 EPM respectively, and transport it to the new wastewater treatment lagoon located on NE 11-11-5 EPM in the Rural Municipality of Springfield, Manitoba or discharge treated effluents in accordance with Environment Act Licence Nos. 294 and 1772 S1 respectively;
  - dewater the sludge in each of the Communities of Dugald and Oakbank wastewater treatment lagoons, located on SW 3-11-5 EPM and on NE 22-11-5 EPM respectively;
  - remove all of the sludge from each of the Communities of Dugald and Oakbank wastewater treatment lagoons, located on SW 3-11-5 EPM and on NE 22-11-5 EPM respectively;
  - dispose of the sludge from each of the Communities of Dugald and Oakbank wastewater treatment lagoons, located on SW 3-11-5 EPM and on NE 22-11-5 EPM respectively, at a waste disposal ground operated under the authority of a permit issued under Manitoba Regulation 150/91 or a Licence issued pursuant to The Environment Act; and
  - level the sites of each of the Communities of Dugald and Oakbank wastewater treatment lagoons, located on SW 3-11-5 EPM and on NE 22-11-5 EPM respectively, to the original grades.
46. The Licencee shall restrict the use of the sites of each of the Communities of Dugald and Oakbank wastewater treatment lagoons, located on SW 3-11-5 EPM and on NE 22-11-5 EPM respectively, to the growing of the following agricultural crops for a period of three years after the sites have been leveled:
- a cereal crop;
  - a forage crop; or
  - a seed crop.
47. At the expiration of the three-year period, the Licencee, or any subsequent owner of the sites, shall use the sites in accordance with the by-laws of the Rural Municipality of Springfield, and other Federal and Provincial regulations as applicable.

**REVIEW AND REVOCATION**

- A. Licence Nos. 294 and 1772 S1 are rescinded upon approved commissioning of the wastewater treatment lagoon.

- B. If, in the opinion of the Director, the Licencee has exceeded or is exceeding or has or is failing to meet the specifications, limits, terms, or conditions set out in this Licence, the Director may, temporarily or permanently, revoke this Licence.
- C. If the Licencee has not commenced construction of the Development within three years of the date of this Licence, the Licence is revoked.
- D. If, in the opinion of the Director, new evidence warrants a change in the specifications, limits, terms or conditions of this Licence, the Director may require the filing of a new proposal pursuant to Section 11 of The Environment Act.

  
Larry Strachan P. Eng.  
Director  
Environment Act

FILE: 4929.00

**RESCINDED**

**Schedule "A" to Environment Act Licence No. 2634**

Soil Sampling:

1. The Licencee shall provide a drilling rig, acceptable to the designated Environment Officer, to extract soil samples from the liner which is not placed or found at the surface of the lagoon structure. This includes all wastewater treatment lagoons constructed with clay cutoffs at the interior base of the dyke or with a clay cutoff in the centre of the dyke. The drill rig shall have the capacity to drill to the maximum depth of the clay cutoff plus an additional 2 metres. The drill rig shall be equipped with both standard and hollow stem augers. The minimum hole diameter shall be 5 inches.
2. For lagoon liners placed or found at the surface of the lagoon structure, the Licencee shall provide a machine, acceptable to the designated Environment Officer, capable of pressing a sampling tube into the liner in a straight line motion along the centre axis line of the sample tube and without sideways movement.
3. Soil samples shall be collected and shipped in accordance with ASTM Standard D 1587 (Standard Practice for Thin-Walled Tube Sampling of Soils), D 4220 (Standard Practice for Preserving and Transporting Soil Samples) and D 3550 (Standard Practice for Ring-Lines Barrel Sampling of Soils). Thin-walled tubes shall meet the stated requirements including length, inside clearance ratio and corrosion protection. An adequate venting area shall be provided through the sampling head.
4. At the time of sample collection, the designated Environment Officer shall advise the Licencee as to the soil testing method that must be used on each sample. The oedometer method may be used for a sample were the Environment Officer determines that the soil sample is taken from an undisturbed clay soil which has not been remoulded and which is homogeneous and unweathered. The triaxial test shall be used for all samples taken from disturbed and remoulded soils or from non homogeneous and weathered soils.
5. The Licencee shall provide a report on the collection of soil samples to the designated Environment Officer and to the laboratory technician which includes but is not limited to: a plot plan indicating sample location, depth or elevation of sample, length of advance of the sample tube length of soil sample contained in the tube at its advancement, the soil test method specified by the Environment Officer for each soil sample and all necessary instructions from the site engineer to the laboratory technician.
6. All drill and sample holes shall be sealed with bentonite pellets after the field drilling and sampling has been completed.

