NATURAL GAS > SYSTEM OVERVIEW

The U.S. natural gas system encompasses hundreds of thousands of wells, hundreds of processing facilities, and over a million miles of transmission and distribution pipelines. Natural gas transmission involves high pressure, large diameter pipelines that transport gas long distances from field production and processing areas to distribution systems or large volume customers such as power plants or chemical plants. Distribution pipelines take the high-pressure gas from the transmission system at "city gate" stations, reduce the pressure and distribute the gas through primarily underground mains and service lines to individual end users.

The Village of Oak Park homes, businesses and municipal facilities receive natural gas service from Nicor, Inc., which is connected to a 29,000-mile distribution system that is part of a network of eight interstate pipelines (fig. 17). Nicor purchases gas during the summer months when it is normally less expensive and store it in underground storage facilities for use throughout the year.

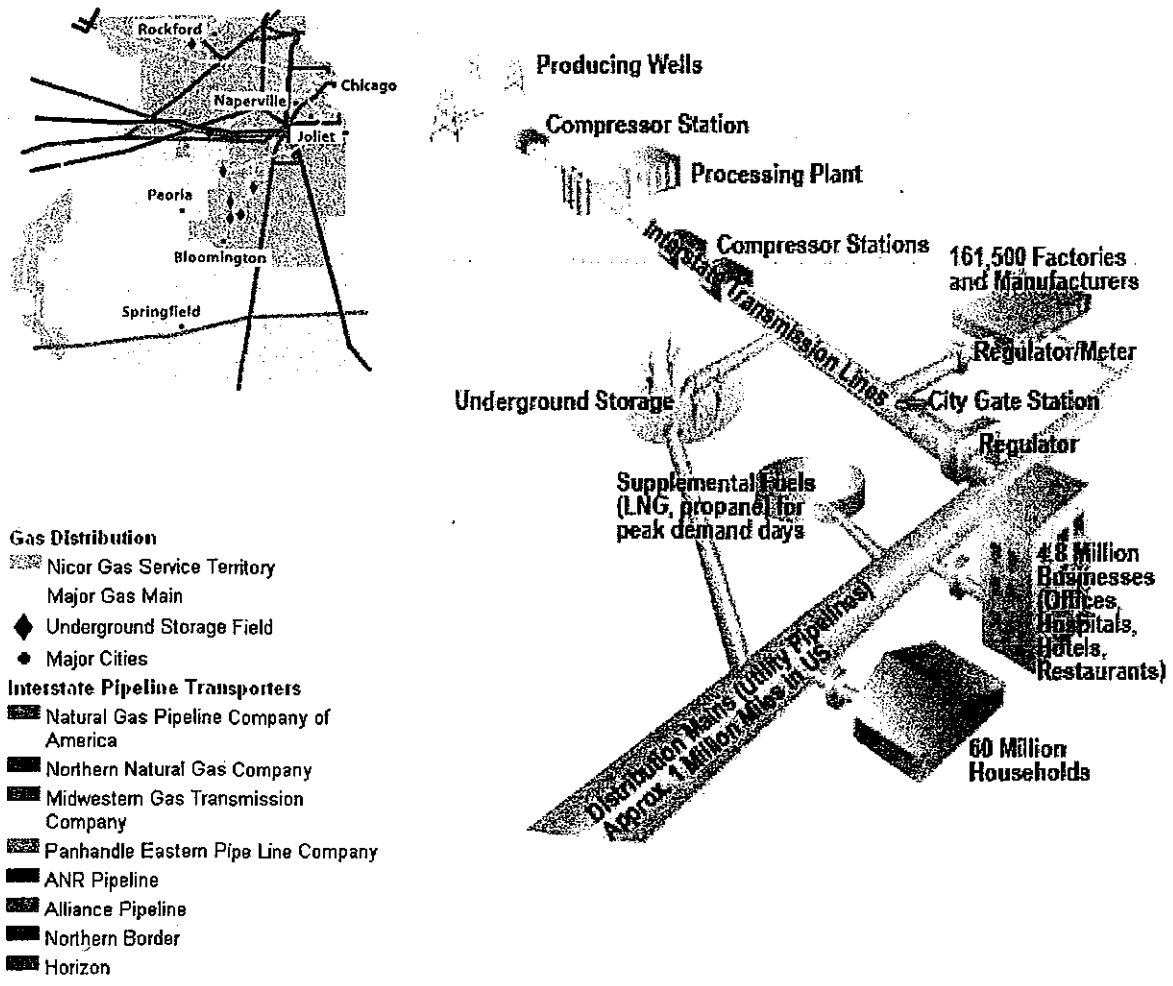


Fig. 17. Gas distribution and pipeline system (Nicor Gas, 2009)

Distribution: New gas lines are installed at about 3' underground: The 10" gas main line (header) runs under streets. From the gas main (fig. 18), a 2" yellow polyethylene gas branch line (leg) eventually connects to the 1" yellow polyethylene gas house line (feeder), which terminates at the individually metered buildings. Polyethylene pipe started to be used at around 1985 (copper was used previously). A yellow-colored electric copper wire is installed with polyethylene gas piping so as to allow Nicor to locate the lines by running a low voltage electric charge, when necessary.

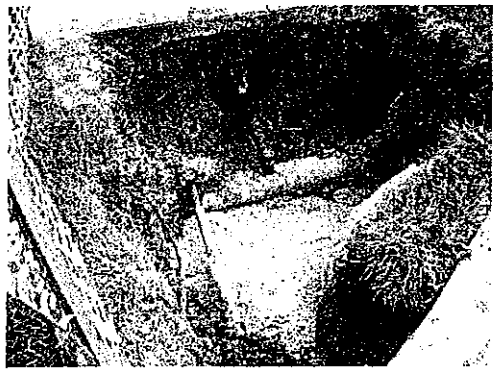


Fig. 18. ComEd's access to public way (photo by Michael Iversen)

NATURAL GAS > INPUTS

