RIDEAU VALLEY
CONSERVATION AUTHORITY
CLEAN UP RURAL BEACHES PROGRAM
1994 ANNUAL REPORT

(April 1, 1994 - March 31, 1995)

YEAR III

Prepared By: Terry K. Davidson, P.Eng
Cheryl Arnott
Peter Van Adrichem

Prepared For: Ontario Ministry of Environment and Energy

ACKNOWLEDGEMENTS

The authors would like to thank the members of the Rideau Valley CURB Review Committee for their time and effort throughout the third year of the program.

Committee Members:

Bruce Reid, Rideau Valley Conservation Authority
Kirk Hansen, Ministry of Environment and Energy, Ottawa
Steve Clark, Ontario Ministry of Agriculture, Food & Rural Affairs
Michael Payne, Ontario Ministry of Agriculture, Food & Rural Affairs
Terry Mulligan, RMOC, Health Department
Jim Craig, Lanark, Leeds and Grenville District Health Unit
Alex Bell, OSCIA, Lanark
Gordon Hill, OSCIA, Carleton
Barry Thompson, OSCIA, Grenville

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EXECUTIVE SUMMARY

The Clean Up Rural Beaches (CURB) Implementation Program is funded by the Ontario Ministry of Environment and Energy, and administered by the Rideau Valley Conservation Authority.

The CURB Program provides financial assistance to farmers to build structures that reduce the potential for livestock wastes to contaminate surface waters. The program also provides financial assistance to rural landowners who repair or rebuild private sewage systems that are impacting local surface water quality. Accordingly, CURB 's primary objective is to improve surface water quality and therefore, to clean up rural beaches for recreational purposes.

For the 1994/95 program year, RVCA was allocated $215,000 for grant assistance. With the assistance of the CURB Review Committee, RVCA approved 100 percent of this allocation for remedial projects.

An intensive promotional campaign was used to advertise the program throughout the watershed, as well as, to educate farmers on the impact livestock operations can have on surface water quality.

Two demonstrations sites were completed on local farms to promote new approaches for agricultural waste management.

The RVCA's water quality monitoring program is continuing to measure the results of implementing remedial action projects which reduce bacterial contamination and nutrient loading of surface waters.

The CURB Implementation Program will continue to be delivered by the RVCA under the direction of the multi-agency steering committee in year four.

RECOMMENDATIONS

The following recommendations will be conveyed to MOEE in the Year IV Proposal for CURB funding:

1. That RVCA be allocated $200,000 for grant assistance in 1995. This would allow for the continuation of the CURB Program in the Rideau Valley Study Area.

2. RVCA Staff will endeavour to seek out the latest technology used for livestock waste management, and to demonstrate this technology on local farms.

3. RVCA Staff will work with area farmers to develop manure management plans to ensure proper land application.

4. The RVCA will continue to educate landowners to improve their knowledge of how their activities may affect the environment.

5. To monitor the effectiveness of remedial measures, the RVCA will continue a water quality monitoring program.

INTRODUCTION

The Ontario Ministry of Environment and Energy's CURB Program is being delivered in Ontario by Conservation Authorities that have completed a CURB Plan, which outlines the remedial measures required to reduce non-point sources of pollution affecting local surface waters.

The CURB Plans submitted by the Conservation Authorities were developed under the Rural Beaches Program which was funded under the Ontario Ministry of Environment and Energy's Provincial Beaches Management Strategy.

The CURB Implementation Program is being delivered by the RVCA over a five year period. Funding is established by the Ministry of Environment and Energy on a year by year basis using the government fiscal year of April 1 to March 31. The delivery of the Clean Up Rural Beaches (CURB) Program in the Rideau Watershed commenced April 1st, 1992, and is expected to continue until March 31st, 1997.

