

Prepared for:

**CAPITAL REGIONAL DISTRICT (CRD)
REQUEST FOR EXPRESSION OF INTEREST
REGARDING INNOVATIVE SEWAGE TREATMENT
AND RESOURCE RECOVERY TECHNOLOGY
FOR VICTORIA, BRITISH COLUMBIA, CANADA**

Prepared by:



N-VIRO SYSTEMS CANADA INC.

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Table of Contents

Section

- 1. Company Information & Authorized Officers**
 - 2. Description of Technology**
 - 3. Overview of Canadian Plants**
 - 4. Non-Canadian Plants**
 - 5. Demonstrated Operating Abilities**
 - 6. Demonstrated Marketing Abilities**
 - 7. Product Uses, Approvals, Properties**
 - 8. Project Example**
- Appendix**

1 Company Information & Authorized Officers

The logo for N-VIRO is a green rounded rectangle with the text "N-VIRO" in white, followed by a registered trademark symbol (®).

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2 Description of the Technology

“The N-Viro process takes all the headaches away”.

Dan Rabe,
Biosolids Supervisor
Auburn, IN

N-Viro Systems Canada Inc. proposes the N-Viro Soil process, which is a patented process for the treatment and recycling of bio-organic wastes, utilizing certain alkaline byproducts. To date, the N-Viro process has been commercially utilized for the recycling of sludges from municipal wastewater treatment facilities in the US, the UK, Australia and Canada.

The N-Viro Soil process stabilizes and pasteurizes the wastewater sludge (in which harmful bacteria are destroyed and the beneficial soil bacteria, or microflora, survive). It reduces odours to acceptable levels, neutralizes or immobilizes heavy metals, and generates a product that has a granular appearance similar to soil. It offers multiple commercial uses.

The Process

General

In the N-Viro Soil patented process (Advanced Alkaline Stabilization with Subsequent Accelerated Drying, or AASSAD), an alkaline admixture (AA) is added to dewatered sludge, mixed, heated (in part through a chemical reaction) and dried.

A flow diagram of the typical N-Viro soil process and a description of the process unit steps are shown on the N-Viro Advanced Alkaline Stabilization Technology - Process Schematic, page 4.

Material

The N-Viro process uses mechanically dewatered sludge, called sludge cake, which consists of between 16 and 35 percent solids. The process can accept a variety of sludges: primary, primary/waste activated or waste activated, either digested or undigested.

The dewatered cake is either transported by truck to a dedicated N-Viro Soil facility or mechanically conveyed to an N-Viro facility integrated with a wastewater treatment plant.

Mixing

Alkaline admixtures (AA), usually industrial by-products such as cement-kiln dust, lime-kiln dust, fly ash and/or steel-making fines supplemented in some cases with quicklime, are mixed with the dewatered sludge cake. The admixtures are dosed at a rate of 30 to 45 percent of the wet-weight sludge. The amount of the alkaline admixture varies according to the amount of heating required or desired in the processing, the type of sludge (the higher the solids content the lower the AA dosage), the characteristics of the alkaline admixture, and the intended beneficial reuse market(s). If the



admixture does not contain enough free lime (CaO , $\text{Ca}(\text{OH})_2$ or other strong alkali) to give the necessary temperature and pH rise, CaO is added. Blending takes place in a pug-mill-type mixer.

Advantages of BioDry Rotary Drum Dryer Technology

- ∠ improved biosolids drying efficiency
- ∠ advanced process automation
- ∠ single-pass materials handling
- ∠ reduction in biosolids product
- ∠ complete emission control
- ∠ consistent high quality product
- ∠ limited footprint requirements
- ∠ elimination of special product storage requirements

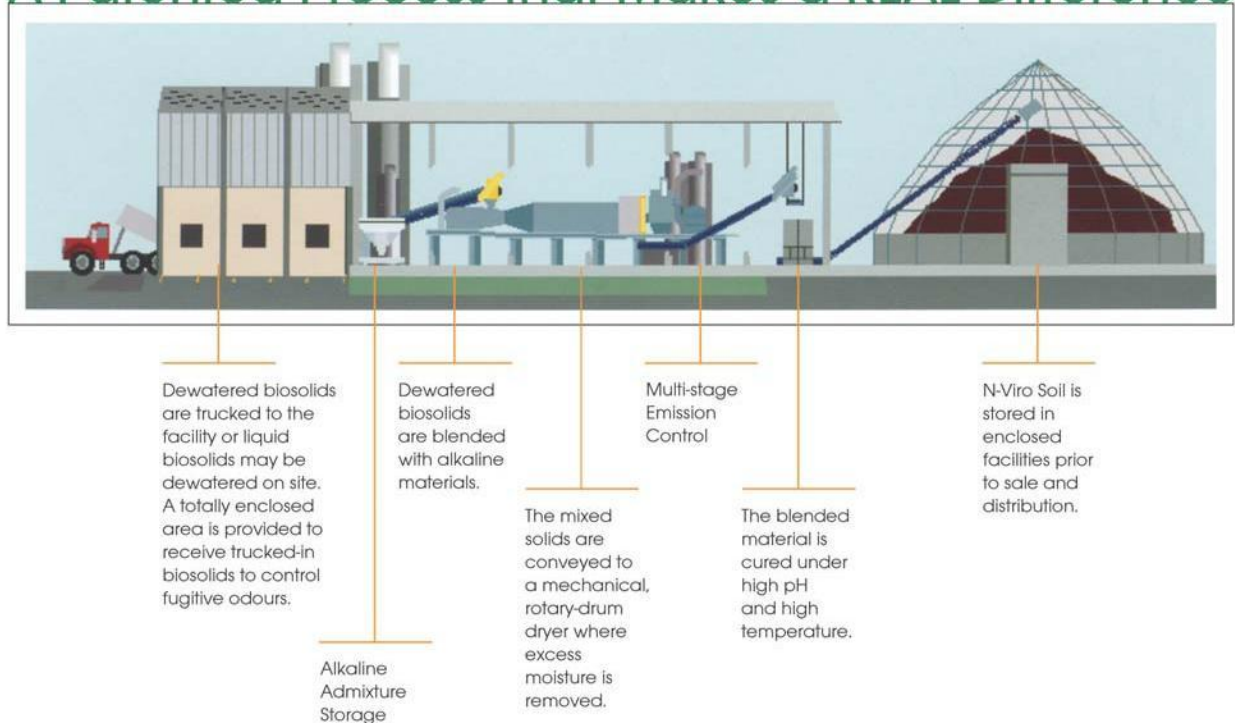
Drying

Following the mixing step the product is dried to the desirable 60 - 65 percent solids content with the use of a mechanical rotary-drum dryer. All of the proposals put forward by N-Viro Canada incorporate mechanical drying.

