

TOWN OF BRANFORD, CT  
GREENHOUSE GAS EMISSIONS INVENTORY  
**2007 Community Emissions  
&  
Fiscal Year 2006-2007 Government Emissions**



**ICLEI**

Local Governments for Sustainability

*Cities for Climate Protection Campaign*

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*Submitted Spring 2009 To:*

Branford Conservation and Environment Commission  
&  
ICLEI – Local Governments for Sustainability

## Acknowledgements

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## EXECUTIVE SUMMARY

Global climate change presents, perhaps, the greatest challenge society has ever faced. Governments, businesses, and individuals around the world are responding by taking unprecedented actions to reduce the production of greenhouse gases. The town of Branford – its government and its citizens- are no different. From the use of innovative technologies to energy conservation initiatives, Branford is taking actions to mitigate its impact on climate change. The Branford Conservation and Environment Commission seeks to learn from and unify these efforts, and expand them into a comprehensive town-wide Climate Action Plan, which will serve as the Town of Branford’s strategic road map to achieving significant greenhouse gas emission reductions.

The first step in developing a reduction strategy was to complete a baseline year greenhouse gas emissions inventory, which is presented in this report. Quantifying the town government’s energy use during Fiscal Year 2007 (FY’07), and residents’ and businesses’ for Calendar Year 2007 (CY’07), made calculating the associated emissions of carbon dioxide and other greenhouse gases possible. The cost of government purchased energy was also included to assist future calculations regarding the cost or savings of particular emissions reductions projects.

Greenhouse gas emissions were combined as metric tons of carbon dioxide equivalents, MTCO<sub>2e</sub>. This conversion of all emissions to carbon dioxide equivalent units, CO<sub>2e</sub>, enables consideration of different greenhouse gases in comparable terms. While the inventory does not capture all of the emissions attributable to Branford and its residents, it does include the major sources, such as consumption of electricity, gasoline, diesel, natural gas, oil, propane, and solid waste disposal. In FY’07, Branford town-government spent \$2,814,606 on 105,688 MMBtu of energy, which caused 8,815 MTCO<sub>2e</sub>. In 2007, the Branford community at large consumed approximately 3,709,325 MMBtu of energy, causing 279,989 MTCO<sub>2e</sub>.

Electricity and heating oil use accounted for the first and second largest percentages of total emissions within the government inventory, at 46% and 26% respectively. Thus, Town-owned buildings will need to be a major area of concentration for government emissions reductions. When looking at town-wide community emissions, electricity consumption was responsible for the most significant percentage of total community emissions, 29.3%. Emissions from community gasoline and natural gas use were also substantial, at 25.7% and 23.0% of total emissions respectively. Transportation planning and increasing energy efficiency of homes and businesses will be necessary if any considerable decrease in total community emissions is to be achieved.

Stakeholders will use the detailed information presented in this inventory to adopt both long and short-term greenhouse gas emissions reduction targets. Adopting a formal goal and a broad reduction strategy will create the need to identify specific cost-effective emissions reduction projects. Once specific projects are identified, drafting and adopting the Climate Action Plan will bring organization to the proposed efforts and will ensure they are executed.

## INTRODUCTION

### **BACKGROUND**

In March 2008, under the initiative of the Conservation and Environment Commission, the Town of Branford, CT, joined the International Council for Local Environmental Initiatives (ICLEI), a collection of “Local Governments for Sustainability”. Branford recognizes the alarming effects that greenhouse gases (GHGs) emitted by human activities are having on the earth’s climate, as well as the town’s responsibility to reduce these emissions, both through its government operations and by promoting change throughout the community. A detailed report on the impacts that climate change is having on Connecticut can be found in Appendix C, on page 50. Reducing emissions locally is supported by regional and state GHG reduction goals. By 2004, both the New England Governors/Eastern Canadian Premiers (NEG/ECP) and the Connecticut General Assembly had established goals to reduce GHG emissions.<sup>1</sup> By increasing energy efficiency in its facilities, purchasing more fuel efficient vehicles, utilizing clean energy sources, reducing waste, and improving land use and transit planning, Branford has the opportunity to reduce emissions, save money, and enhance residents’ quality of life. Branford has committed environmental leaders, and as such GHG emissions reduction efforts (mentioned on page 32) have already begun. Still, there is much more Branford can achieve. According to the Union of Concerned Scientists, avoiding the most damaging and costly effects of climate change will require reducing current global GHG emissions 80 percent by mid-century, or just over 3 percent per year on average over the next several decades.<sup>2</sup> Although Branford will need to make comprehensive changes, achieving these goals is entirely possible.

### **FIVE MILESTONES – CITIES FOR CLIMATE PROTECTION CAMPAIGN**

More than 1,000 local governments, including over 400 in the United States, have joined ICLEI’s Cities for Climate Protection (CCP) campaign. In addition to Branford, the following Connecticut towns are all CCP participants: Essex, Fairfield, Hamden, Hartford, Stamford, Weston, Westport, Windham, and Windsor.

The CCP campaign provides a framework for local communities to identify and reduce greenhouse gas emissions, organized along five milestones:

- (1) Conduct an inventory of local greenhouse gas emissions;
- (2) Establish a greenhouse gas emissions reduction target;
- (3) Develop an action plan for achieving the emissions reduction target;
- (4) Implement the action plan; and,
- (5) Monitor and report on progress.

This inventory represents the completion of the first CCP milestone, and provides the basis for determining a reduction target, and creation of an emission reduction strategy. Also, as reduction

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<sup>1</sup> Governor’s Steering Committee on Climate Change, *Connecticut Greenhouse Gas Inventory 1990-2001*, [http://ctclimatechange.com/ct\\_inventory.html](http://ctclimatechange.com/ct_inventory.html)

<sup>2</sup> Union of Concerned Scientists, *Climate Choices: Solutions, Reducing Emissions*, [http://www.climatechoices.org/ne/solutions\\_ne/meeting-the-climate-challenge.html](http://www.climatechoices.org/ne/solutions_ne/meeting-the-climate-challenge.html)

measures and efficiency efforts in Branford continue, this baseline will help the town quantify each project's significance in meeting the reduction goal.

## RESULTS

Greenhouse gas emissions are reported as metric tons of carbon dioxide equivalents, MTCO<sub>2e</sub>. Converting all emissions to carbon dioxide equivalents, CO<sub>2e</sub>, allows for the consideration of different greenhouse gases in comparable terms.

### **GOVERNMENT INVENTORY RESULTS**

The total cost of electricity, natural gas, heating oil, diesel and gasoline used for government operations in Fiscal Year 2006-2007 (7/1/06-6/30/07) was approximately \$2,814,606.00. The use of these fuels consumed 105,688 MMBtu of energy and caused **8,815 MTCO<sub>2e</sub> emissions**.

Government energy use was categorized into four sectors: town buildings; vehicle fleet; sewage treatment; and street/traffic/outdoor lighting. Results for the four sectors are displayed in the graph and table on page 7. Town buildings emitted a total of 5,115 MTCO<sub>2e</sub>, 58.0% of total Government emissions. The vehicle fleet was the next largest contributing sector with 1,829 MTCO<sub>2e</sub>, 20.8% of total Government emissions. Sewage treatment was responsible for 1,497 MTCO<sub>2e</sub>, 17.0% of total Government emissions. Emissions from street, traffic, and outdoor lighting were 4.2% of total Government emissions.

The graph and table on page 8 display Government emissions results organized by the type of fuel. Electricity use was the largest contributor to total Government CO<sub>2e</sub> emissions, responsible for almost half of all Government emissions. Overall, electricity cost almost \$2 million – a substantial portion of the total \$2.8 million spent on energy. The electricity used specifically in Town buildings caused 2,358 MTCO<sub>2e</sub>, 26.7% of total Government emissions. Emissions from the electricity used for sewage pumping and treatment were 15.2% of total Government CO<sub>2e</sub> emissions. Emissions from the electricity used specifically in streetlights were 3.6% of total Government emissions. Each of the 2,024 streetlights emitted an average of 0.2 MTCO<sub>2e</sub>, used 1.6 MMBtu of energy, and cost \$102.50 in FY06-07.

At 2,317 MTCO<sub>2e</sub>, emissions from heating oil consumption in Town buildings were 26.3% of total Government emissions, and practically equivalent to those from electricity in Town buildings. Diesel used in town vehicles, equipment, and school busses caused 11.6% of total government emissions, while gasoline use in the vehicle fleet contributed an additional 9.2% of total emissions. Natural gas was used in Town buildings and at the sewage treatment plant, resulting in 594 MTCO<sub>2e</sub>, 6.7% of total emissions.

Each government building and operation is assessed individually in Appendix A on page 43. The CO<sub>2e</sub> emissions, energy use, and cost are shown for each of the facilities, which are listed in descending order by total CO<sub>2e</sub>. The High School, Intermediate School, Branford's 3 elementary schools, Town Hall, police headquarters, fire headquarters, Indian Neck School, and Community House, make up the top 10 buildings for CO<sub>2e</sub> emissions in FY06-07. Due to conservation programs mentioned in greater detail on page 32, all public school buildings decreased in total energy consumption the following year, FY07-08. The tables on pages 47-48 list buildings in descending order by CO<sub>2e</sub> per 1000 sq.ft. The top 5 buildings for CO<sub>2e</sub> per

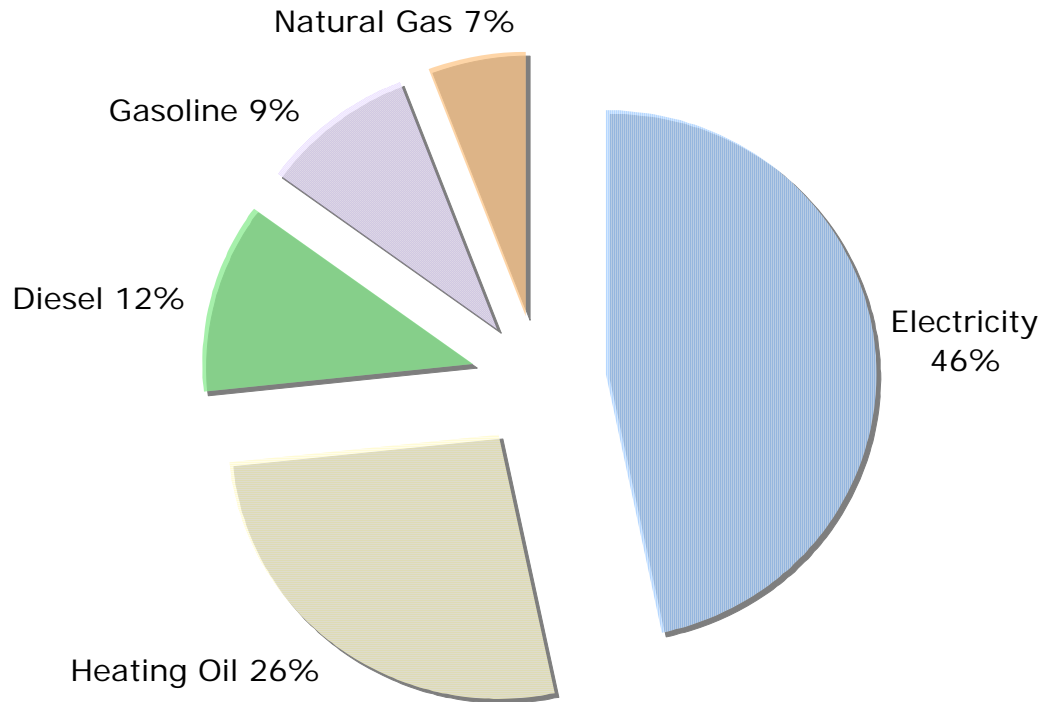
square foot were the Volunteer Services Center, Town Hall, Fire Department Headquarters, Animal Shelter, and East Shore Adult Day Care.



<b>Government CO2e Emissions in FY06-07 by Sector</b>				
<b>Sector</b>	<b>MTCO2e</b>	<b>CO2e (%)</b>	<b>Energy (MMBtu)</b>	<b>Cost (\$)</b>
Town Buildings				
Electricity	2,358	26.7	23,585	\$1,084,377
Heating Oil	2,317	26.3	30,895	\$419,515
Natural Gas	440	5.0	7,849	\$127,550
<b>Subtotal:</b>	<b>5,115</b>	<b>58.0</b>	<b>62,329</b>	<b>\$1,631,442</b>
Vehicle Fleet				
Diesel	1,023	11.6	12,991	\$94,355
Gasoline	807	9.2	10,441	\$177,682
<b>Subtotal:</b>	<b>1,829</b>	<b>20.8</b>	<b>23,432</b>	<b>\$272,037</b>
Street/Traffic Lights				
Electricity	374	4.2	3,742	\$233,597
<b>Subtotal:</b>	<b>374</b>	<b>4.2</b>	<b>3,742</b>	<b>\$233,597</b>
Sewage Treatment				
Electricity	1,343	15.2	13,429	\$619,538
Natural Gas	154	1.8	2,756	\$57,992

<b>Subtotal:</b>	<b>1,497</b>	<b>17.0</b>	<b>16,185</b>	<b>\$677,530</b>
<b>Total:</b>	<b>8,815</b>	<b>100.0</b>	<b>105,688</b>	<b>\$2,814,606</b>

### Government CO2e Emissions in FY06-07 by Fuel Source



<i>Government CO2e Emissions in FY06-07 by Fuel Source</i>				
<b>Fuel Source</b>	<b>MTCO2e</b>	<b>CO2e (%)</b>	<b>Energy (MMBtu)</b>	<b>Cost (\$)</b>
Electricity	4,075	46.2	40,756	\$1,937,511
Heating Oil	2,317	26.3	30,895	\$419,515
Diesel	1,023	11.6	12,991	\$94,355
Gasoline	807	9.2	10,441	\$177,682
Natural Gas	594	6.7	10,065	\$185,542
<b>Total:</b>	<b>8,815</b>	<b>100.0</b>	<b>105,688</b>	<b>\$2,814,606</b>

## COMMUNITY INVENTORY RESULTS

Assuming the FY06-07 government emissions rate of 8,815 MTCO<sub>2</sub>e per year, government emissions would have made up only 3% of community-wide emissions in 2007, which totaled 279,989 MTCO<sub>2</sub>e.

As seen in the graph on page 10 and in the table on page 11, community emissions in 2007 (1/1/07-12/31/07), were broken down into 4 sectors: residential buildings, transportation, commercial/industrial facilities, and landfilled waste. Energy consumption at residential buildings caused 108,959 MTCO<sub>2</sub>e, 38.9 % of total emissions. The transportation sector, which included emissions from gasoline and diesel used on roads within Branford, sold at Branford marinas, and used for hauling community trash to disposal facilities, was responsible for 31.5% of total community emissions. Commercial/industrial facilities generated 29.3% of total emissions. In the community inventory, government emissions were included as part of the “commercial” sector. The only waste sent to landfill was “bulky” construction, demolition, and land-clearing debris, and produced 0.3% of total community emissions, excluding the fuel used to transport it out-of-state. Branford’s trash is not landfilled, but rather combusted at a “waste-to-energy” incinerator in CT. As such, emissions from trash incineration are included as part of the emissions results for residential, commercial, and industrial electricity consumption. Information regarding emissions specific to trash incineration can be found in Appendix B, on page 49.

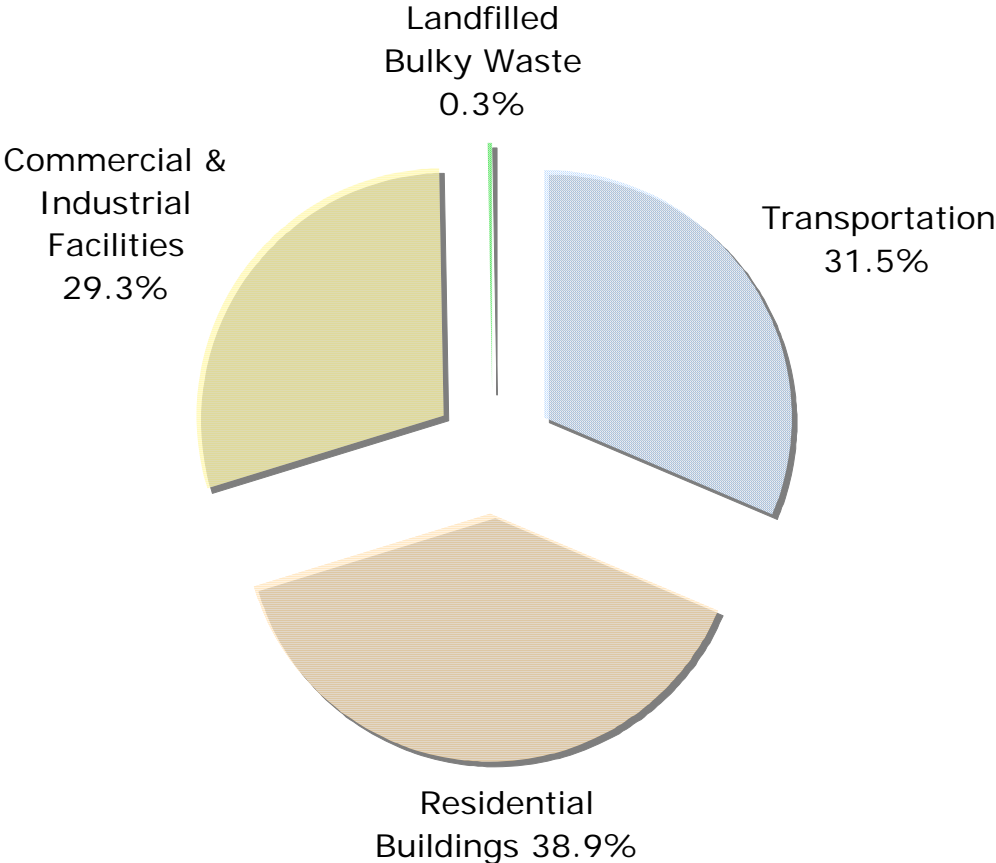
The graph and table on page 12 show community emissions for each fuel source examined. At 81,946 MTCO<sub>2</sub>e, electricity consumption generated the most emissions, 29.3% of total community emissions. Gasoline use generated 71,870 MTCO<sub>2</sub>e, 25.7% of total emissions. Natural gas use produced 64,517 MTCO<sub>2</sub>e, while heating oil contributed 38,613 MTCO<sub>2</sub>e.