The Program focuses on the following aspects:

- Emphasis on local surface water quality improvement through improved rural land management practices.
- Extension, Education and Technology Transfer.
- Grants to farmers who build structures which eliminate livestock waste from entering surface waters.
- Grants to rural residents who repair or rebuild a private sewage system which is impacting on surface water quality.
- All proposed projects will be reviewed by a CURB Review Committee which is represented by the Conservation Authority, Ontario Ministry of Environment and Energy, Ontario Ministry of Agriculture, Food and Rural Affairs, local Health Units and the Ontario Soil and Crop Improvement Association.

STUDY AREA

The grant assistance is available to rural residents of the Rideau Valley Watershed who are located within the CURB Study Area. (Refer to Figure #1).

The Curb Study Area encompasses the Rideau River from Smiths Falls to Mooney's Bay (Ottawa) and includes all tributaries and creeks that discharge into the Rideau within this area. The Tay River, from the outlet of Christie Lake to where it discharges into the Rideau above Smiths Falls, along with its tributaries are also eligible for grant assistance.

GRANT ASSISTANCE

The following grants are available to rural residents who build structures that address non-point sources of surface water pollution.

Section	Eligible items	Grant Rate	Grant Ceiling
A	Private Sewage Systems	50 %	$ 2,000.00
B	Livestock Access Restriction	75 %	$10,000.00
C	Milkhouse Washwater Disposal System	50 %	$ 5,000.00
D	Manure Management	50%	$12,000.00

CURB APPLICATION PROCEDURE

If a landowner is located within the CURB Area, RVCA CURB staff will forward the general "Water Quality Improvement Plan" and the application form that pertains to the individual section of the Program that the applicant has an interest. RVCA staff then arrange a site visit to determine eligibility and provide technical advice on alternative solutions while providing assistance in the completion of the Water Quality Improvement Plan.

RVCA Staff then present the landowner's Ceiling Quality Improvement Plan on behalf of the applicant to the CURB Review Committee.

The Water Quality Improvement Plan is then approved or rejected by the committee based on the ability of the project to improve surface water quality. If approved the application is

forwarded to MOEE Science & Technology Branch in Toronto for final approval. MOEE Toronto then issues a notice of approval to the applicant. When the project is complete, the landowner contacts RVCA staff for project inspection and completes the application for grant form with the landowner. The "Application for Grant" is forwarded to Toronto and approval for payment is then issued. The RVCA, issues a cheque to the landowner, as per MOEE's instructions, which includes total dollar figures.

LOCAL CURB REVIEW COMMITTEE

The Rideau Valley CURB Review Committee is composed of the following representatives:

Chairman: Bruce Reid - RVCA, Water Management Coordinator
Kirk Hansen - MOEE, Ottawa
Terry Mulligan - RMOC, Health Department
Jim Craig - Lanark, Leeds & Grenville District Health Unit
Steve Clark - OMAFRA, Agricultural Engineer
Michael Payne - OMAFRA, Soils & Crops Specialist
Alex Bell - OSCIA, Lanark
Gordon Hill - OSCIA, Carleton
Barry Thompson - OSCIA, Grenville

NOTE:

RVCA	- Rideau Valley Conservation Authority
MOEE	- Ontario Ministry of Environment and Energy
RMOC	- Regional Municipality of Ottawa-Carleton
OMAFRA	- Ontario Ministry of Agriculture, Food and Rural Affairs
OSCIA	- Ontario Soils & Crop Improvement Association

1994 CURB PROGRAM

The RVCA was allocated $215,000 for grant assistance in its third year of delivering the CURB Program (April 1/94 - March 31/95).

The RVCA's CURB Review Committee made a concerted attempt to invoke the priority rating system. The number of applications presented at the first local CURB Review Committee

dictated that applications be assessed on a priority bases. The rating system is designed to ensure that provincial funds are being spent in accordance with the goals and targets of the program. In other words, projects that have the greatest potential to impact on surface water quality will be funded before low priority projects.

The RVCA's CURB Review Committee approved 83 projects in the third year of the program. Unfortunately, not all 83 projects were completed after receiving approval. It is anticipated that the vast majority of projects will be completed by March 31, 1994.