Soil Testing Methods:

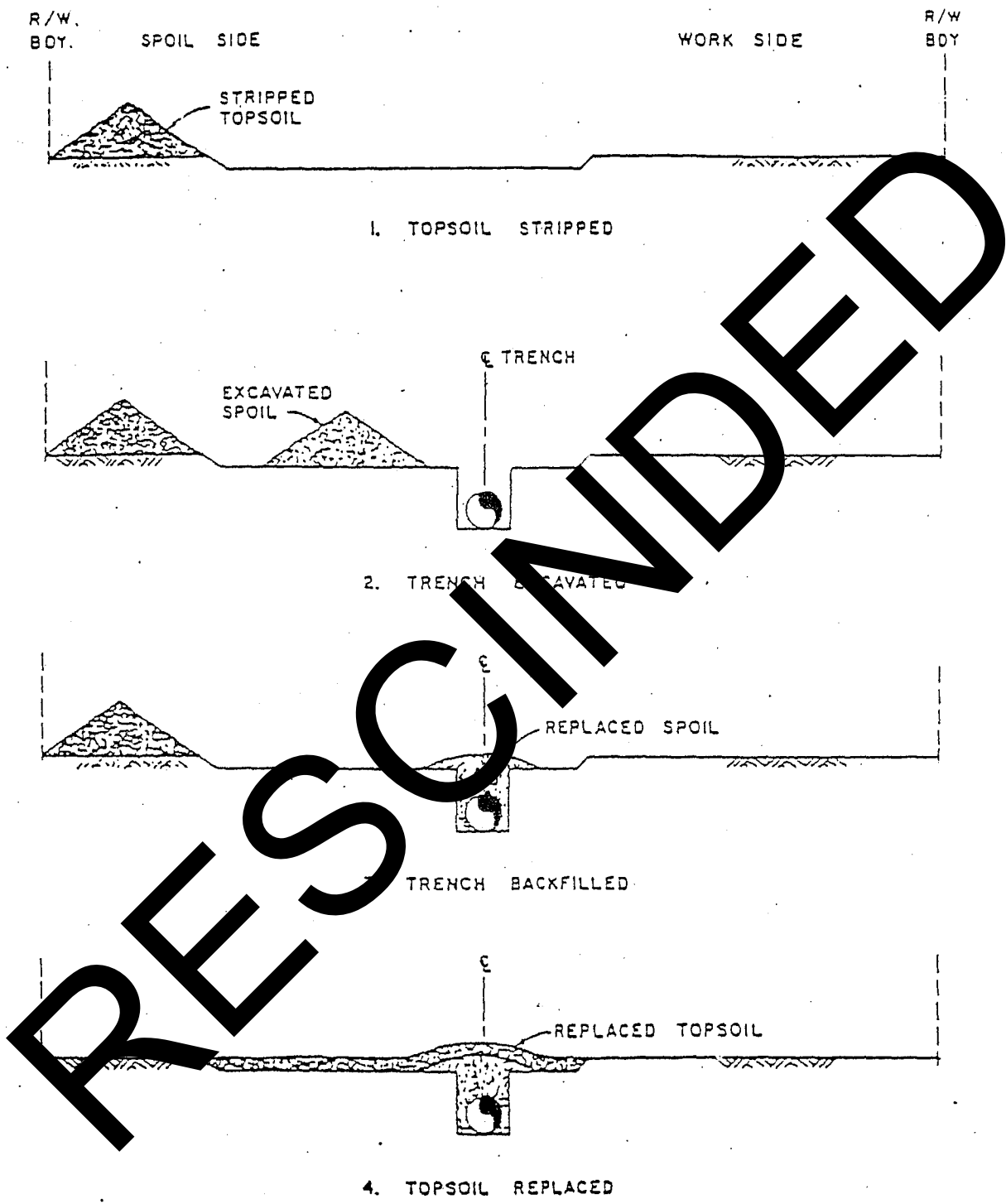
1. Triaxial Test Method

- a) The soil samples shall be tested for hydraulic conductivity using ASTM D 5084 (Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter).
- b) Soil specimens shall have a minimum diameter of 70 mm (2.75 inches) and a minimum height of 70 mm (2.75 inches). The soil specimens shall be selected from a section of the soil sample which contains the most porous material based on a visual inspection. The hydraulic gradient shall not exceed 10 during sample preparation and testing. Swelling of the soil specimen should be controlled to adjust for: the amount of compaction measured during sample collection and extraction from the tube and the depth or elevation of the sample. The effective stress used during saturation or consolidation of the sample shall not exceed 40 kPa (5.7 psi) or the specific stress level, that is expected in the field location where the sample was taken, whichever is greater.
- c) The complete laboratory report, as outlined in ASTM D 5084, shall be supplied for each soil sample collected in the field.