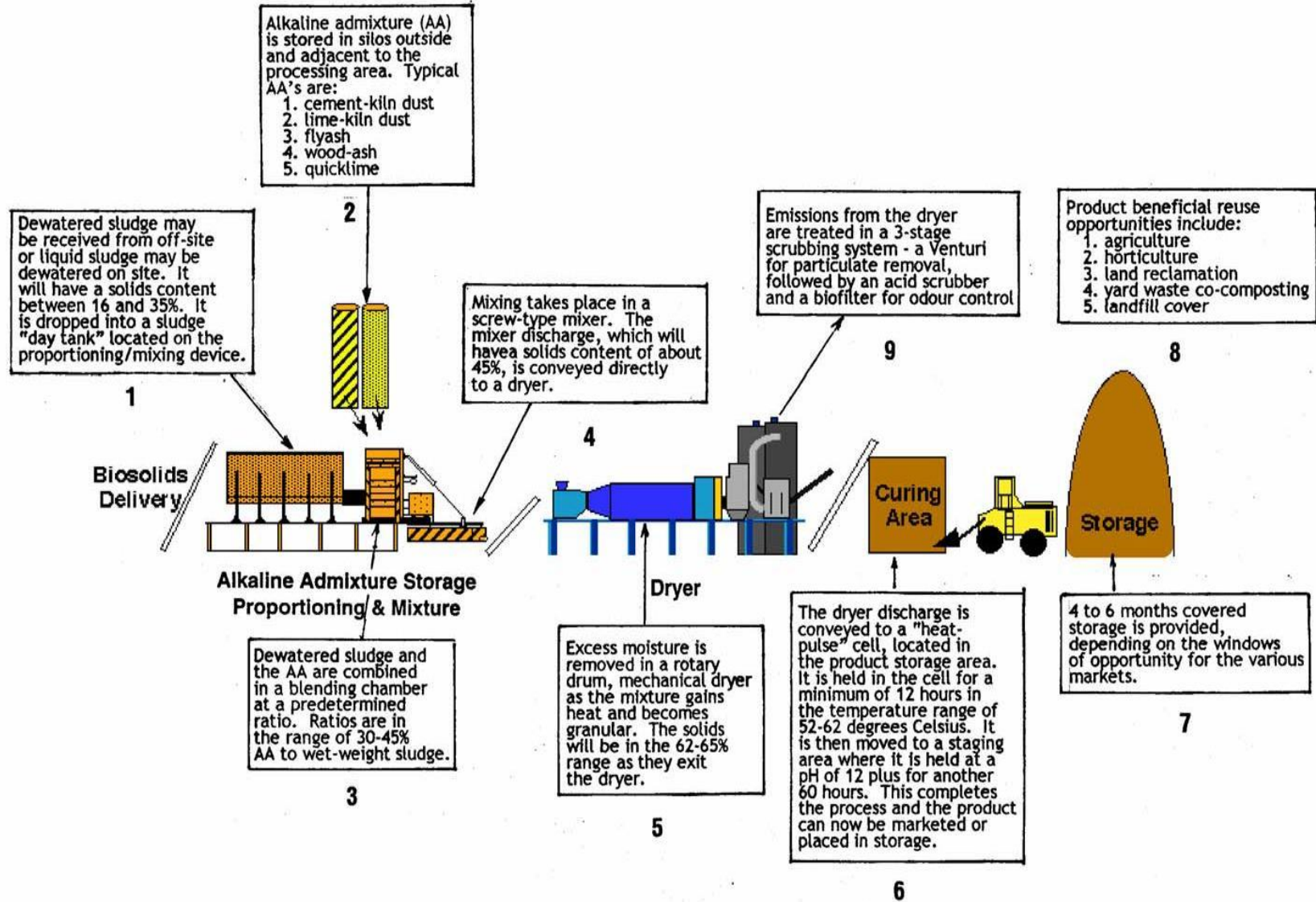
The mixer discharge goes directly to a single-pass, rotary-drum dryer. The dryer discharge then goes to a “heat-pulse” cell. A combination of heat from the dryer and a chemical reaction between the alkaline materials and the moisture in the sludge cake raises the temperature to a controlled range of between 52 and 62°C and the pH to slightly above 12. The material is held in the heat-pulse cell(s) in the controlled temperature range for a period of 12 hours. The elevated pH is maintained for a total of 72 hours, after which the product is ready for distribution or storage.

N-Viro Facility and Process Schematic

A Patented Process that Makes a REAL Difference



N-Viro Advanced Alkaline Stabilization Technology - Process Schematic -



Stability and Pathogen Reduction

The basis of the N-Viro Soil process is to destroy pathogens through a combination of stresses:

1. alkaline pH
2. high temperature
3. high ammonia
4. accelerated drying
5. indigenous microflora

The pathogen destroying stresses are produced in the sludge/alkaline admixture through the unique properties of the admixture. The high alkalinity contributes to stresses 1, 2 and 3 with extremely fine particle size and low moisture content contributing to stress 4. As with compost, thermophilic temperatures (52 - 62°C) and a soil-like environment contribute to the growth of indigenous microorganisms that suppress the regrowth of pathogens and putrefying organisms (stress 5). The relatively high population of soil organisms in the final product (10^3 to 10^7 per gram) produces a slow composting in the material in which degradable organics from the sludge are stabilized.



Odour Control

Another important feature of the N-Viro Soil process in producing a marketable, sludge-derived product is odour control. A Venturi scrubber is used for particulate removal followed by an acid scrubber (as necessary), and then by a biofilter. Air from the mixer area, the heat-pulse, the product storage area and the exhaust from the dryer are all treated.

The primary emissions are particulates, ammonia, and trimethylamines, which are released during the drying and heat-pulse phases. They are amenable to scrubbing, such that emissions readily meet regulatory requirements.

The design of the odour control system at the N-Viro Facility will meet the following criteria:

- fully and effectively enclose the facility, including the product storage area
- maintain all process and storage areas under negative pressure
- treat all malodorous air prior to discharge.



Noise control

Noise control at the N-Viro Facility is achieved by the following proposed measures:

- facility is enclosed
- all equipment installed in the facility is required to meet guidelines for acceptable noise emission levels.

Dust control

Dust control at the N-Viro Facility is achieved by the following proposed measures:

- facility is enclosed and under negative pressure
- all process and dryer exhaust air is exhausted through the emissions control system, which consists of Venturi scrubber, followed by an acid scrubber, followed by a biofilter
- all air discharged from the facility is directed through the biofilter.

The product

The N-Viro Soil product meets the requirements of applicable Agriculture and Agri-Food Canada (Ag Canada) Fertilizers Act and Regulations, and Provincial guidelines for its use in the agricultural sectors. A product label, approved by the CFIA, is obtained for each facility.



The N-Viro Soil process also meets the current US EPA Regulation 40 CFR 503 and is classed as Exceptional Quality Sludge (EQS) or Class A.

The heavy metals present in the sludge are converted to insoluble forms so the use of N-Viro Soil does not create any adverse conditions in terms of metals leaching. No hazardous compounds are produced during the process. Particulate and odour-producing substances are collected and removed via a multi-stage scrubbing system.

The final product is a biologically stable, low-odour, safe, soil-like material that will have a solids content of approximately 62 percent.

Sustainable Development Technology

Principles of sustainable development include:

- fulfillment of human needs for clean air and water
- maintenance of ecological integrity through reduction in wastes and protection of diverse and important natural systems
- provision for self-determination through public involvement in the definition and development of local solutions to environmental problems
- achievement of equity with the fairest possible sharing of limited resources.

The N-Viro technology is a process that meets the requirements of sustainable development with beneficial reuse applications in agriculture, land reclamation, horticulture and landfill areas.

In response to the principles of sustainable development noted above:

1. N-Viro utilizes two waste products, cement kiln dust, or like by-products, and sewage sludge, to produce N-Viro Soil, a granular soil-like product that has many beneficial reuse markets.