To summarize the 1994/95 CURB Program, the following table has been provided. It is a brief financial breakdown of the total monetary cost involved in the completion of projects, and the related CURB grants that were received by owners.

TABLE #1: CURB PROJECTS '94-'95

Section	Number	Project Cost To Owner	Grant To Owner
A	37	$205,414.85	$71,719.00
B	14	$68,200.81	$60,453.30
C	4	$24,925.63	$15,744.76
D	4	$45,980.38	$37,060.55
TOTAL	59	$344,521.67	$183,977.61

The average cost for Projects in each section were then determined from the above table: projects

Section	Eligible Items Average	Project Cost
A	Private Sewage System	$ 5,500
B	Livestock Fencing	$ 5,000
C	Milkhouse Washwater	$ 6,200
D	Manure Storage	$11,500

TABLE #2: CURB PROJECTS '93-'94

Section	Number	Project Cost To Total	Grant To Owner
A	21	$101,494.15	$32,394.68
B	20	$ 85,179.25	$62,690.38
C	9	$ 68,105.49	$27,582.48
D	10	$205,493.33	$69,497.39
TOTAL	60	$336,660.81	$192,164.93

TABLE #3: CURB PROJECTS '92-'93

Section	Number	Project Cost To Owner	Grant To Owner
A	14	$58,550.00	$15,901.98
B	17	$47,739.20	$35,804.41
C	3	$ 4,067.30	$ 2,033.65
D	6	$90,732.08	$36,000.00
TOTAL	49	$201,088.58	$89,740.04

Total Grants Paid Out Under CURB 1992 To March 31, 1995 $390,356.90

Total number of projects have increased during the past period, 59 projects in '94 - '95, the number of projects on agricultural land have decreased, 22 projects for sections B, C and D (Table 1). It is difficult to substantiate reasons for the trend except that farmers tend to be reluctant to spend money on projects with marginal short term cash returns; but due to public pressure, farmers will continue to prioritize and correct problem areas. Uncertainty in the agricultural industry also discourages farmers from participating in the CURB Program. Manure storage facilities and milk house milk house washwater disposal systems are often updated as farmers expand or renovate barn structures. Further program promotion will be carried out in order to increase interest and participation. Several fencing and manure storage projects will be supported this year. One of the fencing projects is on a creek which has been sampled for water quality for the past 2 years. It will be interesting to monitor improvements in water quality.

Due to high density of residences in the RVCA watershed and water front, private sewage system projects will continue to be most common.

DEMONSTRATION PROJECTS

Under CURB demonstration projects, the Rideau Valley Conservation Authority completed 2 demonstrations in the 1994/95 program year. One project involved treating barn yard runoff using a constructed wetland. The other involved using a synthetic clay liner in an earthen liquid manure storage pit. The CURB Program provided up to 75 percent funding in the first two years of the Program for demonstration/research projects. Although, these 2 projects were initiated in the second year, they were not completed until the third year. For specific information on these projects they are examined in greater detail in the enclosed appendices.

EDUCATIONAL AND PROMOTIONAL ACTIVITIES

Promotion and education play an integral role in ensuring the success of a program. As a result, this year's RVCA CURB Program staff embarked on a comprehensive promotional and educational strategy.

Throughout the operation of the 1994 CURB Program, the local media remained an important instrument in ensuring rural residents were aware of the program. A variety of press releases were circulated to a number of prominent newspapers throughout the CURB Study Area.

A concerted effort was made to educate rural residents about the problems associated with leachate produced from septic systems and the availability of grant assistance. Summer students were employed to promote the grant for the septic system upgrade or replacement along the Rideau River between Manotick and Kemptville. Waterfront residents were approached by staff in an effort to make them more aware of the program and problems associated with faulty septic systems. This approach to advertising yielded a number of responses. Promotion for grants pertaining to septic system upgrade and replacement will be continued in 1995.

The Perth and Richmond fairs also served as an important tool in the promotion of the CURB Program. The setting for these events provided an ideal environment for establishing contacts in the rural community. The Authority will continue to attend these events and

promote the CURB Program.

