Changes to the Intent to Apply – GMIF application #466

– Appendix B

The following changes have been made to the original Intent to Apply.

- The Intent to Apply covered two potential sites for the proposed pilot project. That has been reduced to one.
- The project benefits have been updated to reflect actual usage data for the neighborhood targeted.

A revised project description follows.

Increasing the Efficiency of Trucked Water Systems – Using the Healthy House System

Background

In the Arctic, the adequate treatment and delivery of potable water and the environmentally acceptable collection, treatment and disposal of sewage can be a tremendous financial burden. The cost of delivering water to a residence in the Arctic is approximately 125 times greater than in Southern Canada.

Substantial savings in water and servicing costs can be realized through the use of recycled water. The Healthy House System is designed to collect and treat domestic wastewater to a quality suitable for reuse in all non−potable applications in buildings, including residences.

Prototypes of the Healthy House System have been operational in the 'Toronto Healthy Houses', since 1996. Five systems were installed Public Housing in Yellowknife, NWT in late 1998, one system has been installed in a prominent bed and breakfast in Iqaluit, Nunavut in the spring of 1999, a system was installed in a 20 unit housing development in North Vancouver in the summer of 1999 and five systems will be installed in Cape Dorset, Nunavut in 2000/2001.

The following highlights a method of deploying the Healthy House System to maximize benefits to the Municipality of Iqaluit by lowering the cost and improving the reliability of trucked water delivery.

The Problem

Trucked water systems cost considerably more than piped systems to operate. Municipalities or other levels of government subsidize consumers of trucked water.

In a trucked system, a municipality delivers water by truck to building water tanks and picks up sewage from building sewage tanks. Usually the municipality maintains a schedule of delivery and pickup that balances the need for efficiency with the need to ensure uninterrupted supply to consumers. The task of developing an efficient schedule is complicated by the fact that water delivery staff usually have no way of knowing how full building tanks are and what future needs are for each individual building.

Trucked water systems are more prone to sewage spills, even normal operation will distribute small amounts of sewage along roads and at pick up points. Each time sewage is sucked out from building sewage tanks (usually every second day) it is likely to smell. In addition, a small amount of sewage is likely to spill on the ground. Finally, trucked delivery uses fossil fuels and therefor emits greenhouse gases at a much higher rate than either piped systems or water recycling as proposed here.

Consumers of trucked water services have less reliable water supply than those that are on piped systems. Water delivery can be interrupted due to snow storms, heavier than normal use can use stored water up before it is replenished,. Most systems turn off the water when the sewage tank is full, so water supply can be interrupted for that reason as well.

The Solution

The Healthy House System makes it possible to increase efficiency in a number of ways:

- Reduce water consumption volume. The Healthy House System recycles water for 50 to 90% of water uses.
- Reduce or eliminate sewage pickups. The Healthy House System product water is suitable for surface disposal, eliminating sewage pickups where surface disposal is practiced.

Reduce number of deliveries through online monitoring. The Healthy House System includes online monitoring so water deliveries can be made at when the tank is almost empty.

Installing the Healthy House System in a Municipal Context

The Healthy House System can be deployed to serve a number of buildings or facilities at once. The installation designer must take into account the topography present in the target area, water use patterns in served buildings, costs of delivery to the area and the requirements of sharing the facility.

Environmental Benefits

Clean Water for Disposal

The Healthy House System treats water to tertiary standards. The quality of the effluent exceeds most advanced sewage treatment plants in all respects except phosphate reduction. The product water is free of harmful pathogens so public health is protected. Nitrogen nutrients are minimal and so nutrification of adjacent saltwater fisheries is minimized.