According to the U.S. Census (2005-2007)[14], 18,890 (84.5%) of housing units in Oak Park use gas as a heating fuel. Other common uses are cooking gas, water heater, and laundry dryer. As housing is dominated with gas as a heating fuel, it is not surprising to find a significant amount of therms being consumed as inputs, as shown by the following table (Table 8).

Table 8. Natural gas energy usage per housing unit type

Housing Unit Type	Units[1]	Unit Area Factor[2]	Unit Monthly Usage (therms)	Total Monthly Usage (therms)	Total Annual Usage (therms)
Single family	7,678	1.0	148	1,136,344	13.636,128
Multifamily	11,208	0.64	95	1,064,760	12,777,120
Total	18,890	---	117	2,201,104	**26,413,248**

1. Based on 18,890 homes using gas as heating fuel (U.S. Census, 2005-07).
2. Based on Nicor's *Oak Park Energy Consumption Trends* (June, 2008)

Now that the gas energy usage has been determined per housing unit type, the next step is to determine the monetary costs of this usage. This was accomplished by applying all of Nicor's standard monthly residential customer service billing, comprised of delivery charges, natural gas costs, and taxes, to the above Unit Monthly Usage (therms) amounts (Table 8). The monthly delivery charges, natural gas costs, and taxes were based on monthly billing averages for the twelve months ending September 2009[15].

Table 9. Natural gas energy costs per housing unit type

Housing Unit Type	Units[1]	Unit Area Factor[2]	Unit Monthly Cost	Total Monthly Cost	Total Annual Cost
Single family	7,678	1.0	$166.49	$1,278,310	$15,339,720
Multifamily	11,208	0.64	$111.15	$1,245,769	$14,949,228
Total	18,890	---	$133.62	$2,524,079	**$30,288,948**

As shown by Table 9, the annual cost for natural gas for Nicor's residential customers in Oak Park is $30,288,950. A closer assessment of the customer billings shows that a municipal tax of 5.15% is assessed to the total month billing. This results in a municipal utility tax of $129,900 per month, or $1,559,881 per year. This municipal tax is budgeted as utility tax revenue in the village's General Fund.