2. N-Viro Soil provides valuable nutrients such as nitrogen, phosphorous, potassium, aglime equivalency and organics that when applied to agricultural land or used for horticultural purposes, reduces the use of chemical fertilizers and improves soil characteristics.
3. N-Viro Soil meets the Provincial guidelines for agricultural land application, as well as those of the Ag Canada Fertilizers Act and Regulations.
4. N-Viro believes in community consultation with respect to the process and beneficial reuse technology to ensure the public is educated and supportive.
5. N-Viro is a simple, environmentally friendly technology that is very efficient in the use of valuable capital and energy resources while converting sewage sludge waste to product applications that in every way help to maintain and restore land for healthy productive purposes.



3 Canadian Plant Overview

In Canada, N-Viro facilities are operating in Leamington and Sarnia. These are certified biosolids management facilities and the products are approved for use as a soil amendment by the Canadian Food Inspection Agency under the Federal Fertilizers Act and Regulations.

A summary of the Canadian facilities, together with a list of other projects under development in Canada, is provided below.



Leamington, Ontario

Location:

The plant is located on the Leamington Pollution Control Centre property. It serves an equivalent population of approximately 75,000 (18,000 town population plus the Heinz Food processing facility) in Leamington. Approximately 70% of the biosolids processed are from Heinz. The plant has operated continuously since January, 1996.

Contract

The Town of Leamington and N-Viro Systems Canada Inc. (NSCI) co-manage the plant. NSCI provides technical back-up, product approvals, QA/QC, marketing and distribution of the product under a 15 year operating contract. The product is distributed under the Federal Fertilizers Act as a soil amendment to agriculture.

WWTP

The Town of Leamington and Heinz flows are jointly processed through a common plant (extended aeration process) for approximately 10 months of the year. During tomato processing (Aug. 15 – Oct. 15) a second, similar plant dedicated to Heinz wastes is placed in service. There are no digesters. The biosolids (100% waste activated) are dewatered through centrifuges to 18-22% solids.

Product

Approximately 12,000 product tonnes are produced each year. The product is marketed through a local fertilizer distributor. The distributor picks up the product from storage as required, sells and applies it for the farmers.



Sarnia, Ontario

Location

The plant is located on the Sarnia Wastewater Treatment Plant property. The served population is approximately 75,000 for the City of Sarnia. The plant has been operating continuously since March, 2001.

Contract

NSCI managed the plant using Sarnia Wastewater Treatment Plant operators for the first 5 years. Upon retirement of the NSCI site manager, we now use a Sarnia City employee manager along with NSCI support. NSCI also provides technical back-up, QA/QC, product approvals, marketing and distribution of the product. A further 5 year contract renewal was signed in late 2006. The product is distributed under the Federal Fertilizers Act as a soil amendment to agriculture.

WWTP

The Wastewater Treatment Plant process provides conventional secondary treatment. There were digesters prior to 2001 which were shut down when the N-Viro process took over. The biosolids combined are dewatered through centrifuges to 26-30% solids.

Product

Approximately 7,000 product tonnes are produced each year. The product is marketed through a local fertilizer distributor similar to Leamington.

Niagara Region

Location

The plant is located on private property in Thorold, Ontario. It is located on a site which has a quarry, landfill, and a composting operation owned and operated by Walker Industries. It will serve a population of approximately 400,000 (all of the communities in Niagara Region). The plant begins operation February 1, 2007.

Contract

NSCI and Walker Industries formed a 50/50 Joint Venture called Niagara Biosolids Corporation (NBC). NBC owns the contract with Niagara Region and owns the facility. This project received a P³ award from the Canadian Council for Public and Private Partnership in 2006. NBC will be jointly managed by Walker Industries and NSCI. NSCI will also do marketing and distribution of the product. The product will partly be distributed under the Federal Fertilizers Act to agriculture and partly for topsoil manufacturing.

This plant has spare capacity and can easily be expanded further to act as a merchant facility to process other municipalities' biosolids.

WWTP

Niagara Region operates 8 wastewater treatment plants. All plants are conventional treatment with digesters. The Region is considering shutting down some digesters in the future.

The Region's biosolids will be dewatered through 2 regional dewatering facilities by centrifuges. The dewatered cake at 26-35% solids will be trucked to the NBC plant for processing.

Product

This plant will produce 40,000 and up to 80,000 tonnes of product per year. The product will partly be marketed to agriculture and partly to horticulture, soil blending and possible bagging in the future.

Halifax Region

History at Halifax Wastewater Treatment Plants

The Halifax Regional Municipality (HRM) has had very limited wastewater treatment up until now. The bulk of the sewage was discharged directly into Halifax Harbour. A \$330 million project was started several years ago to:

1. Provide a collection sewer system
2. Build 3 new wastewater treatment plants to serve Halifax City, Dartmouth and Herring Cove.
3. Build a biosolids processing facility (BPF).

An existing wastewater treatment plant at the Halifax Aerotech industrial park services the airport, septage haulers and biosolids from several small wastewater treatment plants.

The Halifax Region will own all of the facilities with contract operations for the biosolids processing facility.

Location

The biosolids processing facility (BPF) will be located in the industrial park at the airport (Aerotech Park). Biosolids from the three new wastewater treatment plants and the existing Aerotech plant will be trucked to the BPF. The BPF will serve a population of approximately 400,000.

Contract

Hatch Engineering, under a design-build contract, built the BPF for HRM. NSCI have an operating contract for complete operations of the BPF plus approvals, marketing and distribution of the product. This is a 5 year contract with 5 year renewals.

WWTPs

The three new wastewater treatment plants will all be enhanced primary treatment. Due to the N-Viro process, digestion was not necessary for beneficial reuse of the biosolids-based product. This facilitated a much lower cost wastewater treatment plant process. The existing Aerotech Park wastewater treatment plant will provide a mixture of untreated septage, digested and undigested sludges.

Dewatering at all wastewater treatment plants will be by Fournier Presses providing dewatered cake at 28-38% solids.

Product

Approximately 35,000 tonnes of product at full production per year will be produced. It is planned for 60% to go to agriculture through local distributors. The balance of 40% will be used for topsoil manufacture, sod growing, horticulture and as a back-up, some land reclamation.

Summerside, PEI

Location

The plant is under construction on the Summerside Wastewater Treatment Plant site. This will be a small plant serving a population equivalent of approximately 40,000 (12,000 town population and a dairy products' operation).

Contract

NSCI will provide technical support, approvals, marketing and distribution under a service contract. The product will be distributed under the Canadian Fertilizers Act.

WWTP

The City of Summerside is rebuilding their wastewater treatment plant. The process will be conventional primary/secondary treatment. Dewatering by Fournier Press to 30% solids will be in the biosolids building.

Product

Approximately 4,000 tonnes of product will be produced and sold through a local fertilizer distributor.

4 Non-Canadian Locations

There are approximately 50 N-Viro facilities worldwide, serving some 65 communities. They range in size up to 50,000 dry tons per year. The following are selected N-Viro facilities operating in U.S.