With community emissions totaling 279,989 MTCO<sub>2</sub>e, and a population of 29,864 in 2007, Branford emitted 9.38 MTCO<sub>2</sub>e per capita in 2007. Comparing per capita CO<sub>2</sub>e emissions among communities is difficult since energy needs can vary significantly depending on regional climate. Per capita emissions can also vary somewhat with the weather intensity of the particular baseline year chosen. Furthermore, not many similar-size communities nearby Branford have published emissions data. The U.S. Department of Energy calculated that the U.S. emissions average was 20.4 MTCO<sub>2</sub>e per person in 2004.<sup>3</sup> Even assuming the DOE or other towns use similar inventory methodologies, each may encounter different limitations on available data. As such, it cannot be said that Branford is below the national average. Since not all Branford emissions could be captured for this report, it is likely that Branford is consistent with the U.S. average. It is important for communities to realize that regardless of how they compare to their neighbors, each will need to contribute to emissions reductions.

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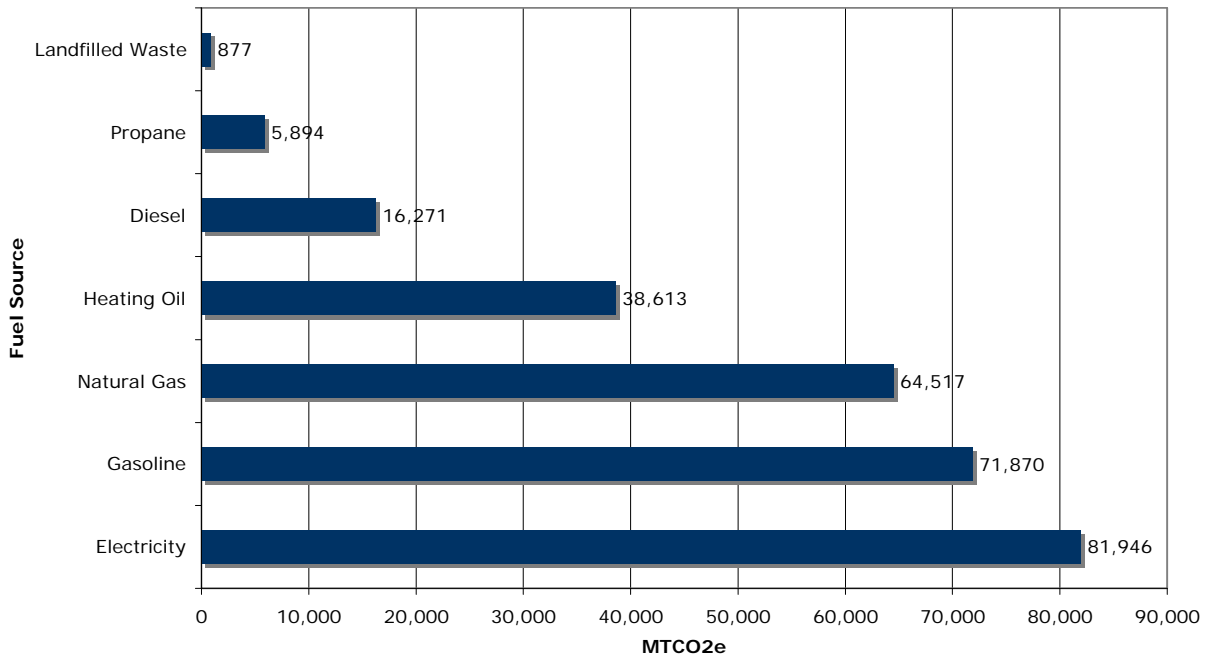
<sup>3</sup> Carbon Dioxide Information Analysis Center, U.S. Department of Energy, <http://cdiac.ornl.gov/>

# Community CO2e Emissions in 2007 by Sector (Total = 279,989 MTCO2e)



<i>Community CO2e Emissions in 2007 by Sector</i>			
<b>Sector</b>	<b>MTCO2e</b>	<b>CO2e (%)</b>	<b>Energy (MMBtu)</b>
Residential Buildings			
Electricity	38,690	13.8	386,997
Natural Gas	35,128	12.5	626,742
Heating Oil	32,108	11.5	428,157
Propane	3,032	1.1	46,182
<b>Subtotal:</b>	<b>108,959</b>	<b>38.9</b>	<b>1,488,078</b>
Transportation			
All Roads (except I-95)			
Gasoline	70,164	25.1	904,826
Diesel	14,867	5.3	188,805
Subtotal:	85,030	30.4	1,093,631
Motor Boat Use			
Gasoline	1,706	0.6	22,422
Diesel	907	0.3	11,534
Subtotal:	2,614	0.9	33,956
SLE Commuter Rail			
Diesel	333	0.1	4,229
Subtotal:	333	0.1	4,229
Trash to Disposal Facility			
Diesel	165	0.1	2,093
Subtotal:	165	0.1	2,093
<b>Subtotal:</b>	<b>88,142</b>	<b>31.5</b>	<b>1,133,909</b>
Commercial & Industrial			
Electricity	43,255	15.4	432,659
Natural Gas	29,390	10.5	524,366
Heating Oil	6,505	2.3	86,737
Propane	2,861	1.0	43,577
<b>Subtotal:</b>	<b>82,011</b>	<b>29.3</b>	<b>1,087,338</b>
Landfilled Waste			
Bulky Waste	877	0.3	
<b>Subtotal:</b>	<b>877</b>	<b>0.3</b>	
<b>Total:</b>	<b>279,989</b>	<b>100.0</b>	<b>3,709,325</b>

**Community CO<sub>2</sub>e Emissions in 2007 by Fuel Source**  
**(Total = 279,989 MTCO<sub>2</sub>e)**



<i>Community CO<sub>2</sub>e Emissions in 2007 by Fuel Source</i>			
<b>Fuel Source</b>	<b>MTCO<sub>2</sub>e</b>	<b>CO<sub>2</sub>e (%)</b>	<b>Energy (MMBtu)</b>
Electricity	81,946	29.3	819,655
Gasoline	71,870	25.7	927,248
Natural Gas	64,517	23.0	1,151,108
Heating Oil	38,613	13.8	514,894
Diesel	16,271	5.8	206,661
Propane	5,894	2.1	89,759
Landfilled Waste	877	0.3	
<b>Total:</b>	<b>279,989</b>	<b>100.0</b>	<b>3,709,325</b>

## METHODOLOGY

### **CLASSIFYING EMISSIONS**

To understand the extent of this inventory, a few definitions are needed:

Direct Emissions – emissions from sources owned or controlled by entity in question

Indirect Emissions – emissions that are a consequence of the activities of entity in question, but occur from sources owned or controlled by another entity.

Scope 1 Emissions – all direct greenhouse gas emissions with the exception of direct CO<sub>2</sub> emissions released naturally from plant or animal sources.

Scope 2 Emissions - Indirect greenhouse gas emissions resulting from the consumption of purchased electricity, heating, cooling, or steam.

Scope 3 Emissions - All indirect greenhouse gas emissions not covered in Scope 2, including emissions resulting from the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, and outsourced activities.<sup>4</sup>

When examining a corporate entity or Town government, Scope 1 Emissions are generally straightforward to determine. As such, this report includes most direct emissions in the government analysis. In a communitywide analysis, including all direct emissions is difficult. While most are easily accounted for, small-scale direct emissions from resident filled gasoline generators, lawn mowers, power tools, dirt bikes, ATVs, or various other off-road fuel related activities of Branford residents were omitted from the community analysis. Direct emissions from Branford residents that occur outside of town, such as work commutes or vacation travel, are difficult to determine, and were therefore also omitted.

Indirect “Scope 2” emissions were also included in both the government and community analysis. Certain other indirect “Scope 3” emissions were excluded, such as the “upstream” emissions generated during the creation of the many products purchased by consumers, such as food, cars, or building materials. Many of these Scope 3 emissions can be seen as the Scope 1 or 2 emissions of another entity, such as the product manufacturer, and are often not included in greenhouse gas inventories. For example, a car company’s emissions inventory would include the emissions resulting from car manufacturing, and possibly also indirect emissions from the construction of the machines used to build the cars. However, the end customer is still responsible for their Scope 3 indirect emissions.

Sometimes, there is no reasonable way to reduce, or accurately calculate, Scope 3 emissions. But, in many situations where the choice of an alternative exists, such as using a local farmer’s market, craftsman, or repairman, one might achieve Scope 3 reductions. Although this inventory does not quantify Scope 3 emissions, the importance of complete “Product Life Cycle” thinking should not be forgotten.

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<sup>4</sup> Definitions derived from The Climate Registry’s Greenhouse Gas Reporting Protocol, <http://www.theclimater registry.org/downloads/GRP.pdf>

## **WHAT'S INCLUDED IN THE INVENTORY?**

*Community Emissions Inventory* (includes government emissions within commercial):

Included:

- Residential, commercial, and industrial electricity and heating oil consumption
- Residential, commercial, and industrial natural gas and propane consumption
- Residential, commercial, and industrial heating oil consumption
- Commercial and industrial distillate fuel oil for “off-road” equipment
- Residential, commercial, and industrial drinking water pumping/treatment
- Diesel and gasoline used on roads within Branford limits (excluding I-95)
- Diesel used in resident commute between Branford and New Haven via railroad
- Diesel and gasoline sold from Branford marinas
- Diesel used to transport trash from Branford to out-of-town disposal facilities
- Methane from landfilling Bulky construction, demolition, and landclearing waste

Excluded:

- Fuel used to transport Bulky waste to out-of-state landfills by road or rail
- Fuel used by residents/businesses for commutes or travel outside of Town limits  
(New Haven railroad commute was included since data was available)
- Fuel used on Interstate 95 in Branford
- Off-road resident gasoline or diesel use (lawn mowers, power tools, ATVs, etc.)
- Scope 3 emissions from products or services purchased in town of by residents  
(Scope 3 drinking water emissions were included since data was available)

*Government Emissions Inventory:*

Included:

- Electricity, natural gas, heating oil, and propane consumed for all Town facilities
- Diesel and gasoline used for vehicle fleets and equipment

Excluded:

- Collection and transportation of government generated trash
- Methane from Branford Landfill
- Scope 3 emissions, such as from products or contracted service to the Town
- Employee commutes

## **BASELINE YEARS AND THE CACP SOFTWARE**

Government data from FY06-07 and community data from Calendar 2007 were entered into the Clean Air and Climate Protection (CACP) computer software, developed for ICLEI by Torrie Smith Associates. Emissions of various greenhouse gases were converted to carbon dioxide equivalents, CO<sub>2</sub>e, allowing for the consideration of different greenhouse gases in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide on a per molecule basis in its capacity to trap heat, so the CACP software converts one metric ton of methane emissions to 21 MTCO<sub>2</sub>e. The software also translated all energy units to British Thermal Units (BTU's) for comparison between energy sources. The CACP software complies with national and international inventory standards established by the Intergovernmental Panel on Climate Change and the U.S. Voluntary Greenhouse Gas Reporting Guidelines.

## GENERAL BRANFORD ECONOMIC AND HOUSING DATA

According to the Connecticut Economic Resource Center, Inc. (CERC), Branford had 12,897 households and a population of 29,864 in 2007. CERC estimates Connecticut had a total of 1,332,283 households and a population of 3,549,606 in 2007.<sup>5</sup> CERC uses advanced economic and demographic analysis to make current estimates based on the most recent actual U.S. Census Bureau data. Based on this data, Branford contains 0.97% of CT households and 0.84% of the CT population. Square footage for Town government buildings was obtained from Branford Town Hall Assessor Field Cards, which reflect the 2002 Revaluation.

An estimate for the number of occupied housing units in Branford on various heating fuels was obtained from the U.S. Census Bureau's "Census 2000".<sup>6</sup>

### *U.S. Census Bureau Heating Fuel Statistics for Branford, CT in year 2000*

House Heating Fuel	# of Occupied Housing Units	% of Occupied Housing Units
Utility gas	6,681	53.3
Bottled, tank, or LP gas	234	1.9
Electricity	1,691	13.5
Fuel oil, kerosene, etc.	3,824	30.5
Coal or coke	29	0.2
Wood	74	0.6
Other fuel	10	0.1
<b>Total:</b>	<b>12,543</b>	<b>100</b>

## COMMUNITY NATURAL GAS

Mike Smalec, of the Southern Connecticut Gas Company (SCG), supplied the total Branford residential and commercial/industrial natural gas consumption for 2007. Throughout the community inventory, the commercial and industrial sectors were combined, since energy providers, including SCG, don't typically use tax classifications to organize customers. Account types are categorized more by usage and demand patterns. Government natural gas consumption is a subset of the commercial sector.

### *2007 Natural Gas Consumption in Branford, CT*

Sector	Usage for 1/1/07-12/31/07
Residential	6,143,880.55 ccf
Commercial & Industrial	5,140,295.15 ccf
<b>Total:</b>	<b>11,284,175.70 ccf</b>
*ccf = 100 standard cubic feet	

<sup>5</sup> Connecticut Economic Resource Center, <http://www.cerc.com/eddi.html>

<sup>6</sup> U.S. Census Bureau, *Census 2000 Demographic Profiles: Branford, CT*, <http://censtats.census.gov/data/CT/0600900907310.pdf>

## GOVERNMENT NATURAL GAS

Deborah Lisi, of the Southern Connecticut Gas Company (SCG), provided natural gas usage for all Town accounts. During FY06-07 Branford received natural gas supply from the Hess Corporation and distribution from SCG. Hess and SCG charges, provided by Branford's Department of Finance and the Board of Education, were summed to determine total cost.

<b><i>FY 06-07 Usage and Cost, Town of Branford Natural Gas Accounts</i></b>				
<b><u>Location</u></b>	<b><u>Dept.</u></b>	<b><u>Description</u></b>	<b><u>Usage (ccf)</u></b>	<b><u>Cost (\$)</u></b>
75 Block Island Rd	WPCA	Treatment Plant	22844	\$47,754.79
185 E Main St	BOE	High School	14580	\$21,208.11
33 Laurel St	Police	Police HQ	8255	\$16,823.93
30 Harrison Ave	Police	Police Garage	5118	\$10,685.23
43 N Main St	DPW	Older Garage	4757	\$10,431.37
41 N Main St	DPW	Newer Garage	4613	\$9,002.70
14 Brushy Plain Rd	BOE	Murphy Elementary	3932	\$6,460.57
749 E Main St	GGB	Animal Shelter	3571	\$7,370.00
30 Harrison Ave	GGB	Soup Kitchen	3220	\$6,680.68
1111 Main St	BOE	Central Office	3000	\$5,163.04
75 Block Island Rd	WPCA	Treatment Plant	2967	\$6,117.03
30 Harrison Ave	GGB	Volunteer Services Center	2446	\$5,051.90
342 Harbor St	GGB	Counseling Center	2415	\$5,111.60
118 Damascus Rd	BOE	Tisko Elementary	2142	\$3,656.96
17 Prospect St	REC	Garage/FieldHouse	947	\$2,164.57
747 E Main St	SWR	Transfer Station	886	\$2,019.44
12 Melrose Ave	BOE	Indian Neck School	881	\$1,671.81
6 Linden Ave	FIRE	Indian Neck Fire	818	\$2,339.35
335 Shore Dr	WPCA	Pump Station	796	\$1,868.48
421 Shore Dr	GGB	Orchard House	776	\$1,786.23
Damascus Rd	BOE	Walsh Intermediate	765	\$1,825.00
39 Short Beach Rd #Gen	WPCA	Pump Station	277	\$817.89
11 Cherry Hill Rd	GGB	Senior Center	174	\$633.25
46 Church St	REC	Community House	97	\$487.31
175 Cedar St # Gen	WPCA	Pump Station	77	\$484.22
30 Beckett Ave	WPCA	Pump Station	31	\$308.73
Bradley Ave	WPCA	Pump Station	20	\$338.64
188 Clark Ave	WPCA	Pump Station	1	\$303.07
<b>TOTAL:</b>			<b>90406</b>	<b>\$178,565.90</b>
	Notes:	ccf = 100 cubic feet		

During FY06-07, Branford's Water Pollution Control Authority (WPCA) occasionally used natural gas to power on-site generators that produced electricity for WPCA facilities, effectively reducing WPCA grid demand on CL&P-determined high customer demand days. Due to new generation projects and new efforts to reduce peak demand, it is assumed that CL&P will not continue the program for much longer. In December 2007, Branford stopped receiving supply from the Hess Corporation and started receiving both distribution and supply solely from SCG.