The Ottawa Valley Farm Show is another important promotion opportunity for the CURB Program. It provides access to farmers who are interested in new ideas or approaches to agriculture.

In August of 1994, RVCA Staff organized a tour of CURB projects within the watershed. The all day tour had over 70 participants who were interested in new initiatives in agricultural waste management.

WATER QUALITY MONITORING

INTRODUCTION

To monitor the effectiveness of remedial measures undertaken by the implementation of the CURB Program, RVCA is continuing to conduct a water quality sampling program.

The water quality monitoring program consists of sampling for bacteriological concentrations and nutrient loading. Bacteria are microorganisms that are used to determine the safety of water for recreational use in terms of disease prevention. Nutrient concentrations are examined as they cause excessive aquatic plant growth and algae blooms, which results in attendant aesthetic problems, and once this vegetation dies, it contributes to the oxygen depletion of a water.

The following discussion is based on the results of the two initial years of sampling under the Rural Beaches Program and the first three years of sampling under the CURB Program. In summary, samples were taken from the Rideau River, the Jock River, Kemptville Creek, the Tay River, and many other tributaries of the Rideau. In many instances, there were several sampling locations along a creek or tributary, however, the data reported is accounting for the outflow sites ie. the point closest to or furthest downstream where the creek or tributary meets the Rideau River. This is true for both the bacteriological data and nutrient loading analysis.

BACTERIAL ANALYSIS

Evidence of feces from human or animal origin in a water is determined by sampling and testing for pollution indicator bacteria. For the years 1990, 1991, and 1992, fecal coliform

was the most common indicator organism used to assess bacterial pollution. The MOEE' s recreational water quality guideline was 100 fecal coliform per 100 mL of water. However, in 1993 and 1994, the indicator organism used to evaluate bacterial contamination was switched to *Escherichia coli,* as it was determined that fecal coliform may give a false indication of fecal or sewage present in a water containing cellulose or plant material. The MOEE' s Provincial Water Quality guideline for recreational purposes is 100 *E. coli* per 100 mL, based on a geometric mean of at least 5 samples.

In order to compare and evaluate fecal coliform and *E. coli* levels contributing to the Rideau from its tributaries and creeks, refer to Table 2. To review bacteria levels in the Rideau River, a profile from Smiths Falls to Mooney's Bay (Ottawa) has been provided in Figure 2.

TABLE #2: Tabulated geometric means for fecal coliform in Rideau River tributaries and creeks

	Fecal Coliform Per 100 ml			E. Coli Per 100 ml	
TRIBUTARY NAME	1990	1991	1992	1993	1994
Jock River	50	310	128	103.1	35.4
Tay River	N/A	513	125	90.0	140.7
Kemptville Creek	76	417	74	62.85	69.5
Mosquito Creek	106	128	67	61.0	66.7
Mud Creek	127	174	178	183.0	74.3
Doyle Creek	460	206	653	84.0	138.8
Steven Creek	35	84	35	30.0	46.0
Cranberry Creek	137	106	26	30.0	NA
Hudson Drain	406	441	251	29.0	160.0
Arcand Drain	95	130	73	31.0	43.8
Murphy Drain	32	83	21	47.0	49.1
Brassils Creek	77	290	97	150.0	93.4
Dales Creek	79	101	55	63.0	132.8
Rideau Creek	50	107	68	59.0	30.9
Barbers Creek	476	336	142	180.0	298.3
Rosedale Creek	316	231	268	230.0	156.5
Irish Creek	14	66	13	31.0	30.0
Otter Creek	28	N/A	N/A	285.0	56.3

Table 2 indicates that the majority of the tributaries have at some point over the sampling years had elevated bacterial levels that exceed the guideline.

In summary figure 2 illustrates that the Rideau River is safe for water-based recreation along the entire study area, however, bacteria levels close to the river's banks and near the confluence of its tributaries may be greater than the MOEE guideline.