While the prevalent use of natural gas as a heating fuel partially explains the relatively high gas usage and costs, Oak Park's large, vintage housing stock also plays a primary role. According to findings of a Nicor Gas report to the Illinois Commerce Commission (Nicor Gas, 2008), housing in Oak Park had the following unique attributes that factored in relatively high residential gas energy billings;

- The predicted annual therm use for Oak Park residential consumers is 31% higher than the typical Nicor Gas residential consumer – due in large part to Oak Park's high concentration of older, larger homes.
- On average, homes built in 1960 or later use 18% fewer therms per square foot than those built in 1945 or earlier. (Appendix D).
- Homes built after 2000 used about half (49% for single-family, 53% for multifamily) the natural gas per square foot than homes built 1900-40.
- With a higher therms / SF than Nicor's typical residential consumer, it appears Oak Park's homes are; a) less energy efficient, b) less energy conservation behavior, and/or c) less use of high-efficiency appliances.
- Average annual gas costs were 63% higher in 2007 vs. 2001 (0.46 cents/therm vs. 0.75 cents/therm).

Housing demographics specific to Oak Park provide additional factors contributing to the higher energy billings. According to the U.S. Census Bureau (2005-2007), 89.0% of housing structures in the village were built before 1970, and 68.4% were built before 1940. In addition, most of Oak

Park housing stock is large in size, with most homes being built in 1900-39 (6,145 homes) that averaged 1,796 SF in area (Table 10). In summary, the existing housing stock in Oak Park is relatively old, large in size, and energy inefficient.

Table 10. Selected statistics for homes by year built (Nicor Gas, June 2008)

Year Home Built	Average Square Footage	Average Predicted Annual Therms
Pre-1900 (n = 701)	2,123	1,917
1900-1939 (n = 6,145)	1,846	1,421
1940 – 1959 (n = 358)	1,734	1,425
1960 – 1984 (n = 91)	1,730	1,589
1985 – 2003[1] (n = 19)	1,968	1,347
Pre-1900 – 2003 (n = 7,314)	1,866	1,471

1. Very small sample size

NATURAL GAS > OUTPUTS

The amount of carbon emitted from the combustion of fossil fuels is dependent upon the carbon content of the fuel and the fraction of that carbon that is oxidized. Fossil fuels vary in their average carbon content, ranging from about 53 Tg CO2 Eq./QBtu for natural gas to upwards of 95 Tg CO2 Eq./QBtu for coal. In general, the carbon content per unit of energy of fossil fuels is the highest for coal products, followed by petroleum, and then natural gas

A residential gas boiler or furnace converts the energy contained in the natural gas fuel into heat. Some furnaces are more efficient at converting fuel energy into heat than others. As furnace efficiency increases, the greenhouse gases that are produced as a waste byproduct to heat the building decreases accordingly.

Generally, there are three different efficiency levels for most furnaces: *Standard* efficiency furnaces are generally furnaces older than 15 years and only convert about 60 percent of the energy contained in fuel into useful heat. *Mid-efficiency* furnaces are generally newer fur-

naces and convert about 78 to 80 percent of the energy contained in fuel into useful heat. *High-efficiency* furnaces convert 85 to 96 percent of the energy contained in fuel into useful heat.

For the gas furnace operating at 92% efficiency, it provides 920 BTU of useful heat for every 1,000 BTU that is consumed. Since 1,000 BTU of natural gas releases 0.117 pounds of CO2, the furnace delivers 7,860 BTU per pound of CO2 emitted. AGA recommends natural gas furnace or boiler that meets or exceeds Energy Star criteria (Annual Fuel Utilization Efficiency ratings of 85 percent for boilers and 90 percent for furnaces).