Middlesex, New Jersey

Middlesex is the largest facility using the N-Viro Soil process. It processes 53,000 dry tons per year at a rate of 180 dry tons per day, producing approximately 180,000 tons per year of N-Viro product. A nearby wastewater treatment plant, which produces the sludge, has a capacity of 117 million Imperial gallons per day and serves a population of over 1,000,000. The N-Viro facility went into operation in April 1992 and has been in continuous operation since.



The Middlesex facility incorporates the basic N-Viro Soil process but accelerated drying is done by windrowing rather than by the use of a mechanical dryer. Chemical scrubbers provide odour control.

Your contact for the Middlesex facility is Dan Tanzi at (732) 721-3800.



Syracuse, New York

Sludge capacity: 11,000 dry tons/year
Product Produced: approx. 45,000 tons/year
Contact: Randy Ott, Tel.: (315) 435-6820



Toledo, Ohio

Sludge capacity: 12,000 dry tons/year
Product Produced: 50,000 tons/year
Contact: Randy Hoffman, Tel.: (419) 729-5710



Ashville, North Carolina

Sludge capacity: 6,000 dry tons/year
Product Produced: 30,000 tons/year
Contact: John Kiviniemi, Tel.: (828) 252-7342



Greenville, South Carolina

Sludge capacity: 5,000 dry tons/year

Product Produced: 22,000 tons/year

Contact: Joey Collins, Tel.: (864) 299-4714

Wilmington, Delaware

Sludge capacity: 20,000 dry tons/year

Product Produced: 70,000 tons/year

Contact: Bob Jones, Tel.: (610) 918-1100



Daytona Beach, Florida

Sludge capacity: 8,000 dry tons/year

Product Produced: 47,000 tons/year

Contact: Tom Otermat, Tel.: (904) 253-7721

For additional N-Viro facilities we invite you to refer to www.nviro.com.

5 Demonstrated Operating Abilities

Operation of N-Viro Facility

N-Viro Systems Canada Inc., has 17 combined years' operating experience with its two existing facilities (Sarnia and Leamington), which are similar to the one put forward in this EOI/Q. N-Viro has the capability to draw on and provide advice on the experience gained in the operation of some 50 facilities worldwide over the last 18 years.



N-Viro Canada follows a rigid, daily, quality assurance and quality control program and a quarterly product analysis regimen at accredited laboratories. In no case has a product been out of compliance with Ag Canada, the provincial guidelines or with the US EPA regulations 40 CFR 503 that embodies the Class A designation.

N-Viro developed a QA/QC Monitoring Protocol for its facilities, which would also be implemented in the CRD Biosolids Processing Facility. The protocol is detailed on the following page.

QA/QC MONITORING PROTOCOL FOR CRD BIOSOLIDS PROCESSING FACILITY

I. Dewatered sludge cake: evaluation to determine the characteristics of the material going into the N-Viro System:

Metals:

Eleven trace metals regulated by Provincial and Federal authorities: Arsenic, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium and Zinc.

Information obtained from CRD sewage treatment plants will be used as the baseline information as well as regular monitoring for this portion of the protocol.

II. Alkaline admixture: evaluation to determine the concentration of metals going into the N-Viro System:

Metals:

Total concentration of the eleven trace metals will be tested at any time when there are changes in production methods.

III. Evaluation of the N-Viro Product:

1. Metals:

Total concentration of the eleven trace metals will be tested initially and quarterly thereafter.

2. Microbiological parameters:

Standards for Class A designation of N-Viro Soil will be tested initially and quarterly thereafter, except for items d and e, which will be tested initially and once during each subsequent twelve month period.

- a. total bacteria
- b. fecal streptococci
- c. fecal coliforms
- d. animal enteroviruses
- e. total and viable helminth eggs

3. Standard agricultural evaluation will be done initially and quarterly thereafter.

- a. N, P, K
- b. calcium carbonate equivalence (CCE)
- c. calcium, sulphur, magnesium and organic matter

4. Standard physical evaluation will be monitored daily as part of process control.

- a. pH (heat-pulse)
- b. temperature (heat-pulse, dryer)
- c. percent total solids (dewatered cake, mixed solids, final product)
- d. alkaline admixture (dosage % and weight)

6 Demonstrated Marketing Abilities

“There is a tremendous demand for the product by area farmers, so much that we cannot produce enough N-Viro Soil™ to go around.”

Clark Annis
Crossville, TN

N-Viro Systems Canada Inc. has been marketing the N-Viro product in Southwestern Ontario since 1997. The bulk of the product has been marketed to agriculture, as this market has realized the highest value and largest market potential. Some product has been used for land reclamation and soil blending but mainly as demonstration projects to date.

In the 50 or more US N-Viro plants the product mainly goes to agriculture as well. However, they do use substantial amounts for topsoil blending. For product and market development purposes N-Viro Systems Canada Inc. can share information with the sister US plants, which is a valuable asset.

The N-Viro key strategies for product marketing are:

- Produce a consistent product with properties tailored to the local markets.
- Distribute product through local area fertilizer distributors.
- Maintain Ag Canada Fertilizers Act approvals for the product.
- Differentiate the N-Viro Systems Canada Inc. product from other biosolids land applicators as much as possible.
- Support market with product development and professional research.
- Price product to be attractive to agriculture but achieve revenue for producer.
- Promote quality and support the market for distributors.

This strategy has worked extremely well in Leamington and Sarnia areas. In Leamington 20 customers using the product buy 80% of the product. It takes fewer than 100 customers in total to use the entire production each year. Sarnia is also using only a small number of customers to use the entire production.

Marketing materials

1. Product data and certification

As part of N-Viro marketing, a “Product Use Guide” has been prepared for each facility (see example Guide included as part of this submission). A similar guide would be prepared for the CRD product.

The Guide provides details on:

- product agronomic values
- test results
- a description of the N-Viro technology
- agriculture uses
- landscape, turf and topsoil uses
- land reclamation
- research reports

Capital Region N-Viro Product Plan

1. N-Viro will meet with distributors and agriculture market representatives in the CRD and other Island areas. These discussions will determine conditions that prevail that would provide a sound agricultural market for a CRD based N-Viro product.
2. Up to six months enclosed product storage would be included in the proposed facility. Product will be stored and delivered directly to customers as required.
3. CRD area distributors would be responsible for freight from storage to customer, product application, sales and marketing direct to the customer. They will pay for the product based on a dollar value per tonne at the storage facility door.
4. Based on the typical customer size, the entire CRD product production would be used by fewer than 250 customers.
5. As an additional market for the product, discussions will take place with major local horticultural and topsoil groups and the mining industry. This market will provide a backup and alternative, and perhaps major, outlet for the CRD product.

In Summary

The N-Viro Systems Canada Inc. marketing program for CRD biosolids would include:

- A product with successful experience in the southern Ontario market since 1997.
- Ag Canada Fertilizers Act approval
- Committed and experienced distributor with a large customer base.
- N-Viro Systems Canada Inc. marketing and distribution management with research and background for market support.
- The worldwide N-Viro network for market support.
- Revenue potential from product sales.
- Low risk program with product liability insurance coverage, pathogen destruction process, easily stored product and low odour potential.

7 Product Uses, Approvals, Properties

1. PRODUCT USES

N-Viro Soil has been shown to be a multifaceted beneficial reuse product. It has been used extensively in the following areas:

- agriculture
- land reclamation
- topsoil manufacture
- yard waste co-composting
- landfill cover

Agriculture

N-Viro Soil reflects excellent value for typical farming operations and provides the highest value and largest beneficial use for the product. Unlike most other sludge-derived products, N-Viro Soil is also an aglime. It is usually applied at the rate of 2 to 3 tonnes per acre every second year.