NUTRIENT ANALYSIS

Although nitrogen and potassium are required plant nutrients, phosphorus is considered the limiting reagent causing excess plant growth, and consequently eutrophication. As a result, total phosphorus concentrations are reported for the Rideau River (see figure #3) and a yearly comparison of total phosphorus levels found in the tributaries and creeks (refer to table #3).

Although current scientific evidence is insufficient to develop a firm Water Quality Objective for total phosphorus concentrations, the MOEE states that the general guideline for the elimination of excessive plant growth in rivers and streams should be below 0.03 mg/L. However, this value should be supplemented by site-specific studies.

TABLE #3: Calculated arithmetic means for total phosphorus concentrations in Rideau River tributaries and creeks.

Tributary Name	Arithmetic Mean Total Phosphorus per 100 ml				
	1990	1991	1992	1993	1994
Jock River	0.048	0.053	0.046	0.042	0.05
Tay River	N/A	0.025	0.022	0.022	0.022
Kemptville Creek	0.021	0.106	0.018	0.018	0.021
Mosquito Creek	0.092	0.105	0.111	0.083	0.12
Mud Creek	0.063	0.043	0.052	0.058	0.08
Doyle Creek	0.348	0.915	0.197	0.098	N/A
Steven Creek	0.038	0.059	0.049	0.043	N/A
Cranberry Creek	0.056	0.062	0.057	0.055	N/A
Hudson Drain	0.826	0.239	0.074	0.022	18.22
Arcand Drain	0.471	0.359	N/A	0.724	N/A
Murphy Drain	0.050	0.066	0.057	0.030	N/A
Brassils Creek	0.062	0.014	N/A	0.015	0.014
Dales Creek	0.030	0.059	0.025	0.024	N/A
Rideau Creek	0.027	0.081	0.026	0.023	N/A
Barbers Creek	0.083	0.130	0.042	0.121	0.066
Rosedale Creek	0.036	0.068	N/A	0.035	0.028
Irish Creek	0.018	0.013	0.013	0.019	0.019
Otter Creek	0.057	N/A	N/A	0.071	N/A

In short, both Table 3 and Figure 3, indicate that total phosphorus concentrations in the Rideau River and many of its tributaries have exceeded the MOEE guideline. This sampling data supports the idea that the Rideau River may be classified as eutrophic due to excessive nutrient loading.

CONCLUSIONS

The third year of delivering the CURB Implementation Program in the Rideau Valley was considered very successful.

With the delivery and promotion of the program, along with the continued water quality monitoring, the following results are presented.

1. The Rideau River from Kilmarnock to Mooney's Bay in the centre channel only had geometric mean E. coli concentrations below the MOEE recreational guidelines of 100 FC/100 ml. There are numerous tributary mixing zones and isolated sources of pollution along this reach causing elevated fecal coliform bacteria levels which exceed the recreational guideline.

2. The majority of the tributaries within the study area have fecal coliform levels above the MOEE guideline.

3. The Rideau River within the study area in most cases exceeds the total phosphorus objective of 0.03mg/L, accounting for large algae blooms and excessive aquatic weed growth.

4. The majority of tributaries within the study area have total phosphorus levels exceeding the MOEE objective.

5. Economic restraints in the agricultural community/environment is reflected upon the CURB demand for funding of manure storages. This may be attributed to the large capital costs associated with such structures.

6. Due to an increased awareness of the CURB program, Section A - septic system has seen a greater utilization of the program.

References

1. Michael Michalski Associates and Anthony Usher Planning Consultant. Rideau Lakes Basin Carrying Capacities and Proposed Shoreland Development Policies February 1992, Prepared for Rideau Valley Conservation Authority.