## COMMUNITY ELECTRICITY

The Connecticut Light and Power Company (CL&P) provides electricity distribution services to all Branford grid-electricity users. David Rackie, CL&P Account Executive, generated the total number of Branford residential, commercial, and industrial CL&P customers, and their consumption in 2007. Government electricity consumption is a subset of the commercial sector.

### *2007 Electricity Consumption in Branford, CT*

<b>Sector</b>	<b># of Customers</b>	<b>2007 Consumption</b>	<b>Average Usage / customer</b>
Residential	13,998	111,865 MWh	0.666 MWh/month
Commercial	1,802	103,949 MWh	4.807 MWh/month
Industrial	61	22,820 MWh	31.175 MWh/month
<b>Total:</b>		<b>238,634 MWh</b>	

The CACP software calculated emissions using the 2007 generation profile of the New England ISO power grid, which receives electricity generated from a number of fuel sources, each contributing differently to emissions. Since the electricity produced from trash incineration is purchased by CL&P and added to the New England power grid, the emissions from trash incineration are therefore already included as a small percentage of total electricity generation emissions. This is discussed further in Appendix B on page 49.

## GOVERNMENT ELECTRICITY

In January 2007, with the help of Connecticut Conference of Municipalities (CCM) and aggregator Bay State Consultants LLC, Branford secured better electricity generation rates by entering a contract dictating that TransCanada Power Marketing Ltd. would act as the Town government's new supplier of electricity for most meters with significant consumption. David Rackie from CL&P supplied monthly electricity usage and CL&P charges for all Town accounts for FY 06-07. Doreen Denhardt, Branford Accounts Payable, provided TransCanada generation charges for the 6 months following January 2007. These were added to the CL&P distribution charges to obtain total cost of electricity. Mark Deming, Facilities Director, supplied cost and usage for Board of Education buildings.

The generation profile of the New England grid was used to calculate emissions. It is not certain that all electrons received at Town buildings were generated by TransCanada facilities. In order to reduce energy losses from transmission over large distances, power is pooled so that the actual electrons a customer receives are from the nearest generation facilities. Due to fluctuations in customer demand, and the amount of power generation possible at any given moment, Branford shares responsibility for the various regional power plants that ensure power despite changes in demand or generation capability. It is still worth noting, though, that the proportions of TransCanada's fuel sources are slightly favorable from an emissions standpoint to those for New England as a whole, due largely to a higher percentage of TransCanada's facilities using natural gas and hydro, and a lower percentage using coal and oil.

On the following pages is a table showing the FY06-07 consumption and costs associated with Town-owned electricity accounts. Accounts are listed by consumption, measured in MWh, in descending order. "TC" stands for "with TransCanada" and indicates whether the account is under contract for TransCanada supply. Cost includes both supply and distribution charges. Consumption for all accounts for FY06-07 totaled 11,938 MWh, and cost for the year totaled \$1,939,468.81. "Branford Day Care" is listed although paid separately by State grant.

Town of Branford FY 2006-2007 CL&P Accounts - Electricity Consumption & Cost

<b>Rate</b>	<b>Address</b>	<b>Description</b>	<b>MWh/yr</b>	<b>Cost (\$)</b>	<b>TC</b>	<b>Dept.</b>
56	75 Block Island Rd	Treatment Plant Main	2742.480	\$384,184.74	Y	WPCA
56	185 E Main St	High School	2659.680	\$378,191.41	Y	BOE
56	Damascus Rd	Walsh Intermediate	1384.320	\$222,942.63	Y	BOE
116	Main St	Street Lights - main	941.788	\$207,527.75	Y	Lights
35	33 Laurel St	Police HQ	349.040	\$52,039.03	Y	PD
35	118 Damascus Rd	Tisko Elementary	347.040	\$56,736.71	Y	BOE
35	14 Brushy Plain Rd	Murphy Elementary	344.480	\$49,538.02	Y	BOE
35	758 Main St	Blackstone Library	280.320	\$47,033.96	Y	LIB
35	1019 Main St	Town Hall	240.640	\$39,225.76	Y	TOWN
35	Eades St	Sliney Elementary	240.440	\$38,131.17	Y	BOE
30	86 Meadow St	Central Pump Station	207.250	\$41,742.35	Y	WPCA
30	45 N Main St	Fire Dept HQ	144.360	\$26,141.85	Y	FIRE
30	22 Damascus Rd	BFD Trmnt PI B 6	126.720	\$22,782.50	Y	WPCA
30	30 Harrison Ave	Vol. Services Ctr.	114.640	\$21,444.97	Y	TOWN
30	E Main St	Pump Station B 3	104.150	\$19,027.14	Y	WPCA
30	62 Church St	Community House	103.760	\$19,126.72	Y	REC
30	204 S Montowese	Pump Stat B 4	99.080	\$18,272.84	Y	WPCA
30	342 Harbor St	Counseling Center	71.720	\$13,517.53	Y	TOWN
30	Bradley Ave	NE Pump Stat B 2	71.360	\$13,235.67	Y	WPCA
30	Hemlock Rd	Pump Stat S 4	64.596	\$12,024.44	Y	WPCA
30	171 Cedar St	Pump Station	64.340	\$10,954.03	Y	WPCA
30	11 Cherry Hill Rd	Senior Citizens Center	59.000	\$11,165.45	Y	TOWN
30	39 Short Beach Rd	New Pump Station	58.850	\$11,139.05	Y	WPCA
30	747 E Main St	Transfer Station	57.595	\$10,486.75	Y	SWR
40	345 Shore Dr.	E Shor Adult Day Care	57.560	\$10,423.57	Y	TOWN
115	Main St	Traffic Signals	56.704	\$6,308.52	Y	Lights
40	12 Melrose Ave	Indian Neck School	55.560	\$10,087.86	Y	BOE
30	Shore Dr	Pump Stat B 5	48.864	\$10,867.63	Y	WPCA
30	Burban Dr	Pump Stat S 3	45.760	\$8,903.95	Y	WPCA
30	1111 Main St	BOE Admin Offices	41.913	\$7,671.37	Y	BOE
30	146 Thimble Island	W Wallace Library	41.841	\$8,312.67	Y	LIB
30	40 Kirkham St	Visiting Nurses Assoc.	38.118	\$6,999.98	Y	TOWN
30	16 Birch/190 Pine O.	Branford Day Care	38.035	\$6,062.61	N	
30	12 Melrose Ave	Indian Neck SACC	34.711	\$7,631.39	Y	BOE
30	Main St	Street Lights	34.511	\$6,401.73	Y	Lights
30	749 E Main St	Animal Shelter	31.775	\$6,130.13	Y	TOWN
30	43 N Main St	Public Works Garage	29.610	\$5,798.88	Y	DPW
30	Main St	St Lt & Traffic Control	25.774	\$4,780.66	Y	Lights
40	Jefferson/80Burban	Branford Hills School	24.252	\$4,407.87	Y	BOE
30	Pine Orchard Rd	P.O. Pump St S 26	23.391	\$4,911.39	Y	WPCA
30	2 Fenway Rd	Pump Stat S 22	22.440	\$4,420.01	Y	WPCA
30	Main St	St Lt & Traffic Control	21.270	\$3,978.91	Y	Lights
30	115 S Montowese	Little League	20.385	\$4,031.14	Y	REC
30	Lanphiers Cove Rd	Pump Stat S 5	19.916	\$4,186.72	Y	WPCA
30	E Main St	Pump Stat Sewer C 3	19.841	\$3,813.88	Y	WPCA
30	175 Brushy Plain rd	Pump Stat S 15	18.220	\$3,598.75	Y	WPCA
30	41 N Main St	New Town Garage	17.400	\$3,433.36	Y	DPW
30	Thimble Island Rd	Stony Creek Fire Dept	16.562	\$3,335.73	Y	FIRE
30	168 Harbor St	South Pump Stat C 2	15.552	\$3,303.79	Y	WPCA
30	Hickory Rd	Pump Stat S 21	14.808	\$2,935.18	N	WPCA
30	E Main St	Pump Stat S 2	14.037	\$2,933.63	Y	WPCA
30	Greenfield Ave	Pump Stat S 10	13.942	\$2,650.34	N	WPCA

1	Ludlow Ct	Pump Station S 27	13.125	\$2,445.95	Y	WPCA
30	0Main/170Montwese	Academy On Green	12.782	\$2,901.78	Y	TOWN
30	W Main St	Pump Station S 9	11.207	\$2,435.87	Y	WPCA
30	Riverside Dr	Pump Stat S 16	10.068	\$2,027.85	Y	WPCA
29	90 Brushy Plain Rd	VetsPark garage/lights	9.880	\$2,480.21	N	REC
30	18 Victor Hill Dr	Pump Station S 18	9.765	\$2,327.54	Y	WPCA
30	Riverside Dr	Pump Stat S 1	9.516	\$1,951.49	N	WPCA
30	Sunrise Cove Rd	Pump Stat S 6	8.445	\$1,776.13	N	WPCA
30	341 Main St	M P Rice Hose Co	8.123	\$1,582.63	N	FIRE
30	6 Linden Ave	Indian Neck Station	8.103	\$1,803.64	Y	FIRE
30	Maltby St	Pump Stat S 23	7.761	\$1,713.58	N	WPCA
30	44 S Montowese St	East Pump Stat C 1	7.329	\$1,598.40	N	WPCA
30	100 Tabor Dr	Landfill Gate Office	7.129	\$1,439.58	N	SWR
30	Montowese St	Outdr. Box-Xmas Tree	6.870	\$1,687.33	N	TOWN
30	30R Beckett Ave	Pump Station S 14	6.386	\$1,373.62	N	WPCA
30	82 Johnsons Point	Pump Stat G 3	5.674	\$1,353.98	N	WPCA
30	57 Milo Dr	Pump Sta S 8	5.125	\$1,412.27	N	WPCA
30	184r Clark Ave	Pump Stat S 12	5.080	\$1,125.94	N	WPCA
30	17 Prospect St	Garage / Field House	5.052	\$1,107.44	N	REC
30	141 Chestnut St	Sewer Pump Sta S 2	4.974	\$1,099.60	N	WPCA
30	6 1/2 Indian Neck	Sump Pump	4.626	\$1,111.09	N	WPCA
30	W Main St	Lights	3.843	\$914.66	N	Lights
30	Clark Ave	FarmRvr Pmp St S19	3.785	\$981.04	N	WPCA
30	Summer Island Rd	Pump Stat S 24	3.576	\$879.71	N	WPCA
30	34 Red Rock Rd	Pumping Station S 17	3.434	\$926.51	N	WPCA
30	4th Ave	Pump Station S 7	3.333	\$922.27	N	WPCA
30	River Rd	Pump Stat S 25	3.167	\$813.93	N	WPCA
115	Beaver Rd	Loc 014 203 (?)	2.914	\$515.22	N	Lights
30	Rice Ter	Pump Stat G 2	2.884	\$742.14	N	WPCA
30	30 Harrison Ave	Garage/Firing Range	2.479	\$693.69	N	PD
30	Dominican Rd	Pump Stat S 11	2.465	\$757.54	N	WPCA
30	20 Harbor St	Parker Park Baths	2.301	\$661.97	N	TOWN
30	Leetes Island Rd	Lights	2.100	\$632.97	N	Lights
30	Chestnut St	WWTP	1.914	\$657.19	N	WPCA
1	Ramona Way	Station S29	1.803	\$433.32	N	WPCA
30	84 Thimble Island	Creek Comm. House	1.710	\$622.37	N	TOWN
115	E Industrial Rd	Office of Traffic	1.660	\$301.51	N	Lights
30	5 Harbor St	Pump Stat G 4	1.511	\$857.70	N	WPCA
29	90 Brushy Plain Rd	Vets Bathrooms	1.385	\$615.54	N	REC
30	101HotchkissGrove	Pump Stat The Ponds	1.304	\$509.45	N	WPCA
30	Thimble Island Rd	GGB (Office)	1.005	\$451.40	N	TOWN
30	26 Birch Rd	Birch Rd Trmt Plant	0.396	\$416.33	N	WPCA
30	Little Bay Ln	Pump Stat S 13	0.384	\$355.68	N	WPCA
30	90 Brushy Plain Rd	Vet Memorial Pk/Gar	0.364	\$352.47	N	REC
30	Montowese St	OutdoorBox (Festival)	0.325	\$434.94	N	TOWN
30	185 E Main St	Board of Education	0.291	\$341.03	N	BOE
30	Montowese St	Outdoor Box (Festival)	0.273	\$419.74	N	TOWN
1	Prospect St	Maintenance Garage	0.169	\$148.29	N	REC
30	Sycamore Way	WWTP	0.139	\$340.68	N	WPCA
30	32.5LanphiersCove	Waterfront Pump St.	0.064	\$303.62	N	WPCA
30	20 Harbor St	Parker Bath Houses	0.021	\$296.73	N	TOWN
30	64 Shore Dr	S Bch H H Lad Siren	0.001	\$293.73	N	FIRE
115	43 N Main St	Fire Sirens	0.000	\$185.40	N	FIRE

## GOVERNMENT HEATING OIL

Heating oil was used in FY06-07 in a number of Town buildings. East River Energy of Guilford, CT, delivered the oil for these facilities. Cost and total gallons for each facility was obtained from spreadsheet records kept by Doreen Denhardt at Branford's Department of Finance. The information is summarized below:

<i>FY06-07 Town of Branford Heating Oil Deliveries</i>		
<b>Facility</b>	<b>Gallons Rec'd</b>	<b>Amount Paid</b>
High School	56013.0	\$107,215.28
Walsh Intermediate	46860.0	\$89,714.06
Sliney Elementary	24365.0	\$46,637.77
Tisko Elementary	15641.0	\$29,939.19
Murphy Elementary	12685.0	\$24,280.64
Town Hall	10639.3	\$20,291.60
Indian Neck School SACC	9577.0	\$18,331.97
E. Shore Adult Day Care	8738.2	\$15,661.45
Fire Department Headquarters	8186.1	\$15,062.71
Community House	7756.1	\$14,230.95
Branford Hills School	4615.0	\$8,834.36
Branford Day Care (Birch Rd.)	4355.0	\$7,963.34
Senior Citizens Center	3943.5	\$7,484.07
Visiting Nurses Association	2134.2	\$3,946.88
Stony Creek Fire Station	1858.9	\$3,522.27
Willoughby Wallace Library	1828.7	\$3,464.46
Stony Creek Coast Guard	896.3	\$1,705.86
MP Rice Fire Station	653.6	\$1,231.94
TOTAL:	220,745.9	\$419,518.80

## RESIDENTIAL HEATING OIL

The Independent Connecticut Petroleum Association (ICPA) estimates that CT's 682,000 heating oil customers use 545,000,000 gallons of heating oil annually, or approximately 800 gallons per customer.<sup>7</sup> Local oil companies estimate the number of companies supplying oil to Branford customers at somewhere over 30.

Attempts were made to compile actual data regarding average consumption per Branford customer. Oil companies gave estimates on par with the ICPA's 800 gallons per customer annually, did not have sufficient data on Branford customers to estimate, were hesitant to provide data, or were unable to be reached. Multiplying Branford's 3,824 housing units on heating oil by an average 800 gallons per customer, results in an estimated 3,059,200 gallons of heating oil used by Branford residents in 2007.