The following table shows the difference between the Healthy House System and the lagoon system currently in place in Iqaluit for key environmental parameters:

Parameter	***Healthy House Effluent***	***Lagoon effluent***
Biological Oxygen Demand	<5	<30
Total suspended solids mg/100 mL	<5	<30
Total Nitrogen mg /100 mL	<5	>20
e. Coli tcu/100 mL	O	100−300
Phosphate	No difference	No difference

Energy Savings

The Healthy House System reduces energy consumption by reducing the amount of trucking required to provide water and sewer services as shown in the following table:

Parameter	*Healthy House System*	*Conventional Trucked System*
Diesel fuel needed to provide water and sewer service, litres fuel per m3 delivered	0.56	2.48
CO_2 emissions resulting from water and sewer services	2.07	9.19

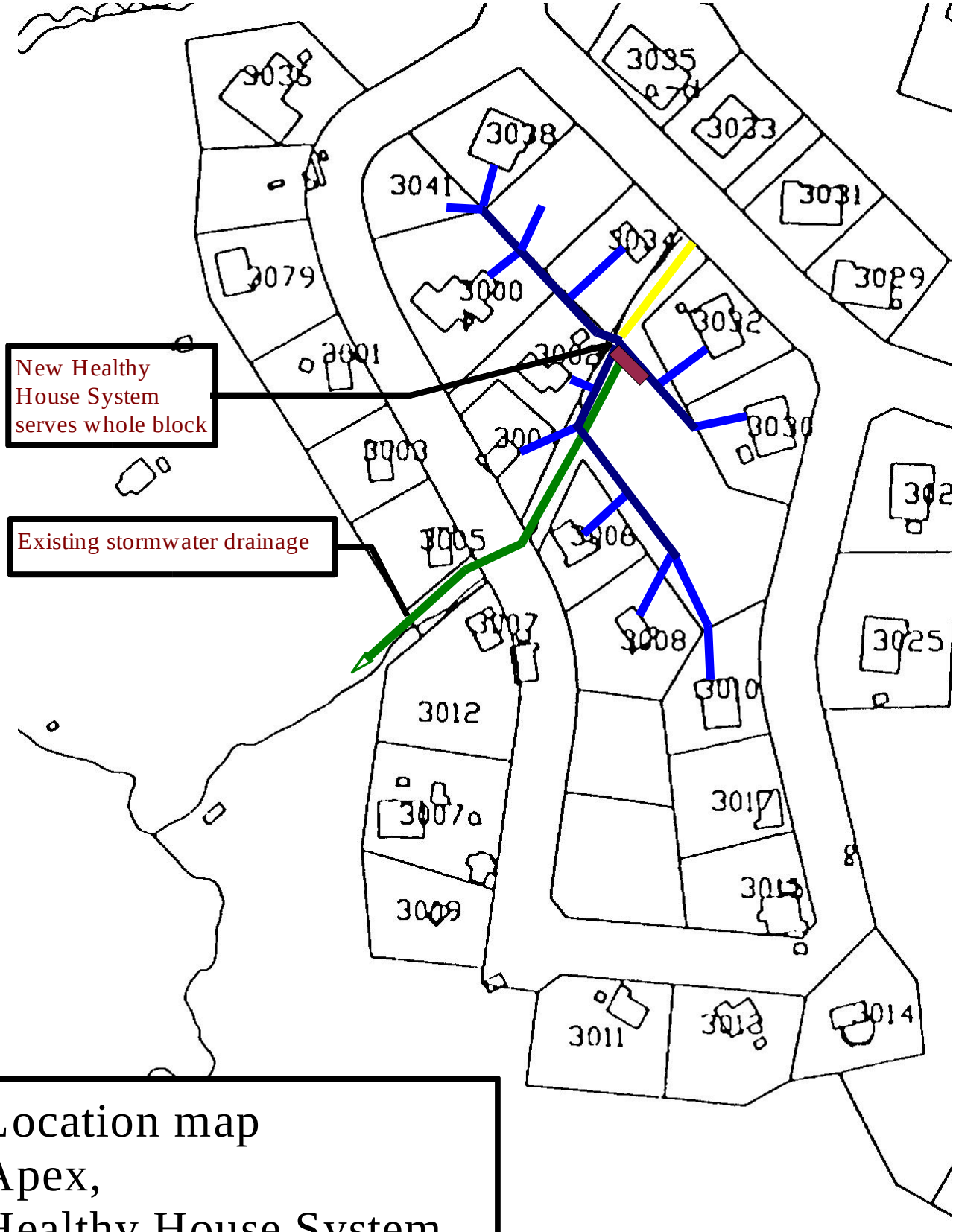
Pilot Project

The advantages of the Healthy House System will be illustrated in a pilot project. The pilot project will serve a group of eleven homes in the Apex area of Iqaluit.