2. Rideau Valley Conservation Authority 1990 Water Quality Study. Manotick, Ontario.

3. Rideau Valley Conservation Authority. CURB PLAN - Rideau River. 1991. Manotick, Ontario.

4. Rideau Valley Conservation Authority CURB - 1992 ANNUAL REPORT. Manotick, Ontario.

5. Rideau Valley Conservation Authority CURB - 1993 ANNUAL REPORT. Manotick, Ontario.

6. Rideau Valley Conservation Authority Rideau Inquirer. July 1992, Manotick, Ontario.

APPENDIX

CONSTRUCTED WETLAND FOR MANURE RUNOFF TREATMENT

INTRODUCTION

The impact of agricultural runoff from barnyards and manure stacks on surface water quality is an important waste management issue for farmers. In today's society environmental degradation is no longer being tolerated and the protection and enhancement of water quality is on everyone's agenda.

To achieve an environmentally acceptable solution for livestock waste management, farmers must assess the best management practice available to them that would be suitable for their operation. An acceptable livestock waste management plan will take into consideration the storage and land application of manure, how liquid runoff from barnyards generated by precipitation is handled, and the disposal of milkhouse wastewater.

In recent years in Ontario, acceptable manure storage systems have been designed for either solid, semi-solid or liquid manure.

Solid systems have consisted of concrete pads with runoff containment pits. Recently, solid manure storage systems have incorporated a roof structure that excludes precipitation from falling on the manure stack, however separate runoff pits are required for the barnyard runoff. Semi-solid and liquid storages have consisted of earthen lagoons, concrete tanks or above ground prefabricated steel tanks that are capable of containing the manure and all contaminated runoff from barnyards and milkhouse wastewater.

A constructed wetland may be used to replace a runoff containment pit on a livestock farm using a solid manure system and at the same time eliminate the need for land application. This report provides a detailed description of the design and the proposed monitoring strategy for the constructed wetland for manure runoff treatment located on the Rideau Angus Farm.

BACKGROUND INFORMATION

Constructed Wetlands are man-made systems that are designed, built and operated to emulate natural wetlands or functions of natural wetlands for human desires and needs (Hammer).

Constructed Wetlands consist of sites that have been modified to create poorly drained soils and wetland flora and fauna for the primary purpose of contaminant or pollutant removal from wastewater (Hammer).

Constructed Wetlands have been used in the United States to treat wastewater from urban, industrial and agricultural sites for the past 20 years (Hammer).

The major components of wetlands that influence the treatment of wastewater are; vegetation, soil/substrate, microbial populations and water depth. The role of vegetation in the purification process is to assist in nutrient uptake, provide additional environments for microbial populations, obstruct flow to facilitate sedimentation, provide reactive surface area for microbes and to transfer oxygen from the atmosphere to the root zone creating an aerobic environment in the saturated soil zone.

Wetlands can reduce the concentration of nitrogen and phosphorus, reduce the pathogens, suspended solids, and the high level of biochemical oxygen demand. The functions that accomplish the removal of the above mentioned constituents are present in Table #1.

CONSTITUENTS REMOVAL MECHANISMS

Suspended Solids	Sedimentation/filtration
BOD_E	Microbial degradation (aerobic and Anaerobic)
	Sedimentation (accumulation of organic matter/sludge on the sediment surface)
Nitrogen	Ammonification followed by microbial nitrification and denitrification
	Plant uptake
	Ammonia volatilization
Phosphorous	Soil sorption (adsorption-precipitation reactions with aluminum, iron, calcium, and clay minerals in the soil)
	Plant uptake
	(Phosphine production)
Pathogens	Sedimentation/filtration
	Natural die-off
	UV radiation
	Excretion of antibiotics from roots of macrophytes

From Watson, J.T.,S.C. Reed, R.H. Kadlec, R.L. Knight, and A.E. Whitehouse. in Constructed Wetlands for Wastewater Treatment. D.A. Hammer, Ed. 319, 1989. With modifications

Constructed Wetlands therefore, may provide a low-cost control for manure runoff treatment for livestock farmers.

SITE DESCRIPTION

The Constructed Wetland designed and monitored by the Rideau Valley Conservation Authority is located in Rideau Township in the Regional Municipality of Ottawa-Carleton. This wetland is located on a cow-calf operation adjacent to the Rideau River. The "Rideau Angus Farm" is owned and operated by Jim and Gwen Peaker & Family. The Peakers maintain approximately 30 head of registered Angus cows for breeding purposes.