Other residential natural equipment also are secondary greenhouse gas emitters, such as water heaters, gas ranges, and gas laundry dryers. While it is beyond the scope of this report to calculate the amount of greenhouse gas emissions being produced by residential natural gas equipment in Oak Park, it certainly is a necessary component to be included in a comprehensive and detailed greenhouse gas inventory for Oak Park,

NATURAL GAS > ASSESSMENT

It is apparent there are significant costs associated with natural gas use for Nicor customers in Oak Park. Natural gas energy costs have historically been increasing, and despite a current rate decrease due to the economic recession, Energy Information Administration projections (United States, 2009) indicate natural gas prices will continue their trend upwards into the foreseeable future (fig. 19). Since these are local costs that are not re-invested in the local economy, there are economic benefits to reducing costs associated with electrical use.

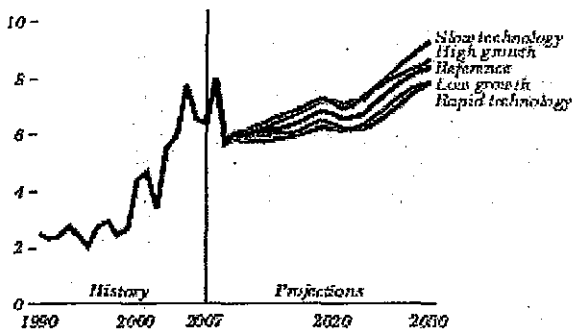


Fig. 19. Lower 48 wellhead natural prices in five cases, 1990-2030 (2007 dollars per thousand cubic feet) (United States, 2009)

That being said, the Village of Oak Park receives a revenue stream of $1,559,881 (2008) per year that is budgeted as utility tax revenue in the village's General Fund. Any decrease in natural gas usage and/or costs would also decrease this utility tax revenue.

Any proposed policy to address this multiple variables needs to be assessed from a cost-benefit viewpoint. Three natural gas energy usage reduction policy scenarios are provided below (Table 11) relative to the previously established inventory baseline of existing housing types. Policy scenarios are provided for 10%, 20%, and 30%c energy use reductions, along with associated impacts to energy costs savings to users and municipal utility tax reduction. There

would also be associated greenhouse gas reduction in the form of CO2, in direct proportion to any realized energy efficiencies.

A 10% energy use reduction is typically accomplished with behavioral change only (example: programming thermostat), with little of no costs or expertise. A 20% energy cost reduction is typically accomplished with minimal costs and low expertise (example: attic insulation, weatherstripping). A 30% energy reduction is typically accomplished with a higher level of investment and may require the hiring of expertise (example: energy-efficient heating equipment).

Table 11. Potential policy scenarios involving residential natural gas energy use reductions

Annual Energy Usage Reduction Scenarios	Baseline	10% Reduction	20% Reduction	30% Reduction
Usage (therms) [usage reduction]	26,413,248 ---	23,771,923 [2,641,325]	21,130,598 [5,282,650]	18,489,273 [7,923,974]
Costs ($) [cost reduction / savings]	$30,288,948 ---	$27,260,053 [$3,028,895]	$24,231,158 **[$6,057,790]**	$21,202,263 [$9,086,684]
Municipal Utility Tax ($) [tax revenue reduction]	$1,559,881 ---	$1,403,893 [$155,988]	$1,247,905 **[$311,976]**	$1,091,917 [$467,964]

An energy policy that affects a 20% energy use reduction would be achievable with minimal cost investment and expertise. An investment of $311,976 per year (equivalent to the annual utility tax revenue reduction) would result in the following direct community benefits;

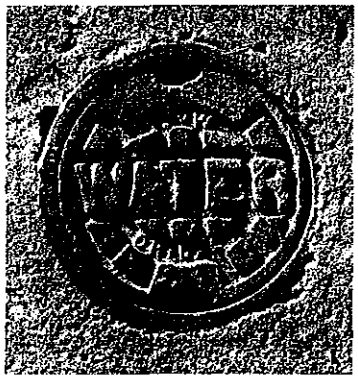
- Reduce residential natural gas costs by $6,057,790 / year, an annual return 19 times the amount of reduced utility tax revenue.
- Reduce CO2 and NOx emissions (CO2 is a primary greenhouse gas).