The following table compares average costs for conventional trucked water delivery to those homes, (calculated using information available from the Municipality of Iqaluit Water and Sewer Study of 1999 and from records of water delivery to those specific homes), with calculations for the same group of houses served by a common Healthy House System for recycling water. The Healthy House System is configured to recycle to toilets, and to cold laundry and reduces the quantity of delivered water by 50%. The Healthy House System is also configured for site disposal, eliminating sewage pickups. The system also includes a communal tank for potable water. The potable tank is sized to allow for five day supply to the homes, reducing the number of deliveries to fewer larger deliveries.

In the table the predicted number of deliveries and sewage pickups for the example group of homes is 4015 deliveries and 2677 sewage pickups. In Healthy House example there are 91 water deliveries and no pickups. The overall cost and the cost per litre to the municipality attributable to water and sewer service for the example homes is summarized below. A location map is attached.

Assumptions	*Conventional Trucked Water Delivery*	*Healthy House System*	*Notes*
Number of homes served	11	11	Apex Houses 3000−3041 block of eleven existing homes
Water deliveries per year	4,015	91	One tank for all homes with a five day supply vs. individual tanks
Sewage pickups per year	2,677	0	On site disposal of excess Healthy House Water
Litres delivered per year	1,825,700.80	912,850.40	Recycled water used in toilets and cold laundry − 50% recycled total
Litres per delivery	454.72	10,031.32	Average from 1998−1999
Water truck time per delivery (min)	1.40	16.72	Calculated as per "Municipality of Iqaluit Water and Sewer Study Part 2: Trucked Water & Sewer Delivery Efficiency"
Water truck −filling time at source (min)	6.56	6.02	− as per Municipality study
Water truck travel time − (min)	7.79	7.79	− as per Municipality study
Attributed water pickups per year	262	91	−average as per Municipality study
Sewage truck time per pickup − (min)	1.40		− as per Municipality study
Sewage truck − disposal time (min)	5.29		− as per Municipality study
Sewage truck travel time − (min)	10.76		− as per Municipality study
Attributed sewage disposal per year	262		−average as per Municipality study
Water truck time per year (min)	9,365.44	2,777.98	− as per Municipality study
Sewage truck time per year in (min)	7,945.27		− as per Municipality study
Add for efficiency of labor at 67%	8,655.36	1,388.99	− as per Municipality study
Add for system efficiency at 85%	4,582.25	735.35	− as per Municipality study
Total truck time per year (min)	30,548.32	4,902.32	− as per Municipality study
Converted to hours	509.14	81.71	Truck time
Extended @$75	$38,185.40		For Truck, driver & helper
Extended @ $60		$4,902.32	Truck & Driver only
Add cost of Water @ $0.004 per litre	$7,302.80	$3,651.40	Allowance for treatment plant and fill station
Add cost of sewage treatment @ $0.00124	$2,263.87		Allowance for treatment plant and dumping station
Add for on site fuel & power		$2,738.55	
Add staff time on−site treatment		$1,500.00	Remote Monitoring & on−site time
Sampling expense		$900.00	Monthly samples
Add R & M for on site		$4,500.00	Repair, replacement and maintenance allowance, five year fixed contract
Total annual water and sewer delivery costs	$47,752.07	$18,192.28	
Annual Cost Difference, not inc. capital		$29,559.79	
Capital Cost of Pilot Project		$310,000.00	
Simple payback in years		10.49	Capital divided by cost difference
Cost per litre − delivered water	0.0262	0.0199	Includes disposal costs/onsite disposal
Cost per litre − recycled water		0.0053	
Cost per litre − blended	0.0262	0.0126	
Revenue − Water rates & Subsidies per litre	0.0090	0.0090	
Net subsidy from other users per litre	0.0172	0.0036	



Location map
Apex,
Healthy House System
for Houses # 3000–3041