The farmstead previously consisted of a concrete barnyard for feeding and preparing cattle for showing purposes and breeding. Manure was scrapped to one corner of the concrete yard until an appropriate spreading time. The farm operation also consisted of an exercise area

or loafing area for feeding and calving in the late winter. All runoff generated from precipitation flowed towards the Rideau River.

WETLAND DESIGN

A Constructed Wetland can provide substantial improvements in water quality and quantity. The water purification process is a function of vegetation, water column, substrate, and microbial populations (Hammer).

The wetland design/system consists of the following components:

First: A Sediment Basin which allows removal of large sediments and acts as storage facility during the winter. The Sediment Basin protects the other components from sediment overload and thus reduces their maintenance requirement. The Sediment Basin was constructed with gentle slopes to facilitate sediment removal on a routine basiswith a farm tractor equipped with a front-end loader.

Second: A Marsh Cell designed to remove organic material, suspended solids and pathogens. The Marsh is design to be shallow and vegetated with cattails (Typha), bulrushes (Scirpus validus), and reeds (Phragmites).

Third: A Pond designed to further reduce BOD and for nitrification and denitrification. The Pond has depths ranging from 0.3 metres to 2.5 metres. Vegetation will vary from duckweed (Lemna) on the surface of the pond to submerged pondweeds.

The outlet of the Sediment Basin consists of a submersible pump located in a concrete catchbasin. This pump is controlled by a 1 hour timer which allows the operator to choose a minimum pump run time of 30 seconds and allows increases in 30 second intervals. Also, there is an emergency overflow spillway from the Sediment Basin to the Marsh Cell.

The outlet control structure to maintain water levels in the marsh cell consists of a water level control structure which allows adjustments by 5 inches or 7 inches.

To prevent the Marsh Cell from drying up in the summer a submersible pump was installed in the Pond to transfer water from the Pond to the inlet of the Marsh Cell. This water pump will also assist in evaporation by recirculating the water from the Pond to the Marsh Cell.

A Pond aerator will be used to encourage evaporation and to promote bacterial die-off by exposing more bacteria to sunlight.

MANURE STORAGE USING A GEOSYNTHETIC CLAY LINER

The Geosynthetic Clay Lined Manure Storage illustrates a viable alternative to the use of concrete if the native soils do not meet the following provincial guidelines for an earthen manure storage:

- the natural clay content of the soil must be greater than 15 %; (infiltration rate should not be greater than 10^{-9} m/s)
- the normal water table should be below the floor elevation of the storage;
- the floor of the storage should be at least 3 feet above bedrock.

DESIGN INFORMATION

This system included the installation of a manure transfer pump and a Geosynthetic Clay Lined Manure Storage.

The Geosynthetic Clay Lined Manure Storage is required because the native soils do not meet the provincial guidelines. (Refer to the above.)

The Rideau Valley Conservation Authority in consultation with the engineering firm Water And Earth Science Associates LTD. has determined that "CLAYMAX 200R" (GCL) will meet the CURB guidelines. The product was purchased from ARMTEC CONSTRUCTION PRODUCTS.

CLAYMAX LINER INFORMATION

The CLAYMAX liner is composed of sodium bentonite clay laminated between two geotextiles. This product and similar products are designed for fast, easy installation with minimal manpower, equipment and site preparation requirements.

After the CLAXMAX is installed and the protective cover material is in place, hydration with fresh water causes the liner to swells, forming tight seams at the lap joints, and filling voids and irregularities in the installation. This hydration process results in a strong barrier system which is highly impermeable to liquids.

ECONOMIC ADVANTAGES

It has not been determined if a Geosynthetic Clay Lined Manure Storage possesses any economic advantages over a concrete manure storage. It was anticipated that there may be a cost savings due to the fact that the liner can be installed by the farmer with limited supervision.