<sup>7</sup> ICPA, <http://www.icpa.org/statistics.htm>

## COMMERCIAL / INDUSTRIAL HEATING OIL

Data provided by the Branford Assessor's Office listed 12 industrial buildings, 107 separately owned commercial units, and 31 additional tax-exempt commercial buildings (churches, non-profits, schools, Town government buildings, state agencies) with oil as the primary heat fuel. Individually owned commercial condo units were listed separately, but buildings with one owner but several rented commercial spaces were listed under one building. Since the total heating oil consumption at Town-owned buildings was already known, they were removed from the list. The remaining buildings were categorized as being under or over 10,000 sq. ft. The "living area" square footage was chosen as the best approximation of the heated space, although these numbers exclude heated finished basements and garages. Total square footage is low due to exclusion of additional buildings at parcels with one owner. Computer software was used to pull square footage numbers from the 2002 revaluation database. For parcels with one address or owned by one entity, but with multiple buildings located at that parcel, the computer software listed only the first building at that parcel. This situation arises sometimes for multiple building apartment complexes and for business parks. For example, the Brushy Plain Plaza at 4 Brushy Plain Rd. has 5 buildings owned by Brushy Plain Plaza LLC. The reporting software was only able to pull 1 building out of 5 from the database. Despite some potentially oil heated buildings being left out, this data was the best available. The Assessor's Office is constantly improving what's possible from the computer system; so extracting every building may be entirely possible in the future.

The following table summarizes that data obtained from the Branford Assessor's Office relating to commercial and industrial heating oil consumption:

<b><i>Branford commercial-industrial buildings/units with Oil heat</i></b>		
<i>Classification</i>	<i># Buildings / units</i>	<i>Sq.Ft. Living Area</i>
<b>industrial</b>	12	83,914
<b>commercial</b>	107	433,714
<b>exempt commercial</b>		
Town buildings, Town schools	14	247,850
Churches, nonprofits, private school	15	90,404
Armory CT National Guard	1	17,477
CT DOT garage	1	6,184
<b>total:</b>	150	879,543
<b>sub-total (non-Town-owned):</b>	136	631,693
buildings < 10,000 sq.ft.	125	364,847
buildings > 10,000 sq.ft.	11	266,846

The U.S. Department of Energy lists average fuel oil energy intensities for all commercial buildings in the Northeast region, broken down by building size. Buildings with 1,001 to 10,000 square feet of floor space use an average of 0.50 gallons/square foot annually, while buildings with 10,001 to 100,000 square feet of floor space use an average of 0.22 gallons/square foot annually.<sup>8</sup> All Branford buildings heating with oil are less than 32,000 sq. ft.

Branford total commercial-industrial heating oil calculations:

Total gallons = (gallons from non-Town-owned) + (gallons from Town-owned)

Total gallons = (gallons from non-Town-owned) + ( 220,746 gallons )

Non Town-Owned =

$(364,847 \text{ sq.ft.} \times 0.50 \text{ gal/sq.ft.}) + (266,846 \text{ sq.ft.} \times 0.22 \text{ gal/sq.ft.}) = 241,130 \text{ gal}$

Total gallons = ( 241,130 gal ) + ( 220,746 gal ) = 461,876 gallons of heating oil

## COMMERCIAL / INDUSTRIAL OIL FOR “OFF-ROAD” EQUIPMENT

Distillate fuel oil is also commonly used by commercial and industrial businesses for purposes other than space heating, such as unenclosed equipment not associated with the building itself. The U.S. Energy Information Administration calculates that Connecticut consumed 18,793,000 gallons of distillate fuel oil for “Off-Highway” purposes, meaning “off-road” vehicles and unenclosed equipment (such as earthmoving equipment, cranes, generators, air compressors, etc.) used most often but not exclusively in construction.<sup>9</sup> Adjusting the total by population estimates that Branford used 157,861 gallons of distillate fuel oil in 2007 for such purposes.

## COMMUNITY PROPANE

Over 15 different retailers supply propane to Branford customers.<sup>10</sup> Retailers were contacted directly in an attempt to compile propane use specific to Branford. Only one was able to report actual sales to Branford customers. Several did not call back and the smaller companies often did not keep data isolated specifically for Branford. Branford propane use was thus estimated using U.S. Energy Information Administration data, which states that CT used 3,698,000 barrels of Liquefied Petroleum Gases (LPG) in 2006, and that 2% of CT homes use LPG for home heating.<sup>11</sup> With an estimated 234 Branford housing units on LPG in 2002, Branford was consistent with the 2% state average. Adjusting CT LPG use by the % of the CT population living in Branford yields an approximation for total propane consumption:

$3,698,000 \text{ barrels} \times 0.84\% = 31,063 \text{ barrels} = 962,959 \text{ gallons}$

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<sup>8</sup> U.S. EIA, Commercial Buildings Energy Consumption Survey (CBECS), Table C35A, [http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed\\_tables\\_2003/detailed\\_tables\\_2003.html](http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.html)

<sup>9</sup> U.S. EIA, Fuel Oil and Kerosene Sales 2006, Table 24, pg. 35, [http://www.eia.doe.gov/pub/oil\\_gas/petroleum/data\\_publications/fuel\\_oil\\_and\\_kerosene\\_sales/current/pdf/foksall.pdf](http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/fuel_oil_and_kerosene_sales/current/pdf/foksall.pdf)

<sup>10</sup> Propane Education & Research Council, <http://www.usepropane.com/find>

<sup>11</sup> EIA State Profiles: CT, [http://tonto.eia.doe.gov/state/state\\_energy\\_profiles.cfm?sid=CT](http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=CT)

The national propane gas association breaks down total CT odorized propane usage by sector: 51.4% residential and cylinder, 48.5% commercial and industrial.<sup>12</sup> Applying this to 31,063 barrels yields:

494,961 gallons of Branford Residential/cylinder use  
467,035 gallons of Branford Commercial/Industrial use

### **GOVERNMENT PROPANE**

The Town government did not use any notable quantities of propane during FY06-07.

### **COMMUNITY DRINKING WATER**

Steve Rupar, of the South Central Regional Water Authority (RWA), estimated electricity use for the treatment and pumping of water to Branford. The total cost to treat and pump an average of 4 million gallons of water per day to Branford is approximately \$740,000 per year and it is estimated that the RWA uses approximately 1,525,000 kWh per year in the process. This amounts to approximately 521 MTCO<sub>2e</sub> per year. As such, treatment and pumping of drinking water is not a major contributor to Branford greenhouse gases, compared with other activities. Learning about the energy embedded in what we purchase is important nonetheless, and it's easy to see the potential for such Scope 3 emissions to add up.

The RWA are stewards of over 1100 acres of managed open space in Branford, preserving the land essential to water quality.<sup>13</sup> Preserving this and other forested land in Branford is critical as forests help control CO<sub>2</sub> levels by sequestering large amounts of carbon.

### **COMMUNITY ROAD TRANSPORTATION**

The total amount of fuel used in 2007 by vehicles traveling on Branford roads was estimated by multiplying the annual Vehicle Miles Traveled (VMT) within Branford limits by the average fuel efficiency of vehicles in the U.S. While a small percentage of vehicles contributing to VMT in Branford may be from neighboring towns, they remain included since development and zoning decisions made in Branford can have a direct impact on the quantity of out-of-town vehicles, and simply because the subset of out-of-town vehicles cannot be isolated.

In April 2006, the Town hired engineering firm EarthTech, Inc., to conduct a town-wide transportation study. The *Town-wide Traffic Study* document is available from Branford's Department of Planning & Zoning.<sup>14</sup> 2006 Average Daily Traffic (ADT) volumes were collected for specific points throughout the Branford road system. EarthTech obtained these numbers from the Traffic Count Locator Program (TCLP) of the Connecticut Department of Transportation

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<sup>12</sup> National Propane Gas Association, [http://www.npga.org/files/public/Economic\\_Study\\_Propane\\_Value\\_Final.pdf](http://www.npga.org/files/public/Economic_Study_Propane_Value_Final.pdf)

<sup>13</sup> POCD, Chapter 5, Open Space, pg. 26,  
[http://www.saltmeadow.com/pz/pr-1-town\\_plan.html](http://www.saltmeadow.com/pz/pr-1-town_plan.html)

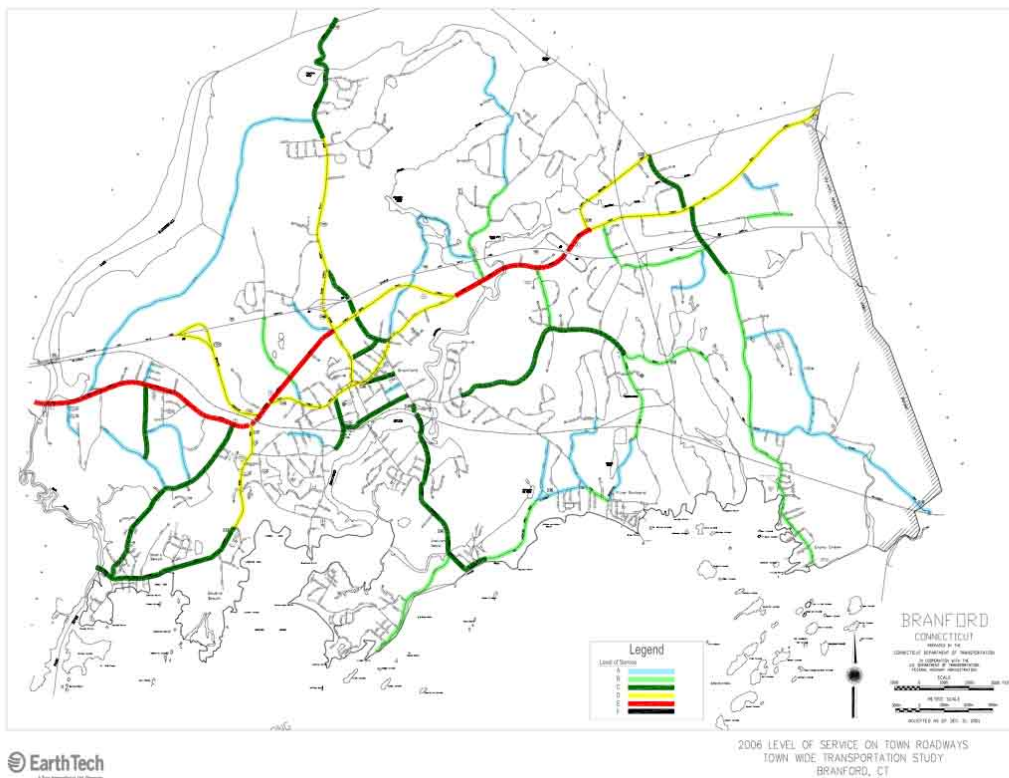
<sup>14</sup> Town of Branford Department of Planning and Zoning, Town-wide Traffic Study,  
<http://www.saltmeadow.com/pz/transportation.html>

(ConnDOT). Results from several previous Traffic Impact Studies completed for Branford were considered in determining additional volumes not available from ConnDOT. The Branford Police Department was given additional locations at which they conducted Automatic Traffic Counter Studies to supplement the State and Town data previously mentioned.

EarthTech plotted ADT data on a map of the Branford road system, and determined a Level of Service (LOS) ranking for each road with available data, based specifically on ADT volume found along the road. LOS was organized as follows:

LOS of road	ADT Volume
A (light blue)	< 1,430 vehicles
B (light green)	< 2,940 vehicles
C (dark green)	< 7,850 vehicles
D (yellow)	< 15,850 vehicles
E (red)	< 26,650 vehicles
F (black)	> 26,650 vehicles

A picture of the 2006 color-coded LOS map (excerpt from EarthTech study) is shown below:



Using Geographic Information Systems (GIS) technology, Branford’s IT Department was able to calculate the total length of road in each Level of Service classification. Multiplying the Total

Length of Road by the ADT Volume for each Level of Service yields the Average Daily VMT on each road-group:

LOS:	Total Miles of Road	x	ADT Volume	=	Av. Daily VMT
A:	14.72 mi	x	1,430 vehicles	=	21,049.6
B:	8.36 mi	x	2,940 vehicles	=	24,578.4
C:	11.24 mi	x	7,850 vehicles	=	88,234.0
D:	11.34 mi	x	15,850 vehicles	=	179,739.0
E:	4.65 mi	x	26,650 vehicles	=	123,922.5
TOTAL =					437,523.5

Analysis of the ADT volume map showed that point specific ADT volumes along each road consistently fell in the upper third of the LOS range. With this in mind, and also considering the lack of data available for smaller back-roads, the upper limit of the ADT range for each LOS was chosen for the above calculations.

To determine Annual VMT, ICLEI and the Department of Transportation recommend multiplying Average Daily VMT by 330 days (accounts for lighter traffic on weekends and holidays):

Average Daily VMT	x	330	=	Annual VMT estimate
437,523.5	x	330	=	144,382,755

Vehicle Miles Traveled on the segment of I-95 Highway within Branford limits was also estimated, although not counted toward Branford community emissions. It is presented below as a comparison to traffic on other town roads. Traffic Log data for 2006, available from ConnDOT, lists ADT numbers for 10 segments of interstate from the East Haven line to the Guilford line.<sup>15</sup> Annual VMT for I-95 in Branford was calculated using the same formula as above:

Segment Length (mi.)		ADT		Days/year	=	Annual VMT
1.08	x	97,200	x	330	=	34,642,080
0.05	x	91,000	x	330	=	1,501,500
0.91	x	84,400	x	330	=	25,345,320
0.32	x	75,200	x	330	=	7,941,120
1.90	x	84,200	x	330	=	52,793,400
0.22	x	77,600	x	330	=	5,633,760
0.51	x	80,500	x	330	=	13,548,150
0.44	x	71,500	x	330	=	10,381,800
0.27	x	73,100	x	330	=	6,513,210
0.58	x	77,100	x	330	=	14,756,940
TOTAL =						173,057,280

<sup>15</sup> 2006 Traffic Volumes - State Maintained Highway Network (Traffic Log), pg.95, <http://www.ct.gov/dot/cwp/view.asp?a=1383&q=330402>

In order to calculate greenhouse gas emissions from Annual VMT, the CACP software uses coefficients derived from nationwide data on average fuel efficiency and percentages of vehicle types in use. This includes the entire range of road vehicles from small personal autos up through waste collection trucks and transit buses, etc. ICLEI considers these averages the most accurate for a town of Branford's size and location, provided that specific local vehicle traffic analysis remains unavailable.

### **COMMUNITY MARINE TRANSPORTATION**

Data on total gallons of diesel and gasoline sold by Branford marinas was obtained by contacting the marinas that sold fuel in 2007: Brewer Bruce & Johnson's Marina (Pier 66), Branford Yacht Club, Pine Orchard Yacht & Country Club, and Indian Neck Yacht Club. It should be noted that a large portion of fuel sold in 2007 was sold to non-Branford residents who keep boats at Branford marinas. Also, yachters from farther away, but stopping through Branford on a coastal trip might fill up large tanks from time to time. In contrast, some Branford resident boaters might fill up small portable boat gasoline tanks at the gas-station.

Total gasoline sold by Branford marinas 2007: 178,515 gallons  
Total diesel sold by Branford marinas 2007: 94,530 gallons

### **COMMUNITY RAIL TRANSPORTATION**

The Shore Line East (SLE) commuter rail service is a fully owned subsidiary of the Connecticut Department of Transportation (ConnDOT), and operates along tracks owned by Amtrak. Jon Foster from ConnDOT Rail Operations provided data on SLE trains, including the number of people getting on and off at each station. In 2007, a total of 4,080 SLE train rides stopped at the Branford Station on weekdays, to either pick up or drop off commuters to or from New Haven. The Branford Station on Maple Street is 9.2 miles from the New Haven Union Station, and 8.5 miles from the New Haven State Street Station. Roughly, only 20-35% of total commuters use the closer State Street Station instead of Union Station. The distances were averaged, estimating the Branford-New Haven commute at 8.85 miles. Since SLE trains spend each night in New Haven, each single direction commute for riders is actually a round trip for the SLE trains. So, each one of the 4,080 trains needed to travel 17.7 miles:

$$4,080 \text{ trains} \times 17.7 \text{ miles} = 72,216 \text{ miles}$$

For the SLE budget, a SLE train is estimated to use 2 gallons of diesel per mile:  
72,216 miles  $\times$  2 gallons diesel = 144,432 gallons diesel

Passenger counts from SLE broken down by station showed that approximately 55,368 people boarded westbound morning SLE trains at Branford Station in 2007, and 219,732 people got off these trains in New Haven. Approximately 228,912 people boarded eastbound afternoon and evening trains in New Haven stopping in Branford and 51,900 got off at Branford Station in 2007. The total 107,268 people that got on at Branford Station in the morning or off in the evening were considered to be Branford residents, and accounted for 24% of the total riders on those trains.

Branford resident commuters were thus responsible for 24% of the total fuel used:

$$0.24 \times 144,432 \text{ gallons diesel} = 34,664 \text{ gallons diesel}$$

In actuality, those considered “Branford residents” above likely included a handful of visitors, and the few people from out-of-town who may have used the Branford Station to commute to New Haven.

During 2007, only 336 total people boarded eastbound SLE trains at Branford Station. Since it is impossible to determine from passenger counts how far east those people traveled, this tiny fraction of commuters was not included.

A tiny fraction of commuters that got on in Branford might have, on a given day, continued beyond New Haven, perhaps to NYC, via Metro North or Amtrak. Any such potential railroad travel beyond New Haven could not be estimated.