In most cases it has a high calcium carbonate equivalency (CCE) which makes it ideal for application on acidic soils. It contains beneficial levels of nitrogen, phosphorous and potassium and other trace minerals such as magnesium, sulphur and zinc, all essential for plant growth. It will have a significant level of active, organic matter.

The N-Viro Soil recipe can be tailored to meet specific beneficial reuse requirements by changing the alkaline admixture or changing the dose rate. Highly acidic soils would benefit from a product with a high CCE (as a substitute for agricultural limestone). For other soils a lower CCE would be suitable, but the nutrients and organics would continue to make the product desirable.

Nematode Control

In 1997 and 1998, N-Viro Systems Canada Inc. conducted field trials with Ag Canada at the Harrow Research Centre for aglime effectiveness and metals take-up. Both of these trials were successful in proving safety and value. Subsequently, a laboratory research program was started at the London, Ontario Ag Canada research facility. This program evaluated the effect of the N-Viro product on SCN (Soybean Cyst Nematodes).

As a result of this first success with SCN, a patent was obtained and a second phase research program was started. N-Viro Systems Canada Inc., Soybean Growers of Ontario and Ag Canada jointly funded this second phase of research. It was a three-year program at a cost of over \$400,000. A parallel program was conducted in the USA at Ohio State University.

N-Viro Soil was found to be successful in the control of the soybean cyst nematode. The researchers were also of the opinion that the product would be successful in controlling a variety of other nematodes which affect specific crops, including the potato cyst nematode. N-Viro Systems Canada has been in touch with Ag Canada to discuss the possibility of testing N-Viro Soil on known infested areas of Quebec next growing season. Success in these trials would bode well for the control of the golden nematode on the Island.

Land Reclamation

(a) Pits and Quarries

N-Viro Soil was used to rehabilitate two worked-out gravel pits in the Leamington area. It was applied at the rate of 100 tonnes per acre (about 1 inch) and worked into the top few inches of the surface. Seed was applied and a lush growth was evident within two months.

(b) Acid Mine Drainage Control

N-Viro Soil has been employed to rehabilitate an abandoned mine in Kentucky. Several attempts were made to reclaim the site using “standard” reclamation materials and techniques without success. N-Viro Soil was applied at the rate of 100 tonnes per acre and seeded, producing a thick growth which continued to be strong five years later.

Based on the US success, N-Viro Soil was examined by Lakefield Research in conjunction with a proposal to use it as an acid-mine drainage control in the Sudbury area of Ontario. N-Viro Soil was tested along with peat, solid waste compost and desulphurized tailings. The study concluded “The results to date from the test program show that of all the materials tested, the N-Viro Soil performed best at meeting the objectives of a good tailings cover”. See “Research Reports” in the Product Use Guide.

Land reclamation, whether at gravel pits or mining sites, is a significant potential market for the product.

Topsoil Manufacture

High quality topsoil is a valuable asset in any urban setting, especially in heavily populated centres. Topsoil manufacturers normally have stockpiled large amounts of poorer-quality soils that must be upgraded before being made available for sale. N-Viro Soil can be blended to increase organic matter, nutrient content and improve the physical properties of poor-grade soils.

N-Viro facilities in the US have used N-Viro Soil in conjunction with poor-quality native soils to make high-quality, manufactured soil with wide acceptance in the landscape and horticultural markets.

Yard Waste Co-Composting

Fresh N-Viro N-Viro Soil has also been shown to be an excellent material for speeding up the process of composting yard wastes, controlling odours normally associated with composting and producing an excellent topsoil.

Yard waste, defined as grass clippings, leaves, tree and shrub prunings, are being collected by municipalities and turned into a beneficial reuse product. These efforts quite often meet a number of technical and environmental problems. High carbon to nitrogen ratios in the yard waste usually require supplemental nitrogen to speed the rate of composting and storage can become a limiting factor over the 9 to 12 month period it takes to fully decompose. Odours are quite often a problem, especially in static composting, contamination with fecal coliforms and pathogens from pets and wildlife occur and overall product quality is difficult to maintain.

The addition of fresh N-Viro Soil can greatly accelerate yard waste composting. The nitrogen in N-Viro Soil improves the carbon to nitrogen ratio and increases necessary microbial degradation. The neutralizing effect of N-Viro Soil raises the pH of the mix allowing existing microflora to break down the carbon materials more readily. N-Viro Soil also adds microflora of a similar type to the mix to speed up the initial composting process. Studies have shown that 1.4 parts by weight of fresh N-Viro Soil mixed with 1 part by weight of collected leaf yard waste accelerated the composting time from the traditional 9 to 12 months down to less than two months. The high surface area of the alkaline materials in N-Viro Soil is effective in odour adsorption, greatly reducing one major concern from composting. The pasteurized, not sterilized, N-Viro Soil is also very effective in inhibiting regrowth of fecal organisms and pathogens.

An important feature of co-composting with N-Viro Soil is that when mixed with 1 part yard waste and 1.4 parts N-Viro Soil, the end product weighs less than one-half of the combined weight of the original two components. This final product can be marketed on its own as a topsoil or used to upgrade other, poorer topsoil materials.

Landfill Cover

Middlesex, NJ, N-Viro Soil was used extensively for daily and intermediate cover at the municipal landfill and proved to be very effective. As other markets developed, however, the production was gradually diverted from the landfill. While it remains an effective use, revenue potential is low and should be considered as a backup market.

2. PRODUCT APPROVALS

N-Viro Soil products meet the requirements of the Federal Fertilizers Act administered by the Canadian Food Inspection Agency. A product label, which lists the guaranteed values for all the elements, is prepared for each facility. The label receives a stamp of approval from CFIA when the product has met the regulatory requirements for metals and microbiological levels. Sample labels are included in the “Agri Values/Label Fertilizers Act” section of the Product Use Guide.

A sample letter and label confirming the approval of N-Viro product for use as a fertilizer by the Canadian Food Inspection Agency under the Federal Fertilizers Act and Regulations are included at the end of this section.

3. PRODUCT VALUES

N-Viro Soil contains many of the properties necessary for plant growth and soil improvement, which give it a very high commercial value. A summary of these properties and values is shown in the table (Table 1) included at the end of this section.

The Product Use Guide (appendix) shows in more detail the agricultural properties and values of the Leamington and Sarnia products based on analysis since 1996 and 2001, respectively. (See section “Agri Values/Label Fert. Act”.) A CRD based N-Viro Soil product would exhibit much the same characteristics.

AGRONOMIC VALUE OF N-VIRO SOIL

The health and yield of all crops are directly related to soil quality and nutrient levels in those soils. Many nutrient deficiencies are also due to improper levels of soil organic matter and pH of the soil. All crops need the consistent source of organic matter, micro- and macronutrients that a healthy soil will provide within an optimum pH range. Early vigor in a plant will translate into greater disease resistance and better yields. Feed the soil and the soil will feed the plants.