2. Oedometer Test Method

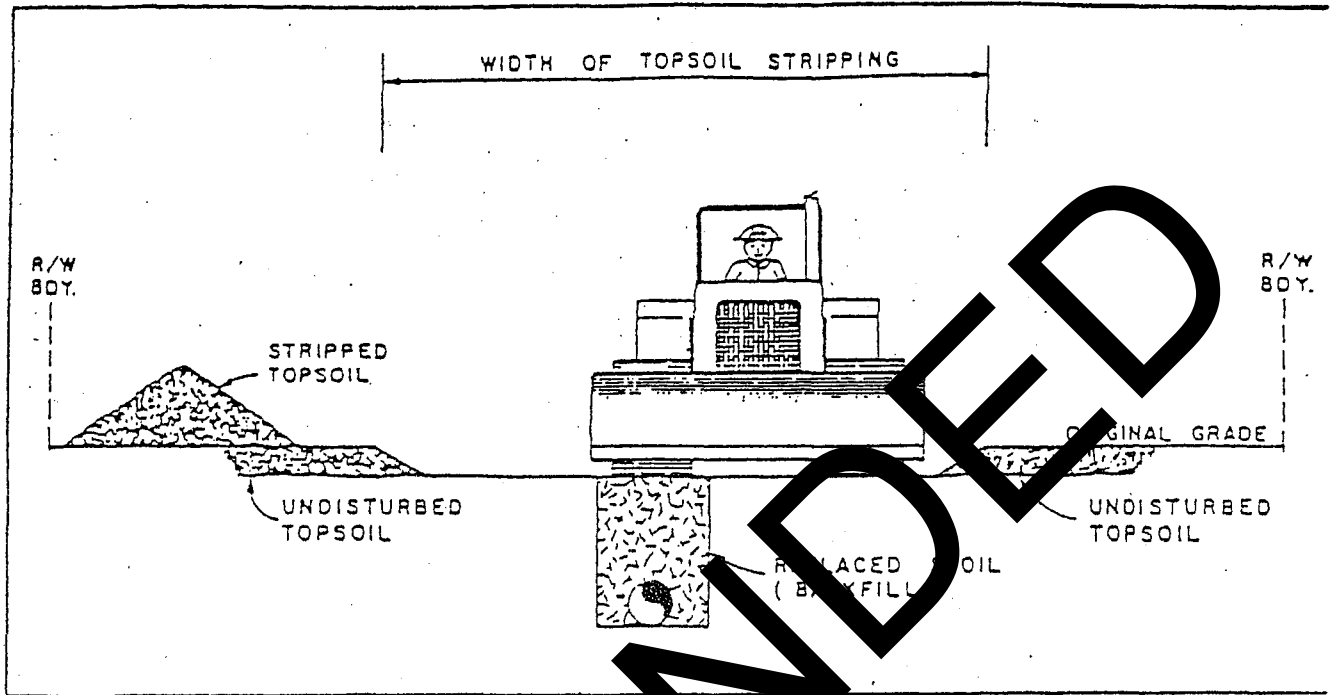
- a) The soil samples shall be tested for hydraulic conductivity using ASTM D 2435 (Standard Test Method for One-Dimensional Consolidation Properties of Soils).
- b) Soil specimens shall have a minimum diameter of 50 mm (2 inches) and a minimum height of 20 mm (0.75 inches). The soil specimens shall be selected from a section of the soil sample which contains the most porous material based on a visual inspection. The soil specimen shall be taken from an undisturbed soil sample. The soil specimen shall be completely saturated.
- c) The complete laboratory report, as outlined in ASTM D 2435, shall be supplied for each soil sample collected in the field.

RESERVED



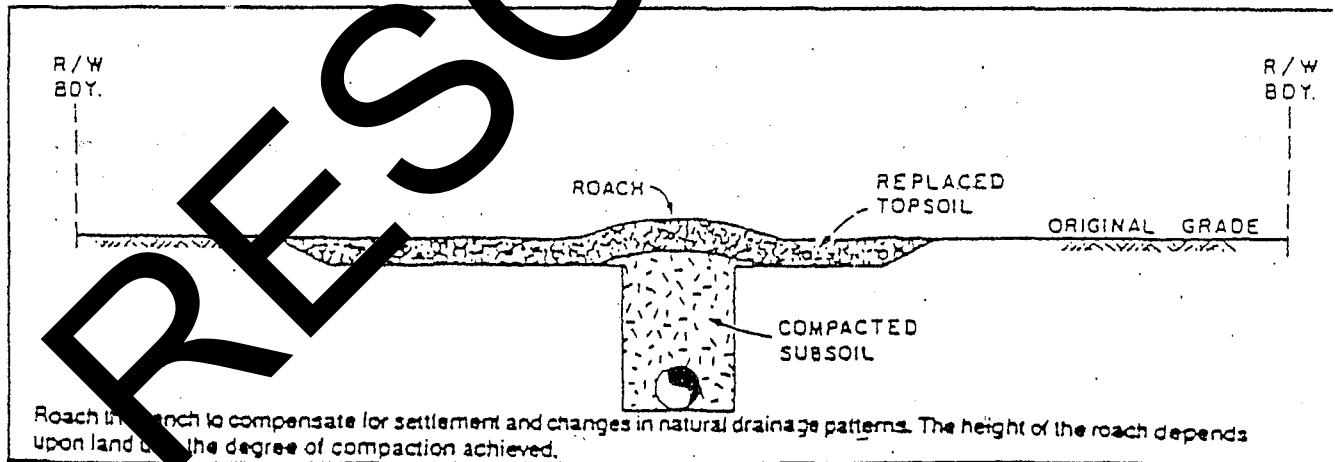
SEQUENCE OF TOPSOIL HANDLING

Figure 1



COMPACTION OF BACKFILL

Figure 2



ROACHING THE TRENCH

Figure 3