Amtrak trains offering longer distance travel do pass through Branford, but do not stop at the Branford Station. As such, emissions from Branford residents on Amtrak trains could not be estimated.

SLE is looking into creating a rail yard in the New London area so that trains would not have to return to New Haven each night, saving a substantial amount of fuel. SLE also plans to replace some diesel trains with electric trains over the next few years, increasing their efficiency.

## TOWN GOVERNMENT VEHICLE FLEET

The amount of fuel used in Town vehicles and equipment was determined using data from records kept by the Department of Finance on diesel and gasoline deliveries to Town tanks by East River Energy, and is summarized below.

<i><b>FY06-07 Town of Branford Diesel and Gasoline Deliveries</b></i>			
<b>Fuel Tank</b>	<b>Gallons Rec'd</b>	<b>Amount Paid</b>	<b>Av. \$ /gal</b>
Public Works Diesel	35727.3	\$83,142.28	
Public Works Gasoline	34713.3	\$86,488.43	
Police Gasoline	37668.7	\$91,142.23	
Transfer Station Equipment Diesel	4824.4	\$11,213.06	
TOTAL GASOLINE:	72382.0	\$177,630.66	\$2.45
TOTAL DIESEL:	40551.7	\$94,355.34	\$2.33

School bus service for Branford is contracted to First Student, Inc. Melinda Torelli, contract manager for First Student, provided data on school bus transportation for Branford students during the month of May 2008:

27 diesel buses ran for 21 days in May. Total mileage for the 27 diesel buses for the month was 32,544 miles.

8 diesel vans ran for 21 days in May. Total mileage for the 8 diesel vans for the month was 10,792 miles.

10 gasoline vans ran for 21 days in May. Total mileage for 10 gasoline vans was 14,870 miles.

For the month of May these vehicles went through approximately 6,000 gallons of diesel and 3,000 gallons of gasoline. Monthly mileage was assumed to stay consistent for the 10 months the buses ran.

## **SOLID WASTE AND RECYCLING**

The Branford Transfer Station received 12,865 tons of primarily residential trash in FY06-07, and sent all of it to a Resource Recovery Facility (RRF) in Bristol, CT, where trash is incinerated to produce electricity. Although exact data specific to commercial trash could not be compiled due to the high number of small-business haulers providing service to Branford businesses and their lack of exact record keeping, it was assumed that privately collected commercial trash also ended up combusted at one of CT's six RRFs.<sup>16</sup> As such, emissions from trash incineration are included as part of the emissions results for residential, commercial, and industrial electricity consumption. Information regarding emissions specific to trash incineration are discussed in isolation though in Appendix B, on page 49.

Trash managed by the Transfer Station in FY06-07 was approximately:

7,686 tons (59.7%) - curbside Town pickup from Residential 1-4 family houses, Town Parks & Beaches, Municipal Buildings, Thimble Islands, and 56 condo units.

2,789 tons (21.7%) - private pickup by 7 different haulers from Branford's remaining 3,670 condo units.

1801 tons (14.0%) - Residential drop-off

546 tons (4.2%) - Commercial and Town Department drop-off

The subset of Town Government trash could not be isolated. As shown above, some Town trash is dropped off to the Transfer Station directly by various Town departments. However, National Carting picks up a large portion of Town trash along with the Residential trash, thus mixing the two sources together. Calculating the exact amount of trash generated by Town facilities in the future would require some front-end data collection done by the Town employees taking the trash to the curb. Due to these factors, emissions from the fuel used to collect and transport only Town government trash could not be included in the Government Inventory. It should be noted

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<sup>16</sup> 2007 RRF Directory, [http://www.wte.org/docs/IWSA\\_2007\\_Directory.pdf](http://www.wte.org/docs/IWSA_2007_Directory.pdf)

here that waste collection emissions for all Branford trash are included in the Community Inventory as part of those from fuel used on Branford roads, which were calculated earlier in the Community Road Transportation section.

Garbage collection trucks have a very low national average fuel economy: 2.8 mpg.<sup>17</sup> Emissions from waste collection are assumed to be quite significant, but they may remain difficult to isolate from other road emissions until private hauling companies start tracking and reporting fuel and collection route data. Such tracking, in addition to using GIS and computer modeling to optimize collection routes, is currently out of reach financially for many haulers, or was not included as a requirement of collection contracts. However, rising fuel costs may start to make some of these practices necessary.

In order to calculate the fuel used to transport community trash to out-of-town RRFs, it was necessary to calculate estimates for commercial trash generation. The U.S. EPA estimates residential waste (including waste from multi-family dwellings) to be 55 to 65 percent of total U.S. MSW generation. Commercial waste (including waste from schools, some industrial sites where packaging is generated, and businesses) constitutes between 35 and 45 percent of total U.S. MSW. Regional climate and local factors, such as level of commercial activity, contribute to the variation.<sup>18</sup> The CT DEP's Solid Waste Management Plan assumes that 50 percent of the State's MSW was generated by residents and 50 percent is generated by commercial establishments.<sup>19</sup> The small difference between these U.S. and CT estimates make sense, considering that the U.S. has roughly 0.077 firms per capita and CT has approximately 0.086 firms per capita.<sup>20</sup> Branford, in comparison, has about 0.064 firms per capita.<sup>21</sup> Therefore, Commercial trash in Branford was estimated under the assumption that it constitutes 45% of total town-wide trash:

town-wide = commercial + residential

town-wide\*0.55 = residential

residential = total tons of Transfer Station trash - 546 Transfer Station commercial tons

residential = 12,865 tons - 546 tons = 12,319 tons

town-wide = 12,319 tons / 0.55 = 22,398 tons

commercial = 22,398 tons \* 0.45 = 10,079 tons

22,398 town-wide tons = 10,079 commercial tons + 12,319 residential tons

The residential trash number used above does include some Town Government trash, but excludes privately hauled apartment buildings, senior living such as the Hearth at Gardenside, and Branford's ~300 mobile homes. So, residential and commercial percentages of town-wide trash are slightly off from the actual.

Transfer Station outgoing records provided by Margaret Hall revealed that DW Transport and Leasing, Inc. took 631 loads from the Branford Transfer Station to the Bristol RRF in FY06-07.

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<sup>17</sup> INFORM, [http://www.informinc.org/pr\\_ggt.php](http://www.informinc.org/pr_ggt.php)

<sup>18</sup> Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 2006 (PDF), pg.2, <http://www.epa.gov/garbage/msw99.htm>

<sup>19</sup> CTSWMP, Appendix I, pg. I-27, [http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav\\_GID=1646](http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav_GID=1646)

<sup>20</sup> U.S. Census QuickFacts, <http://quickfacts.census.gov/qfd/states/09000.html>

<sup>21</sup> Town of Branford, Economic Development, <http://www.branford-ct.gov/Economic%20Dev.%20Docs/Town%20profile%202005.pdf>

Bristol, CT, is 44 miles from Branford. It is therefore assumed that each load is responsible for one 88-mile roundtrip. The national average fuel economy for Heavy Trucks (5.6 mpg) was provided in the CACP software. Total gallons of fuel used to transport residential trash to Bristol calculated below:

$$(631 \text{ loads} \quad \times \quad 88 \text{ mi/load}) \quad / \quad 5.6 \text{ mpg} \quad = \quad 9,916 \text{ gallons diesel}$$

Transportation of incinerator ash to a landfill was considered minimal and not estimated. Two landfills in CT are permitted to receive incinerator bottom ash. One is scheduled to close in October 2008, but the other, located in Putnam, should be able to accommodate CT RRF ash through the year 2018, provided no new RRFs are built in the state.<sup>22</sup>

The average distance from Branford to a CT RRF was used to estimate the fuel used in transportation of commercial trash to an RRF. The average distance from Branford to an RRF town (Bristol, Hartford, Lisbon, Preston, Wallingford, Bridgeport) is 41 miles.<sup>23</sup> DW Transport's average 20 tons per load for Branford Transfer Station trash was used to estimate number of loads required for commercial trash. Total gallons of fuel used to transport commercial trash to an RRF calculated below:

$$(494 \text{ loads} \quad \times \quad 82 \text{ mi/load}) \quad / \quad 5.6 \text{ mpg} \quad = \quad 7,234 \text{ gallons diesel}$$

For the 3,805,000 tons of MSW generated in CT during FY04-05, 57.6% was disposed at CT RRFs, 29.8% was diverted (reduction-composting-recycling), 4% was disposed at CT landfills, and 8.6% was disposed at out-of-state landfills.<sup>24</sup> The 6 existing RRFs in CT have a fixed capacity (the highest state in the nation) and will likely operate for the next 20 years.<sup>25</sup> The CT Solid Waste Management Plan does not note any plans for new RRFs, and therefore expects the percent disposed at out-of-state landfills to increase significantly unless source reduction and recycling increases dramatically.<sup>26</sup> Sending waste out of state, likely to landfills, will cost more and cause increased CO<sub>2</sub>e emissions from landfilling and greater transportation distances.

The "Branford Landfill" covers an area of approximately 28.5 acres and is commonly considered to have two separate sections. The first, a ~10.2 acre solid waste disposal site that includes an older landfill located on the ZuWalick property, known as the "Marshall Road" western portion, was capped and seeded in 1976. The second, an ~18.4 acre bulky and special waste disposal site known as the "Tabor Drive" eastern portion, has also mostly closed except for a small area that will accept contaminated soil and "bulky waste" such as unburnable, inseparable, construction, demolition, and land-clearing debris.

Bulky waste for the Branford Landfill is often unburnable material such as: wallboard, treated or inseparable wood, shingles, insulation, plate glass, countertops, broken dishes, or fiberglass. Land-clearing debris is minimal, since leaves and clean brush are generally

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<sup>22</sup> CTSWMP, Executive Summary, RRF Ash Residue, pg. ES-3,  
[http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav\\_GID=1646#SWMP](http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav_GID=1646#SWMP)

<sup>23</sup> 2007 RRF Directory, [http://www.wte.org/docs/IWSA\\_2007\\_Directory.pdf](http://www.wte.org/docs/IWSA_2007_Directory.pdf)

<sup>24</sup> CTSWMP, Appendix B, Section B.1.1,  
[http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav\\_GID=1646#SWMP](http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav_GID=1646#SWMP)

<sup>25</sup> CTSWMP, Chapter 2, pg. 2-8,  
[http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav\\_GID=1646#SWMP](http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav_GID=1646#SWMP)

<sup>26</sup> CTSWMP, Executive Summary, Capacity Shortfall, pg. ES-6,  
[http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav\\_GID=1646#SWMP](http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav_GID=1646#SWMP)

composted or chipped. Rarely, it is inseparable from other bulky waste, and will get landfilled, along with an admonition to the deliverer to please not mix in the future. Due to the presence of some inseparable biodegradable material, there is potential for methane emissions from bulky landfills, although emissions are much less significant than those from landfilling MSW. The landfill has a 1-ton limit per project, essentially limiting accepted bulky waste to that which is brought to the Transfer Station in cars or trucks. Since the majority of construction projects deal with much larger quantities, most bulky waste bypasses the Transfer Station and is sent to out-of-state landfills. Furthermore, the Branford Landfill is expected to stop accepting bulky waste by 2010. The Branford Landfill accepted 939 tons of bulky waste to in FY06-07.

In 2004, CT generated a total 1,100,000 tons of Bulky Waste before 7% (77,000 tons) was diverted and recycled. Most of the bulky landfills in CT are small, municipally owned landfills serving only their communities, and are expected to close soon. As such, the vast majority of bulky waste is sent to out-of-state landfills. Only 11% of non-diverted bulky was sent to CT landfills.<sup>27</sup> Branford contains 0.84% of the CT population.<sup>28</sup> Adjusting the total tons of Bulky generated according to population estimates that Branford generated 9,240 Bulky tons. Assuming the same 7% diversion rate, approximately 8,593 bulky tons remained after diversion. The 939 bulky tons sent to the Branford landfill is in fact 11% of 8,593, consistent with the state estimates above. Emissions from landfilling Branford bulky waste were calculated using ICLEI's "methane commitment method", which considers emissions that will eventually occur as a result of solid waste produced and landfilled in a given year.

When taken by road, bulky waste would likely be transported out-of-state in 110 cubic yard trailers. However, much of the bulky waste sent to out-of-state landfills (possibly 500+ miles away) is likely sent by railroad. Due to lack of data on the percent of bulky waste leaving CT by rail, emissions from out-of-state transportation of bulky waste could not be calculated or included. However, noticing the large distances traveled, emissions from export of bulky waste are likely substantial, and future attempts at calculation should be made as more data is uncovered.

Branford bulky waste was assumed to be 18.6% wood (EPA estimated 20% minus CT's 7% bulky diversion rate).<sup>29</sup> Data relating to the amount of cardboard, paper, and plant debris inseparable from bulky waste could not be found and the % for each was thus left at 0%, although small amounts of these biodegradable materials are certainly present.

Small amounts of methane are emitted from the closed areas of the Branford Landfill, especially from the sections that used to accept MSW. Engineering firm Fuss & O'Neill have methane monitoring locations throughout the Branford Landfill area, and test for methane potential at each location once every couple months. The tests measure whether the methane emission potential on testing days is below the acceptable threshold, but the technology does not allow for actual data on the total quantity of methane released over a given time period. Methane emissions from the "Waste-in-Place" in closed landfills can be estimated using the total tonnage and characterization of waste in the landfill. However, the landfill is old and most of the waste in place predates accurate record keeping. As such, methane emissions from the Branford Landfill were excluded from this report.

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<sup>27</sup> CTSWMP, Bulky Waste Management and Diversion, Section 2.2.5, pp. 2-10 through 2-13, [http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav\\_GID=1646](http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav_GID=1646)

<sup>28</sup> Connecticut Economic Resource Center, <http://www.cerc.com/eddi.html>

<sup>29</sup> U.S. EPA, Construction & Demolition Materials, <http://www.epa.gov/epaoswer/non-hw/debris-new/basic.htm>

## EXISTING REDUCTION EFFORTS

This report provides a baseline of data for the purpose of setting reduction targets and completing emissions reduction projects. Many efforts have already begun in Branford, and some of these are described below. These efforts should be commended, supported and improved upon where possible.

### BOE Conservation and Efficiency Program

Mark Deming, Facilities Director for the Board of Education (BOE), has been tracking energy use in BOE buildings for a number of years. He has recently been utilizing online software from “SchoolDude.com” to generate quick and informative reports on building electricity, natural gas, fuel oil, and water use. Mark provided more recent energy use for BOE buildings for FY07-08 as well, which had closed shortly before the completion of this report. The following table shows the change in CO2e emissions from BOE facilities in FY06-07 to FY07-08. Significant emission reductions were achieved for each BOE building. BOE buildings achieved an outstanding 22% total CO2e emissions reduction, equal to 825 fewer metric tons.

Equivalent CO2 emissions from Branford Board of Education Buildings				
	FY2006-2007	FY2007-2008	Emissions Reduction	
Building	MTCO2e	MTCO2e	MTCO2e	%
High School	1579	1200	379	24
Walsh Intermediate	969	796	173	18
Sliney Elementary	338	268	70	21
Tisko Elementary	297	205	92	31
Murphy Elementary	273	202	71	26
Indian Neck School	125	118	7	6
Bfd. Hills School	57	31	26	46
Central Office	31	24	7	23
<b>Total BOE Buildings:</b>	<b>3669</b>	<b>2844</b>	<b>825</b>	<b>22</b>

BOE conservation and efficiency efforts have been ongoing. Recent measures in the past few years include: lighting retrofits; working with Trane Inc. to identify strategies for energy efficiency improvements with the heating and cooling systems; renovation of HVAC equipment at Walsh Intermediate School resulting in an Energy Star rating, hot water boiler replacement, installation of new Bon Aqua Water Treatment systems at the High School and Sliney Elementary; installation of new Building Management Systems at Tisko and Murphy Elementary; analysis of available options for photovoltaic installations on school roofs; and utilization of funding from CL&P and CT Clean Energy Fund for clean energy systems.

Data for above CO2e calculations was taken from Mark Deming’s report on FY06-07 use (“2006”) and FY07-08 use (“2007”), found on the following page.