N-Viro Soil (NVS) is a unique product that when applied to agricultural soils will provide that soil with many of the constituents described above. NVS is approved under the Federal Fertilizers Act and is marketed through established farm products distributors. It is sold as a soil amendment, liming product and fertilizer containing both macro- and micronutrients. It also contains a significant amount of organic matter, soluble calcium and gypsum.

Table 1 illustrates the average agronomic properties and value of NVS currently being sold in Canada.

Table 1

CONSTITUENT	CEMENT KILN DUST			LIME KILN DUST					
				CALCITIC			DOLOMITIC		
	Conc. (%)	Lb/tonne	Value(\$)/tonne	Conc. (%)	Lb/tonne	Value(\$)/tonne	Conc. (%)	Lb/tonne	Value(\$)/tonne
Nitrogen (N)	0.81	17.75	7.28	0.81	17.8	7.30	0.87	19.1	7.81
Phosphorus (P₂O₅)	0.93	40.9	8.10	0.91	20.0	7.87	1.12	24.7	9.75
Potassium (K₂O)	4.2	92.4	17.72	0.54	12.1	2.70	0.19	4.2	0.88
CCE (Aglime Equivalency)	34.5	-	13.64	39.9	-	15.75	41.2	-	16.30
Organic Matter	19.9	438	8.75	22.7	501	10.01	29.1	634	12.67
Magnesium (Mg)	0.82	18.1	9.93	0.48	10.6	5.81	4.7	104	56.90
Sulphur (S)	2.63	57.9	28.50	0.93	21.1	9.27	1.5	33.0	14.85
Calcium (Ca)	14.7	323	37.95	15.3	337	39.54	8.6	189	22.09
Total			\$131.87			\$98.25			\$141.25

N-Viro Soil can be applied with typical lime spreading equipment. Application rates range from 2-10 tonnes/acre but are dependent on soil tests and distributor recommendations. Many current distributors are also using spreaders equipped with GIS systems that match the nutrient needs of a particular spot in the field with the application rate of the product. The majority of the NVS product sold in Ontario is to repeat customers, a good indication of their confidence in the product.

8 Project Example

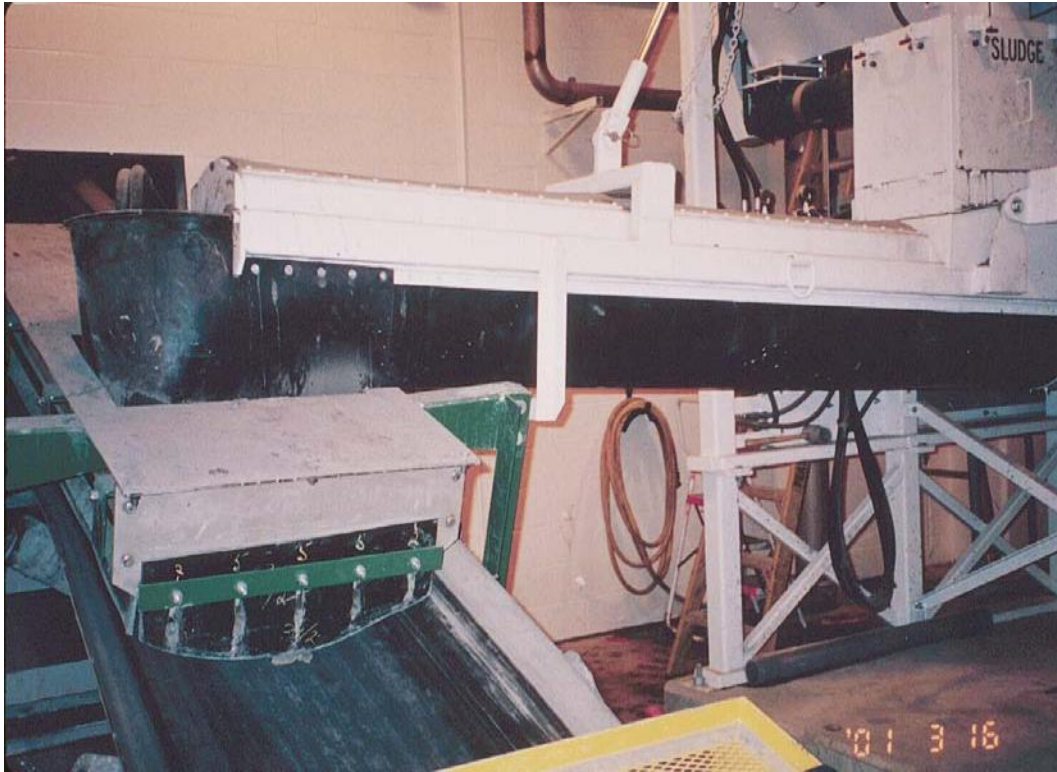
1. Location - Sarnia, Ontario
2. Owner - City of Sarnia - Operator - N-Viro Systems Canada Inc.
3. Contract - 5 year with renewals, starting March 2001
4. Process Technology - N-Viro BioDry Process
5. Biosolids from - wastewater treatment plant
6. Design capacity - 4,380 dry tonnes per year at 28% average solids content, 8 hours per day, 5 days per week
7. Current annual output of finished product - 7,000 tonnes
8. Date Completed - March 2001
9. Product is used for - field applications (as fertilizer and agricultural limestone)
10. Product is approved under Ag Canada Fertilizers Act as a product for agricultural use and is specified as Class A under US EPA regulations 40 CFR 503.
11. See included interior and exterior photos of the Sarnia facility, a process schematic flow diagram and an equipment layout plan. The proposed facility for the Capital Regional District would be similar in most respects.



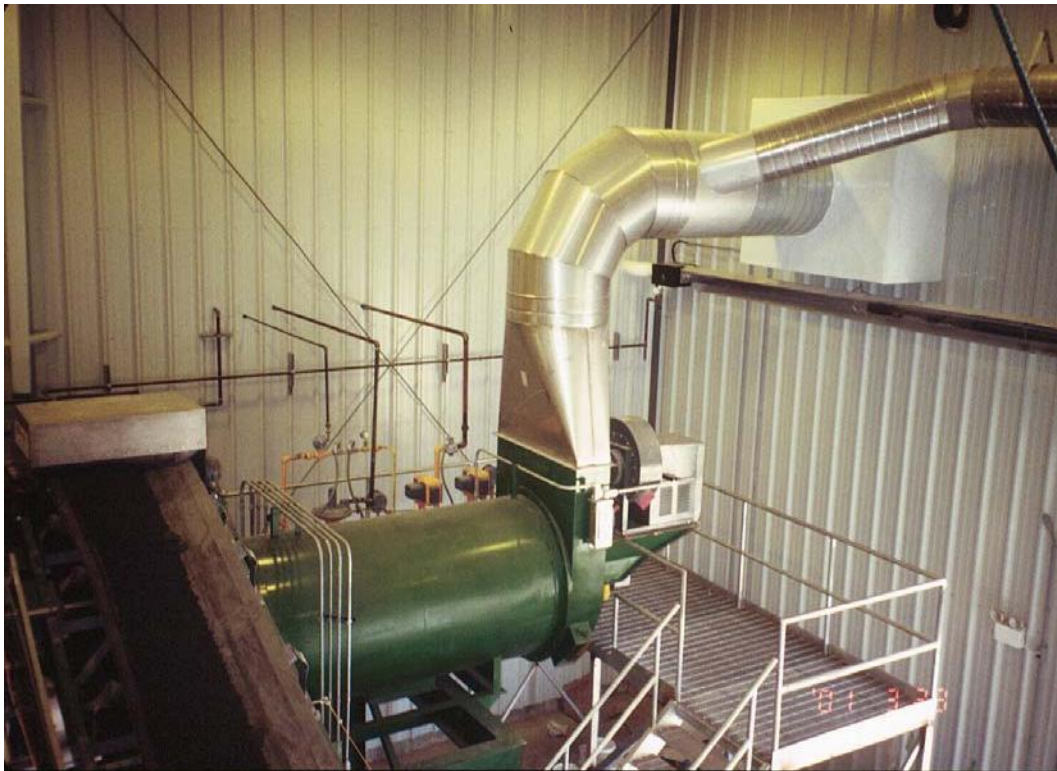
THE SARNIA N-VIRO FACILITY



PROPORTIONER - MIXER



SCREW MIXER



BURNER AND AIR INTAKE SYSTEM



DRYER



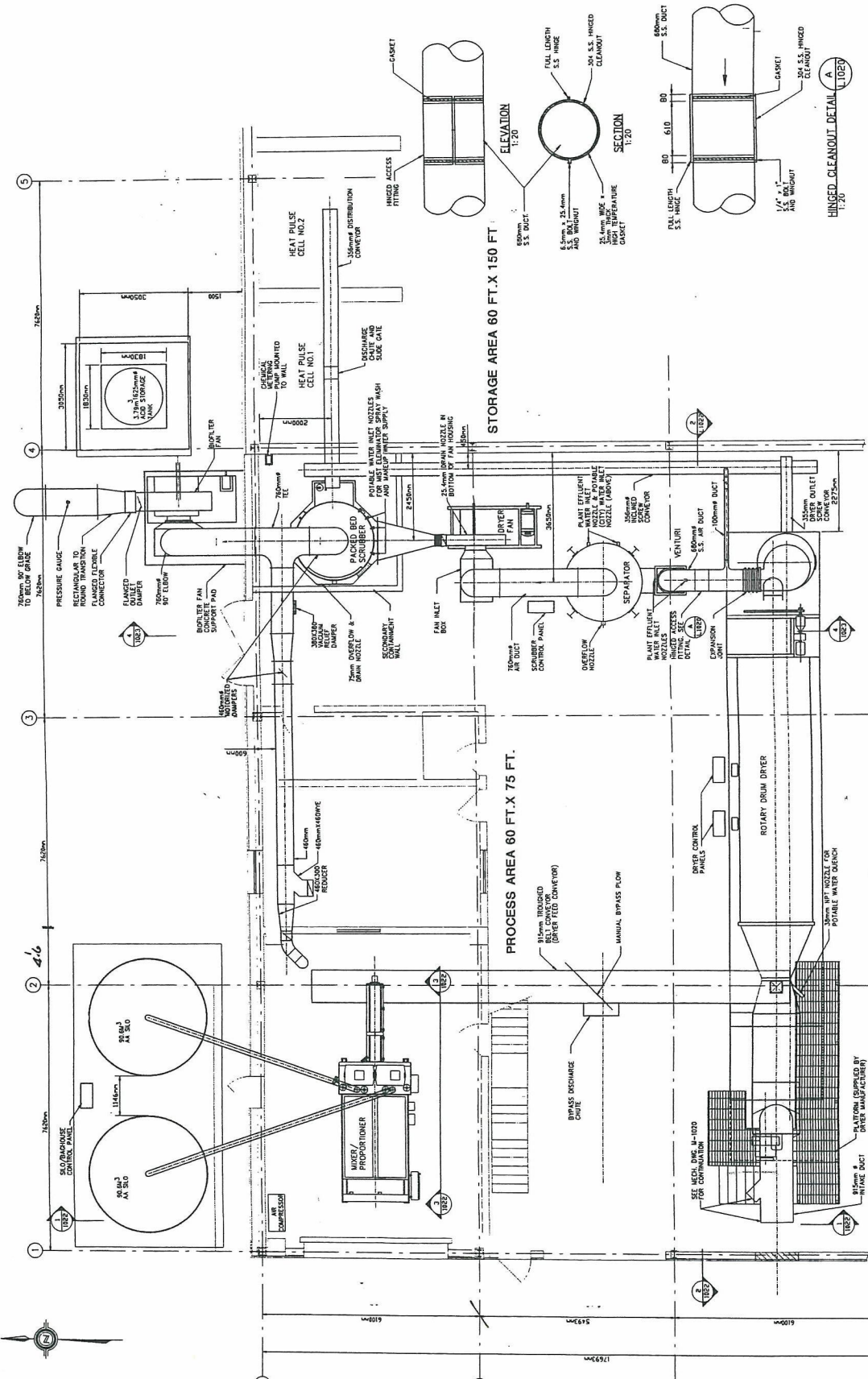
CONDENSOR/SEPARATOR, VENTURI SCRUBBER, CYCLONE SEPARATOR



ACID SCRUBBER



BIOFILTER



**SARNIA WATER POLLUTION CONTROL CENTRE
SLUDGE MANAGEMENT FACILITY
EQUIPMENT LAYOUT
PLAN**

EARTH TECH

Earth Tech (Canada) Inc. London, Ontario N6A3R3
 DRAWN BY: D.S. SCALE: 1:50 U.A.D. DATE: FEB. 14, 2000
 CHECKED BY: J.M. SCALE: 1:50 U.A.D. DATE: FEB. 14, 2000
 CADD SYSTEM: DWG. NO. 98342-11020
 AUG. CAD. A1-98342-11020 0