**Utility Use and Cost for Branford Board of Education Buildings:**

<b>Building</b>	<b>Utility Type</b>	<b>2006</b>		<b>2007</b>	
BOE Central Office	Electric (KWH)	41,913 KWH	\$7,671.37	30,480 KWH	\$5,085.01
	Natural Gas (CCF)	3,000 CCF	\$5,163.04	2,474 CCF	\$4,086.10
	Water (CCF)	51 CCF	\$343.31	38 CCF	\$277.24
	<b>BOE Central Office Subtotal</b>		<b>\$13,177.72</b>		<b>\$9,448.35</b>
Branford High School	Electric (KWH)	2,659,971 KWH	\$378,191.41	2,318,280 KWH	\$348,802.50
	Natural Gas (CCF)	14,580 CCF	\$21,208.11	73,051 CCF	\$93,507.42
	Fuel Oil (Gal.)	56,013 Gal.	\$107,215.28	0 Gal.	\$0.00
	Water (CCF)	6,615 CCF	\$17,989.45	5,779 CCF	\$16,492.73
	<b>Branford High School Subtotal</b>		<b>\$524,604.25</b>		<b>\$458,802.65</b>
Branford Hills School	Electric (KWH)	23,900 KWH	\$4,407.87	24,309 KWH	\$4,776.05
	Fuel Oil (Gal.)	4,615 Gal.	\$8,834.36	2,163 Gal.	\$5,849.46
	Water (CCF)	100 CCF	\$803.46	70 CCF	\$633.10
	<b>Branford Hills School Subtotal</b>		<b>\$14,045.69</b>		<b>\$11,258.61</b>
Indian Neck School	Electric (KWH)	55,560 KWH	\$10,087.86	46,790 KWH	\$7,852.55
	Natural Gas (CCF)	881 CCF	\$1,671.81	877 CCF	\$1,568.92
	Fuel Oil (Gal.)	9,577 Gal.	\$18,331.97	9,267 Gal.	\$27,145.65
	Water (CCF)	356 CCF	\$1,257.82	450 CCF	\$1,671.68
	<b>Indian Neck School Subtotal</b>		<b>\$31,349.46</b>		<b>\$38,238.80</b>
John B. Slincy Elementary	Electric (KWH)	240,440 KWH	\$38,131.17	203,920 KWH	\$34,296.97
	Fuel Oil (Gal.)	24,365 Gal.	\$46,637.77	19,015 Gal.	\$56,905.25
	Water (CCF)	915 CCF	\$2,498.01	677 CCF	\$2,195.01
	<b>John B. Slincy Elementary Subtotal</b>		<b>\$87,266.95</b>		<b>\$93,397.23</b>
Mary R. Tisko Elementary	Electric (KWH)	353,600 KWH	\$56,736.71	336,000 KWH	\$54,381.43
	Natural Gas (CCF)	2,142 CCF	\$3,656.96	15,983 CCF	\$24,341.50
	Fuel Oil (Gal.)	15,641 Gal.	\$29,939.19	0 Gal.	\$0.00
	Water (CCF)	1,086 CCF	\$3,204.21	916 CCF	\$2,978.03
	<b>Mary R. Tisko Elementary Subtotal</b>		<b>\$93,537.07</b>		<b>\$81,700.96</b>
Mary T. Murphy Elementary	Electric (KWH)	344,480 KWH	\$49,538.02	325,600 KWH	\$49,148.78
	Natural Gas (CCF)	3,932 CCF	\$6,460.57	16,176 CCF	\$24,939.88
	Fuel Oil (Gal.)	12,685 Gal.	\$24,280.64	0 Gal.	\$0.00
	Water (CCF)	699 CCF	\$3,009.52	803 CCF	\$2,743.97
	Water (750 Gal)	0 750 Gal	\$0.00	0 750 Gal	\$198.42
	<b>Mary T. Murphy Elementary Subtotal</b>		<b>\$83,288.75</b>		<b>\$77,031.05</b>
Walsh Intermediate School	Electric (KWH)	1,384,320 KWH	\$222,942.63	1,351,448 KWH	\$215,737.48
	Natural Gas (CCF)	765 CCF	\$1,825.31	51,267 CCF	\$78,524.56
	Fuel Oil (Gal.)	46,860 Gal.	\$89,714.06	4,489 Gal.	\$10,860.04
	Water (CCF)	2,359 CCF	\$6,349.45	3,044 CCF	\$8,209.80
	<b>Walsh Intermediate School Subtotal</b>		<b>\$320,831.45</b>		<b>\$313,331.88</b>
<b>Group Subtotal</b>			<b>\$1,168,101.34</b>		<b>\$1,083,209.53</b>
<b>Total Electric (KWH) All Buildings</b>		<b>5,104,184</b>	<b>\$767,707.04</b>	<b>4,636,827</b>	<b>\$720,080.77</b>
<b>Total Natural Gas (CCF) All Buildings</b>		<b>25,300</b>	<b>\$39,985.80</b>	<b>159,828</b>	<b>\$226,968.38</b>
<b>Total Water (CCF) All Buildings</b>		<b>12,181</b>	<b>\$35,455.23</b>	<b>11,777</b>	<b>\$35,201.56</b>
<b>Total Fuel Oil (Gal.) All Buildings</b>		<b>169,758</b>	<b>\$324,953.27</b>	<b>34,933</b>	<b>\$100,760.40</b>
<b>Total Water (750 Gal) All Buildings</b>		<b>0</b>	<b>\$0.00</b>	<b>0</b>	<b>\$198.42</b>
<b>Total Cost All Buildings</b>			<b>\$1,168,101.34</b>		<b>\$1,083,209.53</b>

Recently, the BOE installed a Tri-Generation energy solution at the High School, which involves the installation of micro-turbines and an absorption chiller for generating electricity from natural gas and utilizing heat from the process for space heating in winter months, and chilling water for cooling in summer months. This is also known as Combined Cooling Heating and Power (CCHP). By recovering heat and using it for heating/cooling, system efficiencies can reach 90% compared to only 33% for typical national electricity generation, where resulting heat is often wasted. Since the project was only just commissioned in Spring 2008, additional significant emissions savings are expected for the upcoming year, as more substantial portions of the High School's yearly electricity usage are met by cleaner burning, more efficient on-site generation. UTC Power estimates the system will reduce yearly emissions by 47 MTCO<sub>2e</sub>. An added benefit of on-site generation is that the High School now provides a stand-alone power system for use by the Town in the event of emergencies or electrical power outages. The project was funded by CL&P, the CT Clean Energy Fund, and the money saved due to increased efficiency.

#### Growth in Public Transportation

According to data provided by Jon Foster at ConnDOT Rail Operations, the Shore Line East (SLE) commuter rail has seen growth in ridership over the past several years. Comparing June 2007 with June 2008 shows that the number of passengers handled by SLE rose by 7,340 people/month. In June 2008, SLE passenger miles totaled 964,221, up 23% from SLE passenger miles in June 2007, which totaled 785,553. Branford riders took 9,742 one-way rides to or from New Haven in June 2008, up 9% from the 8,976 one-way rides in June 2007.

#### Waste Reduction Challenge

Reducing trash by 60 lbs / resident over the next 12 months would cause Branford's recycling rate to increase from the current 30%, to 49%. The CT Solid Waste Management Plan projects this is needed statewide by 2024, in order for CT not to export any more trash out of state than we already do, but fears that residents will not meet this challenge. To handle all CT trash in state, an increase to 61% by 2024 is needed. Every CT resident currently disposes of .76 tons per year. Reaching 49% would mean reducing this to .73 tons (60 pounds) per year. Composting food scraps, and heavy items such as pumpkins, will add up quickly. Recycling or donating heavy products, clothing, or furniture will turn this challenge into a rather easy accomplishment. Less exported trash will mean less pollution and greenhouse gas emissions from burning, landfilling, and fossil fuel for transportation. Fewer big trucks on the highway will cause less noise pollution and traffic, and will cause smaller increases in resident taxes. Branford should brainstorm and implement new creative ways to get more residents and businesses participating in this excellent program.

More information can be found online here:

<http://www.branford-ct.gov/SolidWaste%20PDF/Waste%20Reduction%20Challenge.pdf>

[http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav\\_GID=1646](http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav_GID=1646)

#### Trash Collection Efficiency

On June 12, 2008, the Board of Selectmen eliminated the second weekly trash collection in the summer, saving taxpayer money and reducing the Town's carbon footprint. The simplified schedule is easier to remember since collection times are now the same all year. In addition to creating more quiet mornings for residents, the decision lessened the amount of diesel fuel needed for the 2.8 mpg garbage collection trucks.

### Beyond Home Composting

Branford has partnered with Solarcone to offer a discount on the Green Cone Solar Digester System. The backyard container, which accepts food scraps, plate scrapings, spoiled dairy products or pasta, cooked and uncooked meat, poultry or fish (bones and all), and even small amounts of pet waste, has been marked down from \$160 to only \$50 until August 2008. Residents and businesses are encouraged to compost food scraps at home whenever possible. Contact the Solid Waste & Recycling Department or read more online here: <http://solarcone.net/branford/>

### Recycling Program

The Branford Transfer Station received 1,715 tons of brush for chipping into mulch, and over 422 tons of leaves for composting in FY06-07. Composting lets organic waste decompose in the presence of oxygen, and therefore avoids the larger quantities of methane generated if placed in anaerobic landfills. The process of composting also sequesters carbon in the soil.<sup>30</sup> Also, applying compost to soils as fertilizer increases the content of microorganisms in soil causing improved workability, better water retention, less need for chemical fertilizers, and even further capacity for the soil to absorb carbon from the air.

The extent of recycling at commercial establishments is unknown. Recyclable materials managed by the Branford Transfer Station in FY06-07 were mostly residential, and consisted of: 1,416 tons of Newspaper and Magazines, 791 tons of Bottles & Cans, 474 tons of Scrap Metal, 274 tons of Corrugated Cardboard, 30 tons of Office Paper, and 71 tons of Electronics. The CACP software estimates the energy saved by re-processing these amounts resulted in emissions savings of 5,183 MTCO<sub>2e</sub> for the newspapers, 2,547 MTCO<sub>2e</sub> for the bottles and cans, 722 MTCO<sub>2e</sub> for the cardboard, and 73 MTCO<sub>2e</sub> for the office paper. If there are no local industrial and consumer markets for a recyclable material, it will either end up traveling longer distances to be recycled, or become more costly, unused trash. The CACP software assumes each recycled material actually is re-processed. Therefore, the monitoring that the Solid Waste Department does of recycling markets is critical.

The software also does not take into consideration emissions from collecting and transporting recyclables to re-processing facilities. In some situations, the transportation burden of recycling a material is similar to that of transporting it as trash. However, certain recyclables such as clear plastic bottles, cause dramatic increases in the volume transported by recycling haulers, meaning more trips are needed to collect and transport them. The plastic bottles cannot be crushed and compacted until separated from breakable glass. When considering an entire life cycle of a plastic bottle in Branford, where trash is burned for electricity, recycling the plastic bottle could actually result in greater net energy use than incinerating it. Since various fuels contribute differently to greenhouse gas emissions, the difference in greenhouse gas emissions between the two scenarios is more complicated, and would need further study. Changing the situation to one where less net energy is used when recycling plastic bottles might require a closer sorting facility and an alternate strategy for reducing collection volume. Instead of mixing plastic bottles in with other recyclables in the blue bin - collected by low-fuel economy trucks - perhaps bottles could be saved by residents, partially compacted at home, and driven to

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<sup>30</sup> Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks, Chapter 4, Section 4.2, pg. 50, <http://epa.gov/climatechange/wyacd/waste/SWMGHGreport.html>

convenient drop off points in Town during an already planned trip. However, such a scheme would require more effort from residents than that needed to simply reduce disposable bottle purchases and consistently drink from a re-useable bottle.

For more information: <http://www.branford-ct.gov/Solid%20Waste.htm>

#### *Electronics Recycling Legislation*

Effective January 1, 2009, Public Act 07-189 passed by the Connecticut General Assembly mandates the recycling of TVs and computer CPUs and monitors, with the manufacturers paying the costs of collection, transportation, and recycling. Although electronics recycling is largely about ensuring hazardous and toxic materials are dealt with appropriately, building a system that similarly increases manufacturer responsibility for all types of products would be beneficial from a greenhouse gas emissions reduction perspective.

More information can be found online here:

<http://www.cga.ct.gov/2007/ACT/PA/2007PA-00189-R00HB-07249-PA.htm>

#### *LEED Training for the Building Department*

The Branford Building Department, responsible for the enforcement of the Connecticut State Building Code and relevant town ordinances, will be attending training seminars in the Leadership in Energy and Environmental Design (LEED) and Green Globes rating systems for green building design, operation, and management. This will allow Branford Building Department inspectors to understand the rating criteria and ensure ratings are applied correctly.

#### *Bioheat for Town Buildings*

The Town and supplier East River Energy decided that for FY07-08 all Town buildings heated with oil would switch to using “Bioheat”, a cleaner burning oil blend containing 5% biodiesel. East River Energy is also using the B5 Bioheat for all of their residential customers.

#### *Sewage Pump Station Upgrades*

The Water Pollution Control Authority (WPCA) has monitored electrical usage at pumping stations and installed variable speed drives at several of the larger stations, improving their efficiency. The WPCA is looking for ways to further increase efficiency and calculate the feasibility of on-site electricity generation.

#### *Hybrid Vehicles*

The Town currently owns 3 Ford Escape Hybrid vehicles, and is planning the purchase of several more.

#### *Street Light Wattage Reduction*

Many streetlights in Town can be reduced in wattage, saving significant amounts of money and electricity. Bob Crelin has been spearheading the effort to map and analyze existing streetlights in Branford. Working with other experts in the field of artificial lighting, Town Engineers, and members of the Conservation and Environment Commission, Bob has determined that wattage can be reduced by at least 22% while maintaining or improving the lighting efficiency. Since electricity consumption for street lighting has remained stable the past several years at approximately 942 MWh / year, it is possible to calculate that a 22% reduction in the electricity for street lighting would reduce Town emissions by 71 MTCO<sub>2e</sub> per year.

### CT Clean Energy Options Program

Through a Department of Public Utilities Control (DPUC) approved program called “CTCleanEnergyOptions”, any CL&P or UI customer can support clean energy made from approved renewable resources such as wind, small hydro and landfill gas. Enrolling customers continue to receive electric delivery service from their utility and pay a small surcharge that goes toward the purchase of Renewable Energy Certificates (RECs). The purchase of RECs creates another revenue stream for renewable electricity generators, and in many cases makes building additional renewable capacity financially viable. Although the current fuel source used to generate the electricity provided to the customer does not change upon enrollment, CTCleanEnergyOptions customers encourage a growing market that enables new clean, renewable generation facilities to be built and connected to the regional power grid. A resolution of the Branford RTM committed the Town of Branford to the goal of making at least 20% of municipal energy purchases from clean energy resources by the year 2010. This allows Branford to be considered a “Connecticut Clean Energy Community” by the CT Clean Energy Fund (CCEF), causing the town’s 352 signups thus far to qualify Branford for a free 7 kW solar PV electric system for a public building. It can be determined by using the Clean Power Estimator (<http://www.clean-power.com/ccef>) that a 7kW solar PV system will generate approximately 9,442 kWh of electricity per year, assuming favorable building and site conditions. This would currently save the Town of Branford approximately \$1,900 per year and reduce emissions by 3 MTCO<sub>2e</sub>. Branford’s Clean Energy Task Force has been overseeing the progress of the program in Branford, and is looking to distribute grant money received from the CCEF to residents interested in executing grassroots efforts to increase awareness of the benefits and availability of clean energy.

For more information, visit:

<http://ctcleanenergyoptions.com/>

<http://www.ctcleanenergy.com/communities>

<http://www.branfordcleanenergy.com>

### Shifting Town Building Use

The Town has discussed changing the location of several Town Departments and shift the use of certain Town buildings to activities more suited to the buildings. Often times, additional heating and cooling, or new construction can be avoided by simply reassessing what each Town building is best suited for. Although specific changes have not yet been studied with respect to greenhouse gas emissions, the approach promotes conservation and could potentially cause significant Town emissions reductions even after buildings have undergone structural or mechanical improvements. It is critical that homeowners perform the same type of analysis on how each room serves daily living patterns. Sometimes, additional square footage for a home can also be avoided by adjusting the layout or use of existing space.

## **AVAILABLE PROGRAMS**

### Database of State Incentives for Renewables & Efficiency

Many CT energy programs and funding opportunities are concisely listed by state at the DSIRE website: <http://www.dsireusa.org/>

### *Energy Efficiency and Conservation Block Grant*

The Energy Efficiency and Conservation Block Grant delivery system, established by Congress and signed into law last year by President Bush as part of the Energy Independence and Security Act of 2007, establishes a method for providing large financial assistance to cities looking to establish conservation strategies and implement significant energy efficiency projects. The U.S. Conference of Mayors estimated needing \$4 billion annually from the federal government, but recent Senate action allocated only \$295 million to the effort. The U.S. Conference of Mayors seeks support from cities to get funding increased. Branford should monitor this program and should research the application process. In addition to block grant legislative updates, the U.S. Mayors Climate Protection Center has a report on “Best Practices” for CO<sub>2</sub>e reduction, which lists specific actions taken by specific member cities.