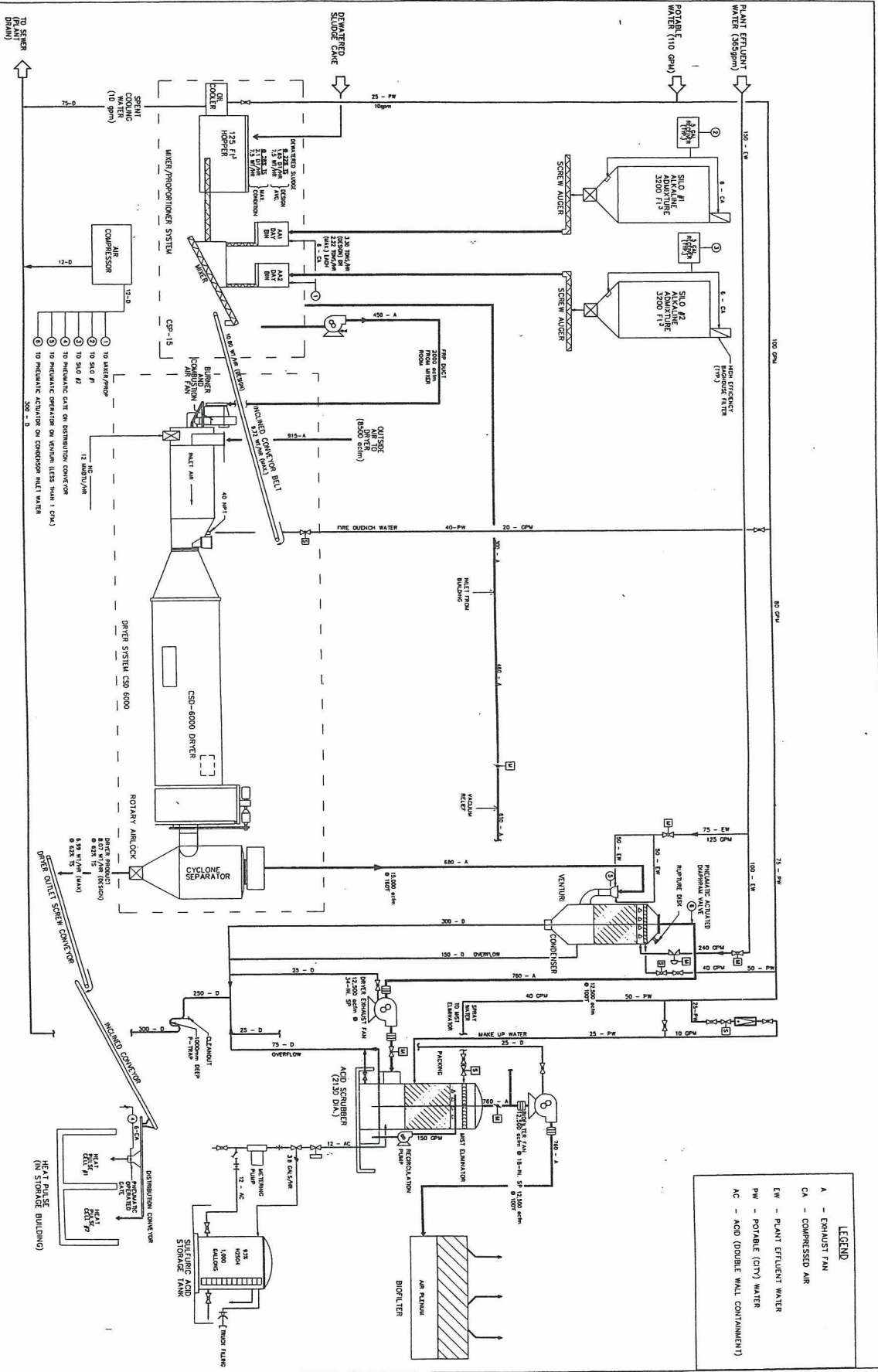
ORIGINAL DRAWING
STAMPED BY
D. W. HEIN

APPROVED

NO.	REVISION	DATE	INITIAL
0	PRELIMINARY AS CONSTRUCTED	NOV. 6/01	J.M.

NOTES

1. PLATFORM (SUPPLIED BY DRIER MANUFACTURER)
 2. SEE MECH. Dwg. 11-1020 FOR CONTINUATION
 3. BIPASS DISCHARGE GATE
 4. MANUAL BYPASS FLOW
 5. 15mm THROTTLED BELT CONVEYOR (DRIER FEED CONVEYOR)
 6. 100mm AIR DUCT
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LEGEND

- A - EXHAUST FAN
- CA - COMPRESSED AIR
- EW - PLANT EFFLUENT WATER
- PW - POTABLE (CITY) WATER
- AC - ACID (DOUBLE WALL CONTAINMENT)

NOTES:

- 1 TO WATER/PW
- 2 TO SLO #1
- 3 TO SLO #2
- 4 TO INDICATE EXIT ON DISTRIBUTION CONVEYOR (LESS THAN 1 CM)
- 5 TO INDICATE OPERATION ON COMPRESSOR INLET WATER

300 - B

APPROVED

ORIGINAL DRAWING
DRAWN BY
D. W. HEIN

WILSON ENGINEERING ASSOCIATES INC.
1000 W. 14th St. Suite 200
Winnipeg, MB R2H 1A6
Tel: (204) 241-3000
City, Manitoba

**SARINA WATER POLLUTION CONTROL CENTRE
SLUDGE MANAGEMENT FACILITY
N-VIRO PROCESS
SCHEMATIC FLOW DIAGRAM**

EARTH T E C H N I C S
Earth Tech (Canada) Inc.
1000 16th St. S. Suite 100
Winnipeg, MB R2H 1A6
Tel: (204) 241-3000
Fax: (204) 241-1021



Plant Products Directorate
Plant Production Division
Fertilizer Section
59 Camelot Drive
Ottawa, Ontario
K1A 0Y9

Telephone: (613) 225-2342
Fax: (613) 228-6629
E-mail: bordeleaucl@inspection.gc.ca

September 2nd, 2004

R.E. Wallin
N-Viro Systems Canada Inc.
1307 Highway 2 east
P. O. Box 280
Maitland, Ontario
K0E 1P0

RE: Sarnia Soil Amendment 0.5-0.3-0.1

(File # 14923LR)

Dear Mr. Wallin,

Thank you for your submission of the product label listed above. In future correspondence with the Fertilizer Section concerning this product, please refer to the file number in brackets following the product name listed above.

The product label has been accepted by the Fertilizer Section. Enclosed with this letter is a copy of the accepted label.

Please feel free to contact me should you have any questions regarding this assessment.

Regards,

A handwritten signature in black ink, appearing to be "C. Bordeleau", written over a horizontal line.

Christian Bordeleau, M.Sc.
Evaluation officer,
Fertilizer Section

C.C. Wendell Bomberry, Area Network Specialist, Ontario Region.

Canada

PRODUCT LABEL

Product Name: Sarnia Soil Amendment (SSA) 0.5-0.3-0.1 (Rev. #1 Magnesium)

Product Description: Sarnia Soil Amendment 0.5 - 0.3 - 0.1 is processed sewage that has been treated with Lime Kiln Dust. The mixing, drying and pasteurizing produces a granular material for use as a liming material in agriculture with nutrients and organic matter as noted below.

Guaranteed Minimum Analysis

• Total Nitrogen (N) (0.3% Water Insoluble Nitrogen (WIN))	0.5%
• Available Phosphoric Acid (P ₂ O ₅)	0.3%
• Soluble Potash (K ₂ O)	0.1%
• Calcium (Ca)	10%
• Magnesium (Mg)	4%
• Organic Matter	20%
• Neutralizing Value (CaCO ₃ Equivalency)	30%
• Moisture (Maximum)	38%
• Fineness Passing #10 Mesh Tyler Screen	33.3%
• Fineness Passing #100 Mesh Tyler Screen	6.0%

Directions for Use: The responsible fertilizer distributor applicator will take soil samples to determine the rate of application of aglime required. Based on soil samples, the product will be applied but not to exceed appropriate agronomic rates. Maximum application rate for this product is 5 tonnes per hectare annually. Effective for moderate pH adjustment only. Use a correction factor of 0.9 for fineness when calculating the rate of application. Nitrogen available in year of application 15 - 20%.

Responsible Producer: City of Sarnia
Wastewater Treatment Plant
333 St. Andrews Street
Sarnia, Ontario N7T 7N2



Personnel Protective Equipment for Using and Handling this Product:

Long-sleeved shirt, long pants extending over the tops of work boots, gauntlet-type work gloves and eye goggles. A NIOSH approved dust respirator is recommended for use when applying this product. Wash hands thoroughly after use.

Net Weight of Shipment: _____ Tonnes

Customer:

Director-Plant Production Division
Directeur-division de la production des végétaux
Plant Products Directorate
Direction des produits végétaux

CB