More information can be found online:

<http://usmayors.org/climateprotection/>

<http://usmayors.org/pressreleases/uploads/Climatesenateactionfinal7908.pdf>

### *Connecticut Clean Energy Fund (CCEF)*

The CCEF has a number of incentives and programs that help homeowners, businesses, and communities support clean energy, invest in renewable technology, and spread the word about wise energy use and climate change. Significant rebates exist for installation of solar PV systems on homes or businesses. The “Solar Leasing Program” provides the low-income homeowner the opportunity for solar energy systems without any down payment. The “Project 150” initiative gives assistance to developers, manufacturers, and financiers looking to advance Connecticut Class I renewable energy generation projects. The CCEF also has suggestions for increasing home efficiency and helps municipalities turn schools into “high performance buildings”. Funding is provided to developers looking to include solar PV in affordable housing, and to inventors, scientists, and companies seeking to build or display new clean energy technologies not yet in the marketplace. Learn more online: <http://www.ctcleanenergy.com/>

### *Environmental Outreach Small Grant Program*

Northeast Utilities offers an Environmental Community Grant Program that provides funding to organizations served by Connecticut Light and Power for local community and grassroots environmental projects. Grants between \$250 and \$1,000 are awarded to projects that are often overlooked by larger grant programs. Eligible projects protect or preserve the environment, or teach others the value of doing so. Examples include:

- Providing education on environmental issues of local interest to adults or children.
- Improving the environment through organized cleanup projects (such as cleaning up a park, stream or a vacant lot) or by reclaiming and rehabilitating damaged environments.
- Improving local wildlife habitat, or starting and maintaining a recycling program, etc.

For more information or to apply for a grant, contact David Weinberg of Northeast Utilities Environmental Services at (860) 665-3951 or go online:

<http://www.nu.com/environmental/grant.asp>

### *Furnace and Boiler Replacement Rebate Program*

A statewide incentive program that offers “rebates of up to \$500 to households that purchase and install replacement natural gas, propane or oil furnaces and boilers between July 1, 2007 and July 1, 2017. Rebates will be available for replacement natural gas furnaces or boilers that meet or exceed Federal Energy Star standards and propane and oil furnaces and boilers that are at least 84% efficient.” More information available by calling 1-866-940-4676 or visiting the Office of Policy and Management online:

[http://www.ct.gov/opm/cwp/view.asp?a=2994&q=420476&opmNav\\_GID=1808](http://www.ct.gov/opm/cwp/view.asp?a=2994&q=420476&opmNav_GID=1808)

### *Conservation and Energy Efficiency*

Gas and electric distribution utilities, as well as most oil delivery companies, offer programs that promote energy efficiency. Oil prices are rising for delivery companies as well, so they are eager to keep oil financially viable for their customers by assisting with equipment upgrades and insulation suggestions. Individual oil companies should be contacted directly. Both Southern Connecticut Gas and Connecticut Light & Power are serious about managing usage, lessening peak demand, and lessening the environmental impact of customers’ buildings. Conserving energy and shifting usage patterns can help distribution companies avoid unnecessary and costly investments in new infrastructure. Funding is available for home energy audits, installation of new equipment, and building weatherization. Recently, distribution companies have offered discounts or credit for simple conservation of energy. State law requires electric suppliers and distribution companies to obtain a portion of their supply from Class III resources such as electricity savings from conservation and load management programs, customer-sited Combined Heat and Power systems, and systems that recover waste heat or pressure from commercial and industrial processes. It is important for Branford residents to realize that energy providers are also interested in conservation and efficiency.

For more information, visit:

<http://www.ctsavesenergy.org/>

<http://www.cl-p.com/clmres/indexclmres.asp>

<http://www.cl-p.com/clmbus/indexclmbus.asp>

<http://www.soconngas.com/YourHome/EnergyConservation/default.html>

<http://www.soconngas.com/YourBusiness/EnergyConservation/default.html>

[http://www.energystar.gov/index.cfm?c=products.pr\\_tax\\_credits](http://www.energystar.gov/index.cfm?c=products.pr_tax_credits)

<http://hes.lbl.gov/>

Similar to how Renewable Energy Certificates can fund Class I renewable generation projects, Energy Efficiency Certificates (EECs) can fund conservation projects. EECs, also known as white tags, are awarded to projects that conserve measurable amounts of energy. Large businesses or municipalities looking for funding for conservation projects can partner with EEC brokers and contract to sell them the future EECs from the project. EEC brokers then sell EECs in the voluntary market to businesses looking to subsidize conservation, or to suppliers trying to meet their mandated Class III requirements.

More information: <http://www.sterlingplanet.com/>

### EPA Community Energy Challenge

The U.S. Environmental Protection Agency's "Community Energy Challenge" is an "opportunity for municipalities across New England to identify simple and cost-effective measures that increase energy efficiency and renewable energy use while reducing air pollution and saving money." Basically, this is a free program where municipalities pledge to assess energy use in schools, municipal buildings, and wastewater facilities, set reduction targets (at least 10% lower than a baseline) in energy use per square foot, and use the ENERGY STAR Portfolio Manager online software tool to track consumption and greenhouse gas emissions. This program is very similar to the ICLEI program Branford is already participating in with this report. Still, Branford can utilize the overlapping resource material on the EPA website such as the "Building Upgrade Manual":

[http://www.energystar.gov/index.cfm?c=business.bus\\_upgrade\\_manual](http://www.energystar.gov/index.cfm?c=business.bus_upgrade_manual)

Branford can continue to use ICLEI's CACP software for energy tracking, but should also investigate the differences between CACP and other utility tracking tools, such as the Portfolio Manager or other commercial packages, which may cater more to month by month tracking or have additional reporting features.

For more information, visit:

<http://www.epa.gov/region1/eco/energy/energy-challenge.html>

[http://www.energystar.gov/index.cfm?c=evaluate\\_performance.bus\\_portfoliomanager](http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager)

### Pay-As-You-Throw (PAYT) Trash Programs

Residents that dispose of large quantities of trash might not initially support a program where those who dispose less, pay less, and those who dispose more, pay more. However, PAYT is really an effective and fair way to keep taxes and the costs of waste management down. By having to pay based on the quantity of trash generated, residents would seriously consider ways to reduce trash generation. Such a program would need substantial public notice, political support, and most importantly, a costly addition of more staff to both the solid waste and billing departments to handle the logistics of altering the current system. Branford would also need to put in place methods for preventing illegal dumping and be prepared to handle residents becoming even more demanding that the town recycle things that might not make economic or environmental sense. Residents should be given the chance to prove they will meet Branford's Waste Reduction Challenge, but should know that PAYT programs are gaining in popularity.

The CT DEP has a webpage listing successful Connecticut PAYT programs and PAYT resources, and may help to address some of the obvious issues Branford would have with such a system:

[http://www.ct.gov/dep/cwp/view.asp?a=2714&q=324920&depNav\\_GID=1646](http://www.ct.gov/dep/cwp/view.asp?a=2714&q=324920&depNav_GID=1646)

### Home Energy Efficiency Ratings

The EPA Energy Star efficiency program utilizes the HERS Index scoring system in process of certifying homes as "Energy Star Qualified". The HERS Index is a system established by the Residential Energy Services Network (RESNET) in which a home built to the specifications of

the HERS Reference Home (based on the 2006 International Energy Conservation Code) scores a HERS Index of 100, while a net zero energy home scores a HERS Index of 0. The lower a home's HERS Index, the more energy efficient it is in comparison to the HERS Reference Home. Certified Energy Raters can be found using the RESNET website:  
<http://www.natresnet.org/>

Developers and builders can become Energy Star Partners and use such a rating system to ensure their homes are Energy Star qualified:  
[http://www.energystar.gov/index.cfm?c=bldrs\\_lenders\\_raters.nh\\_builder\\_site](http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_builder_site)

Municipalities can consider creative ways to utilize such rating systems to achieve CO<sub>2</sub>e reduction goals. One such example is the Town of Southampton, NY, which voted in July 2008 to adopt an amendment to the building construction code that requires all new homes and substantially renovated homes obtain a HERS Index rating, and ensures that the larger the homes are, the better the energy efficiency ratings must be. In addition, the code requires that heaters for swimming pools be solar, unless the site doesn't receive adequate sunlight. Since energy efficiency must be taken into consideration during the planning stages, the additional costs are affordable to the homeowner, while also creating new local rating and certification jobs. Read the news story here:  
<http://www.newsday.com/news/opinion/ny-vpsou275779198jul27,0,1787858.story>

#### *Promoting Non-Motorized Transportation*

Simple actions like riding a bike or walking instead of driving are often easy and can create significant emissions savings. Municipalities could require or encourage businesses to take pedestrian and bike access into consideration. Placing bike racks at various Town-owned locations might also encourage bike transit. The South Central Regional Council of Governments (SCRCOG) published a Regional Bicycle and Pedestrian Plan in 2007, which lists specific deficiencies and recommended improvements for specific Branford road segments. The full report can be found online, with a section on Branford on pages 39-42:  
[http://www.scrkog.org/toc\\_files/Regional\\_bike\\_ped.pdf](http://www.scrkog.org/toc_files/Regional_bike_ped.pdf)

In 2008, SCRCOG published two additional reports relating to Branford transportation planning. The Route 1/North Main Street Access Management Plan:  
[http://www.scrkog.org/toc\\_files/BranfordAccessMgmt.pdf](http://www.scrkog.org/toc_files/BranfordAccessMgmt.pdf)  
The Route 146 Scenic Highway Gateway Study:  
[http://www.scrkog.org/toc\\_files/146MainStGateway.pdf](http://www.scrkog.org/toc_files/146MainStGateway.pdf)

#### *Shoreline Greenway Trail*

The Shoreline Greenway Trail is being built to help promote non-motorized recreation and transit through the meadows and woods along the Sound from Lighthouse Point on New Haven Harbor for twenty-five miles to Hammonasset State Beach in Madison. Several sections have been completed in Branford. Ensuring that overall the trail will be environmentally sensitive, and that open space land continues to preserve natural habitat, will require detailed planning. Input and suggestions from residents can be given at the monthly town meetings, and volunteers can work on existing sections of the trail as needed. More information is available online:  
<http://www.shorelinegreenwaytrail.org/>

## **THE NEXT STEP – MILESTONE II**

To comply with ICLEI's program, the Town will need to adopt a reduction target for government operations as well as the community at large. Establishing mechanisms for ongoing energy analysis, and for community involvement in the reduction process will be critical. After focused brainstorming, stakeholders can draft the Climate Action Plan, which lists specifically which projects will need to be implemented in order to reach the target, how much they will cost or save, and what department will be in charge of each project.

Other cities involved with this Climate Protection Campaign stress the importance of choosing larger long-term reduction goals, like 80% by 2050, and smaller interim goals.

**APPENDIX A – GOVERNMENT EMISSIONS RESULTS IN FURTHER DETAIL**

<b>Government CO2e Emissions in FY06-07 Detailed by Building or Operation</b>					
Facility	Fuel	MTCO2e	CO2e (%)	Energy (MMBtu)	Cost (\$)
<b>SEWAGE TREATMENT &amp; PUMPING</b>					
WPCA Pump Stations					
	Electricity	448	4.7	4069	\$235,354.00
	Nat. Gas	8	0.1	123	\$4,121.00
	<b>Subtotal WPCA Pump Stations</b>	<b>456</b>	<b>4.7</b>	<b>4192</b>	<b>\$239,475.00</b>
WPCA Treatment Plant					
	Electricity	1032	10.7	9360	\$384,184.00
	Nat. Gas	163	1.7	2633	\$53,871.00
	<b>Subtotal WPCA Treatment Plant</b>	<b>1194</b>	<b>12.4</b>	<b>11993</b>	<b>\$438,055.00</b>
	<b>Subtotal Sewage Treat &amp; Pump</b>	<b>1650</b>	<b>17.2</b>	<b>16185</b>	<b>\$677,530.00</b>
<b>VEHICLE FLEET</b>					
Police Gasoline					
	Gasoline	403	4.2	4734	\$91,194.00
	<b>Subtotal Police Gasoline</b>	<b>403</b>	<b>4.2</b>	<b>4734</b>	<b>\$91,194.00</b>
Public Works Tank					
	Gasoline	371	3.9	4360	\$86,488.00
	Diesel	378	3.9	4359	\$83,142.00
	<b>Subtotal Public Works Tank</b>	<b>749</b>	<b>7.8</b>	<b>8719</b>	<b>\$169,630.00</b>
School Buses					
	Gasoline	115	1.2	1347	\$0.00
	Diesel	698	7.3	8043	\$0.00
	<b>Subtotal School Buses</b>	<b>813</b>	<b>8.5</b>	<b>9390</b>	<b>\$0.00</b>
Transfer Station Equipment					
	Diesel	51	0.5	589	\$11,213.00
	<b>Subtotal Transfer Station</b>	<b>51</b>	<b>0.5</b>	<b>589</b>	<b>\$11,213.00</b>
	<b>Subtotal Vehicle Fleet</b>	<b>2017</b>	<b>21</b>	<b>23432</b>	<b>\$272,037.00</b>
<b>BUILDINGS</b>					
High School					
	Electricity	1000	10.4	9078	\$378,191.00
	Oil	648	6.7	7839	\$107,215.00
	Nat. Gas	92	1	1487	\$21,208.00
	<b>Subtotal High School</b>	<b>1740</b>	<b>18.1</b>	<b>18405</b>	<b>\$506,614.00</b>
Walsh Intermediate School					
	Electricity	521	5.4	4725	\$222,942.00
	Oil	542	5.6	6558	\$89,714.00
	Nat. Gas	5	0.1	78	\$1,825.00
	<b>Subtotal Walsh Intermediate</b>	<b>1068</b>	<b>11.1</b>	<b>11361</b>	<b>\$314,481.00</b>
Sliney Elementary					
	Electricity	90	0.9	821	\$38,131.00
	Oil	282	2.9	3410	\$46,637.00
	<b>Subtotal Sliney Elementary</b>	<b>372</b>	<b>3.9</b>	<b>4231</b>	<b>\$84,768.00</b>

Tisko Elementary					
	Electricity	133	1.4	1207	\$56,736.00
	Oil	181	1.9	2189	\$29,939.00
	Nat. Gas	13	0.1	219	\$3,656.00
	<b>Subtotal Tisko Elementary</b>	<b>327</b>	<b>3.4</b>	<b>3614</b>	<b>\$90,331.00</b>
Murphy Elementary					
	Electricity	130	1.3	1176	\$49,538.00
	Oil	147	1.5	1775	\$24,280.00
	Nat. Gas	25	0.3	401	\$6,460.00
	<b>Subtotal Murphy Elementary</b>	<b>301</b>	<b>3.1</b>	<b>3352</b>	<b>\$80,278.00</b>
Town Hall					
	Electricity	91	0.9	821	\$39,225.00
	Oil	123	1.3	1489	\$20,292.00
	<b>Subtotal Town Hall</b>	<b>214</b>	<b>2.2</b>	<b>2310</b>	<b>\$59,517.00</b>
Police HQ					
	Electricity	131	1.4	1191	\$52,039.00
	Nat. Gas	52	0.5	842	\$16,823.00
	<b>Subtotal Police HQ</b>	<b>183</b>	<b>1.9</b>	<b>2033</b>	<b>\$68,862.00</b>
Fire Dept HQ					
	Electricity	54	0.6	493	\$26,141.00
	Oil	95	1	1146	\$15,063.00
	<b>Subtotal Fire Dept HQ</b>	<b>149</b>	<b>1.5</b>	<b>1638</b>	<b>\$41,204.00</b>
Indian Neck School					
	Electricity	21	0.2	190	\$10,087.00
	Oil	111	1.2	1340	\$18,331.00
	Nat. Gas	6	0.1	90	\$1,671.00
	<b>Subtotal Indian Neck School</b>	<b>137</b>	<b>1.4</b>	<b>1620</b>	<b>\$30,089.00</b>
Community House					
	Electricity	39	0.4	354	\$19,126.00
	Oil	90	0.9	1086	\$14,231.00
	Nat. Gas	1	0	10	\$487.00
	<b>Subtotal Community House</b>	<b>129</b>	<b>1.3</b>	<b>1450</b>	<b>\$33,844.00</b>
E Shore Adult Day Care					
	Electricity	22	0.2	196	\$10,423.00
	Oil	101	1.1	1223	\$15,661.00
	Nat. Gas	5	0.1	79	\$1,786.00
	<b>Subtotal E Shore Adult Day Care</b>	<b>128</b>	<b>1.3</b>	<b>1499</b>	<b>\$27,870.00</b>
Blackstone Library					
(only Electricity is directly paid by Town)	Electricity	105	1.1	957	\$35,498.00
	Nat. Gas				
	<b>Subtotal Blackstone Library</b>	<b>105</b>	<b>1.1</b>	<b>957</b>	<b>\$35,498.00</b>
Volunteer Services Center					
	Electricity	43	0.4	391	\$21,444.00
	Nat. Gas	36	0.4	578	\$11,732.00
	<b>Subtotal Volunteer Services Center</b>	<b>79</b>	<b>0.8</b>	<b>969</b>	<b>\$33,176.00</b>
Senior Citizens Center					
	Electricity	22	0.2	201	\$11,165.00

	Oil	46	0.5	552	\$7,484.00
	Nat. Gas	1	0	18	\$633.00
<b>Subtotal Senior Citizens Center</b>		<b>69</b>	<b>0.7</b>	<b>771</b>	<b>\$19,282.00</b>
Branford Hills School					
	Electricity	9	0.1	82	\$4,407.00
	Oil	53	0.6	646	\$8,834.00
<b>Subtotal Branford Hills School</b>		<b>62</b>	<b>0.6</b>	<b>727</b>	<b>\$13,241.00</b>
Branford Day Care					
(renters have own electricity account)	Oil	50	0.5	610	\$7,963.00
<b>Subtotal Branford Day Care</b>		<b>50</b>	<b>0.5</b>	<b>610</b>	<b>\$7,963.00</b>
Counseling Center					
	Electricity	27	0.3	245	\$13,517.00
	Nat. Gas	15	0.2	246	\$5,111.00
<b>Subtotal Counseling Center</b>		<b>42</b>	<b>0.4</b>	<b>491</b>	<b>\$18,628.00</b>
Older Public Works Garage					
	Electricity	11	0.1	101	\$5,798.00
	Nat. Gas	30	0.3	485	\$10,431.00
<b>Subtotal Older DPW Garage</b>		<b>41</b>	<b>0.4</b>	<b>586</b>	<b>\$16,229.00</b>
Stony Creek Fire Station					
	Electricity	7	0.1	62	\$3,957.00
	Oil	32	0.3	386	\$5,228.00
<b>Subtotal Stony Creek Fire Station</b>		<b>39</b>	<b>0.4</b>	<b>448</b>	<b>\$9,185.00</b>
Visiting Nurse Assoc.					
	Electricity	14	0.1	130	\$6,999.00
	Oil	25	0.3	299	\$3,947.00
<b>Subtotal Visiting Nurse Assoc.</b>		<b>39</b>	<b>0.4</b>	<b>429</b>	<b>\$10,946.00</b>
W. Wallace Library					
	Electricity	16	0.2	143	\$8,312.00
	Oil	21	0.2	256	\$3,464.00
<b>Subtotal W. Wallace Library</b>		<b>37</b>	<b>0.4</b>	<b>399</b>	<b>\$11,776.00</b>
Newer Public Works Garage					
	Electricity	7	0.1	59	\$3,433.00
	Nat. Gas	29	0.3	471	\$9,002.00
<b>Subtotal Newer DPW Garage</b>		<b>36</b>	<b>0.4</b>	<b>530</b>	<b>\$12,435.00</b>
BOE Central Office					
	Electricity	16	0.2	143	\$7,671.00
	Nat. Gas	19	0.2	306	\$5,163.00
<b>Subtotal BOE Central Office</b>		<b>35</b>	<b>0.4</b>	<b>449</b>	<b>\$12,834.00</b>
Animal Shelter					
	Electricity	12	0.1	108	\$6,130.00
	Nat. Gas	23	0.2	364	\$7,370.00
<b>Subtotal Animal Shelter</b>		<b>34</b>	<b>0.4</b>	<b>473</b>	<b>\$13,500.00</b>
Police Garage					
	Electricity	1	0	9	\$693.00
	Nat. Gas	32	0.3	522	\$10,685.00
<b>Subtotal Police Garage</b>		<b>33</b>	<b>0.3</b>	<b>531</b>	<b>\$11,378.00</b>
Transfer Station					

	Electricity	22	0.2	197	\$10,486.00
	Nat. Gas	6	0.1	90	\$2,019.00
<b>Subtotal Transfer Station</b>		<b>27</b>	<b>0.3</b>	<b>287</b>	<b>\$12,505.00</b>
Indian Neck School Age Child Care					
<b>Subtotal (includes Electric Heat)</b>	Electricity	<b>13</b>	<b>0.1</b>	<b>118</b>	<b>\$7,631.00</b>
MP Rice Fire Station					
	Electricity	3	0	28	\$1,582.00
	Oil	8	0.1	91	\$1,232.00
<b>Subtotal MP Rice Fire Station</b>		<b>11</b>	<b>0.1</b>	<b>119</b>	<b>\$2,814.00</b>
Indian Neck Fire Station					
	Electricity	3	0	28	\$1,803.00
	Nat. Gas	5	0.1	83	\$2,339.00
<b>Subtotal Indian Neck Fire Station</b>		<b>8</b>	<b>0.1</b>	<b>111</b>	<b>\$4,142.00</b>
Little League Stand + Irrigation					
	Electricity	8	0.1	70	\$4,031.00
<b>Subtotal Little League Stand</b>		<b>8</b>	<b>0.1</b>	<b>70</b>	<b>\$4,031.00</b>
Prospect St. Field Houses					
	Electricity	2	0	18	\$1,250.00
	Nat. Gas	6	0.1	97	\$2,164.00
<b>Subtotal Prospect St. Field Houses</b>		<b>8</b>	<b>0.1</b>	<b>114</b>	<b>\$3,414.00</b>
Academy (On Town Green)					
<b>Subtotal Academy (includes Elec Heat)</b>	Electricity	<b>5</b>	<b>0</b>	<b>44</b>	<b>\$2,901.00</b>
Veterans Park Garage + Lights					
<b>Subtotal Vets Park Garage+Lights</b>	Electricity	<b>4</b>	<b>0</b>	<b>34</b>	<b>\$2,480.00</b>
Landfill Gate Office					
<b>Subtotal Landfill Gate Office</b>	Electricity	<b>3</b>	<b>0</b>	<b>24</b>	<b>\$1,439.00</b>
Parker Park Baths					
<b>Subtotal Parker Park Baths</b>	Electricity	<b>1</b>	<b>0</b>	<b>8</b>	<b>\$957.00</b>
Veterans Park Bathrooms					
<b>Subtotal Veterans Park Bathrooms</b>	Electricity	<b>1</b>	<b>0</b>	<b>5</b>	<b>\$615.00</b>
<b>SUBTOTAL ALL BUILDINGS</b>		<b>5538</b>	<b>57.6</b>	<b>60817</b>	<b>\$1,606,859.00</b>
<b>STREET, TRAFFIC, OUTDOOR LIGHTS</b>					
Streetlights - Main account (Main St.)	Electricity	354	3.7	3214	\$207,528.00
Traffic Signals (Main St.)	Electricity	21	0.2	194	\$6,308.00
Street Lights (Main St)	Electricity	13	0.1	118	\$6,401.00
St Lt & Traf Control (Main St.)	Electricity	10	0.1	88	\$4,780.00
St Lt & Traf Control 2 (Main St.)	Electricity	8	0.1	73	\$3,978.00
Outdoor Box (Xmas Tree)	Electricity	3	0	23	\$1,687.00
Leetes Island Rd. Lights	Electricity	1	0	7	\$632.00
Lights (W. Main St.)	Electricity	1	0	13	\$914.00
Loc 014 203 Beaver Rd. (Lights)	Electricity	1	0	10	\$515.00
Outdoor Boxes (Festival)	Electricity	0	0	2	\$854.00
<b>Subtotal Lights</b>		<b>412</b>	<b>4.3</b>	<b>3742</b>	<b>\$233,597.00</b>
<b>TOTAL GOVERNMENT OPERATIONS</b>		<b>9618</b>	<b>100</b>	<b>104176</b>	<b>\$2,790,022.00</b>

Energy, cost, and CO2e and “intensities” are shown below, assessing each building per 1,000 ft. of floor space. High CO2e and energy intensities can result from inefficient space heating/cooling, higher electricity demand for lighting/computers/appliances, or both. The table below is based on consumption of electricity, natural gas, and heating oil.

<b>Town of Branford Buildings' CO2e, Energy, and Cost Intensities</b>						
<b>For Electricity, Natural Gas, and Heating Oil</b>						
	<b>Fiscal Year 2006-2007</b>			<b>Fiscal Year 2007-2008*</b>		
	<b>PER 1000 SQ.FT.</b>			<b>PER 1000 SQ.FT.</b>		
	CO2e	Energy	Cost	CO2e	Energy	Cost
Facility	MTCO2e	MMBtu	\$	MTCO2e	MMBtu	\$
VolunteerServices Ctr.	18.8	255.1	\$8,730			
Town Hall	15.9	189.4	\$4,878			
Fire Dept HQ	13.3	160.6	\$4,039			
Animal Shelter	13.0	197.0	\$5,625			
E.Shore AdultDayCare	10.3	133.2	\$2,477			
Police HQ	8.9	109.0	\$3,690			
Visiting Nurse Assoc.	8.9	107.2	\$2,736			
Senior Citizens Center	8.8	108.0	\$2,700			
Blackstone Library	8.2	111.4	\$2,572			
Indian Neck School	8.0	104.5	\$1,941	7.6	99.8	\$2,359
BOE Central Office	7.9	112.3	\$3,208	6.1	89.1	\$2,292
Indian Neck SACC	7.0	69.7	\$4,488			
MP Rice Fire Station	6.6	81.1	\$1,914			
Stony Creek Fire	6.2	78.6	\$1,611			
Sliney Elementary	6.1	76.9	\$1,541	4.9	61.0	\$1,658
High School	5.8	68.2	\$1,876	4.4	56.9	\$1,638
VetsPark garage/lights	5.8	58.1	\$4,275			
Community House	5.7	70.5	\$1,645			
Counseling Center	5.7	72.9	\$2,763			
Older DPW Garage	5.7	88.8	\$2,458			
Branford Day Care	5.4	68.5	\$1,298			
Tisko Elementary	5.4	65.7	\$1,642	3.7	50.5	\$1,431
W. Wallace Library	5.2	61.7	\$1,823			
Murphy Elementary	5.0	60.9	\$1,459	3.7	50.2	\$1,347
Indian Neck Fire	4.2	63.1	\$2,353			
Newer DPW Garage	4.1	67.9	\$1,594			
Walsh Intermediate	3.9	45.8	\$1,268	3.2	42.2	\$1,230
Police Garage	3.7	65.0	\$1,394			
Branford Hills School	3.7	46.9	\$854	2.0	24.9	\$685
Academy OnGreen	2.9	28.7	\$1,908			
ProspectSt. FieldHouse	2.5	39.4	\$1,177			
Vets Park Bathrooms	0.9	8.9	\$1,160			
Parker Park Baths	0.5	5.3	\$638			
*Additional FY07-08 data for BOE facilities showed intensity reductions						

Removing electricity use, and calculating the CO2e, energy, and cost intensities for only natural gas and heating oil consumption, helps identify buildings that are inefficiently heated and would benefit most from insulation, leak sealing, equipment upgrades, or fuel switching. The table below is based on natural gas and heating oil consumption only, except for the “Academy” and “Indian Neck SACC”, which have electric heat only and therefore electricity use at those facilities was included, despite the electricity being used for lights and appliances as well.

<b>Town of Branford Buildings' CO2e, Energy, and Cost Intensities</b>						
<b>For Natural Gas and Heating Oil **</b>						
	<b>Fiscal Year 2006-2007</b>			<b>Fiscal Year 2007-2008*</b>		
	<b>PER 1000 SQ.FT.</b>			<b>PER 1000 SQ.FT.</b>		
	CO2e	Energy	Cost	CO2e	Energy	Cost
Facility	MTCO2e	MMBtu	\$	MTCO2e	MMBtu	\$
Town Hall	9.2	122.1	\$1,663			
VolunteerServices Ctr.	8.5	152.1	\$3,087			
Animal Shelter	8.5	151.8	\$3,070			
E.Shore AdultDayCare	8.5	115.7	\$1,550			
Fire Dept HQ	8.4	112.3	\$1,476			
Indian Neck SACC **	7.0	69.7	\$4,488			
Indian Neck School	6.8	92.3	\$1,290	6.6	89.4	\$1,852
Senior Citizens Center	5.9	79.8	\$1,136			
Visiting Nurse Assoc.	5.6	74.7	\$986			
Stony Creek Fire	5.1	67.7	\$917			
MP Rice Fire Station	4.7	62.2	\$838			
TransferS. ScaleHouse	4.6	82.2	\$1,835			
Sliney Elementary	4.6	62.0	\$847	3.6	48.4	\$1,034
BOE Central Office	4.3	76.5	\$1,290	3.5	63.1	\$1,021
Branford Day Care	4.2	56.4	\$737			
Older DPW Garage	4.1	73.5	\$1,580			
Community House	4.0	53.3	\$715			
Blackstone Library	3.7	65.8	\$332			
Police Garage	3.6	64.0	\$1,309			
Newer DPW Garage	3.4	60.3	\$1,154			
Tisko Elementary	3.2	43.8	\$610	1.7	29.6	\$442
Branford Hills School	3.1	41.7	\$569	1.5	19.5	\$377
W. Wallace Library	3.0	39.6	\$536			
Academy OnGreen **	2.9	28.7	\$1,908			
Murphy Elementary	2.8	39.6	\$558	1.7	30.0	\$453
Indian Neck Fire	2.7	47.4	\$1,329			
Police HQ	2.5	45.1	\$901			
High School	2.5	34.5	\$475	1.5	27.6	\$346
Counceling Center	2.0	36.6	\$758			
Walsh Intermediate	2.0	26.8	\$369	1.4	23.6	\$360
ProspectSt. FieldHouse	1.9	33.3	\$746			
*Additional FY07-08 data for BOE facilities showed intensity reductions						
**Electricity included only for Academy and Indian Neck SACC (electric heat)						

## APPENDIX B – TRASH INCINERATION EMISSIONS

There are CO<sub>2</sub>e emissions from trash-to-energy incineration at Resource Recovery Facilities (RRFs), although mainly from plastics or synthetics. Furthermore, emissions vary depending on the specific type of synthetic material.<sup>31</sup> There is no specific Solid Waste Characterization for Branford, meaning the exact percentage of each type of material in Branford's MSW is unknown. In order to derive a general estimate for emissions from Branford trash incineration, the content of Branford's trash was considered consistent with the national average for non-diverted MSW: 24.4% Paper Waste; 18% Food Waste; 7.3% Plant/Yard Waste; 13.3% Wood and Textiles; and 37% All Other.<sup>32</sup> The CACP software uses EPA "WARM Model" national averages to estimate the extent of plastics in the "All Other" category. These values were used since CT has not yet completed its own waste characterization study, although one is currently in progress.<sup>33</sup>

Controlled incineration emissions for the national average trash composition are 26% of those resulting from landfilling without methane recovery. As such, waste-to-energy (W-t-E) incineration is considered a better waste disposal strategy than traditional landfilling. The extensive use of RRFs in CT did not come about entirely because of environmental reasons – economics also played a part. Connecticut MSW landfills are full. Only two landfills in CT are permitted to accept MSW, and both are extremely close to maximum capacity and have plans for closure by 2009.<sup>34</sup> Sending Branford's existing trash to an out of state landfill would be much worse environmentally, but it also wouldn't happen due to the much greater transportation cost.

Assuming the national average trash composition, emissions from incinerating the 22,398 tons of Branford community trash were approximately 4,673 MTCO<sub>2</sub>e. According to the Environmental Protection Agency, 523 kWh of electricity are delivered per ton of waste combusted at mass burn facilities such as the one in Bristol.<sup>35</sup> Branford community trash combustion would therefore have generated approximately 11,714 MWh of electricity, equal to 5% of total amount of electricity consumed in Branford town-wide (238,634 MWh). Emissions for 11,714 MWh of electricity from New England Grid Average generation (focused heavily on natural gas, nuclear, and coal) are actually only 3,997 MTCO<sub>2</sub>e. Emissions from trash as a power source can be higher or lower than those from other fuels depending on the trash composition. However, the point being made here is that until trash composition can be known more exactly, W-t-E incineration will remain a much better solution than traditional landfilling, but may not be the cleanest or most efficient method of generating electricity, even compared to conventional sources. As such, waste reduction and electricity conservation remain essential to reducing emissions from product creation and electricity generation.

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<sup>31</sup> Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks, Chapter 1 page 13, and Chapter 5 page 70, <http://epa.gov/climatechange/wycd/waste/SWMGHGreport.html>

<sup>32</sup> US EPA, MSW Facts and Figures for 2006, Table 1, pg. 5, <http://www.epa.gov/epaoswer/non-hw/muncpl/pubs/msw06.pdf>

<sup>33</sup> CT SWM Plan, Chapter 4, Objectives and Strategies, Section 4.3.6, Strategy 6-7, pg. 4-90, [http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav\\_GID=1646#SWMP](http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav_GID=1646#SWMP)

<sup>34</sup> CT DEP, Active CT Landfill Sites, [http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325462&depNav\\_GID=1646](http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325462&depNav_GID=1646)

<sup>35</sup> Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks, Chapter 5, Section 5.1.5, pg. 72, <http://epa.gov/climatechange/wycd/waste/SWMGHGreport.html>

## **APPENDIX C – CLIMATE CHANGE BACKGROUND**

The Union of Concerned Scientists extensively studies the impacts of climate change, and has developed various future emissions scenarios and advanced models for predicting future climate patterns. They have published a report, specific to Connecticut, entitled: *Confronting Climate in the U.S. Northeast*, which is available online:

<http://www.climatechoices.org/>