Other indirect community benefits from the same investment amount are as follows;

- Local economy would be enhanced, due to money being redirected from utility company (Nicor) to local residential energy efficiency trades, materials and products.
- Increase in local purchases of energy efficiency materials and products would positively impact local sales tax revenues, and increase in use of local energy efficiency trades would positively impact local employment market.
- Increased energy efficiency would positively impact residential property values, which in turn would generate increased property tax revenues.

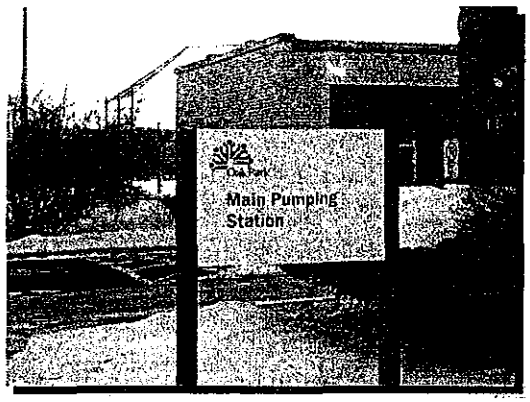
WATER (SUPPLY, STORMWATER, SEWER)

OVERVIEW



Lake Michigan is a surface water supply that provides drinking water for Oak Park, Chicago and 120 other suburban communities. Water arrives pretreated and the village adds chlorine. Water samples are routinely tested every step of the way - from the source of the water, to Oak Park's three pumping stations, as well as randomly selected individual homes.

The Water & Sewer Division of the Public Works Department is responsible for the delivery of safe, potable water to residents and businesses in the Village and for fire suppression. Purchased directly from the City of Chicago ($2.80/1,000 gallons, for a total cost of $3M/year), the water is received via three water mains and stored in four underground reservoirs, with a combined capacity of 12.5M gallons, each linked to a pumping station. From these reservoirs, water is pumped through 105 miles of 6"-16" diameter water mains to about 12,470 water billing customers.



The Water Distribution program involves the activity of the operation and maintenance of the water distribution system, including the repair of water mains, 13,500 service lines/connections, 1,235 fire hydrants, valves and b-boxes.

Personnel in the Water & Sewer Division are responsible for emergency replacement of broken mains, as well as repair and exercising of system valves, repair and replacement of water meters and pumping equipment. The division also repairs and maintains the combined sanitary and storm sewers that transport Village sewerage into the Metropolitan Water Reclamation District interceptors. The village currently has 116 miles of sewer mains.

WATER > INPUTS

The Water Supply program involves the activity of operating and maintaining the Village's pumping stations, underground reservoirs, chemical testing of water and all state and federal mandated water samples. Included in this program are costs for water from the City of Chicago

and electricity charges for the three pumping stations. 2008 village budget included $3,088,800 payments to the City of Chicago for water (assumed an 8% total increase).

The daily average of water consumed in Oak Park is 5.7M gallons, or 2B gallons per year, which equates to an average daily per capita consumption is 105 gallons. As per the *Village of Oak Park Annual Water Use Audit (IEPA 2005)*, the following (Table 12) is the village-wide daily water usage;

Table 12. Village-wide daily water usage

User category	Usage (million gallons / day)	Percentage of Total
Residential	3.727	65%
Commercial / industrial	1.885	33%
Municipal	0.096	2%
construction	0.008	Negligible
Total	5.716	100%

Effective January 1, 2009, the following water rates applied in the Village of Oak Park. The Class I water rate for residential and commercial/industrial users is $4.25 for each one thousand (1,000) gallons, for consumers of less than one hundred thousand (100,000) gallons per month. The Class II water rate for construction or demolition purposes is $4.83 for each one thousand (1,000) gallons. The water rate for municipal use is $1.33 per 1,000 gallons. At these water rates, the annual costs for each user type is provided as follows (Table 13);

Table 13. Village-wide daily and annual water usage and costs

User Type	Charge (1,000 gallons)	Daily		Annual	
		Usage (1,000 ga.)	Cost	Usage (1,000 ga.)	Cost
residential	$4.25	3,727	$15,591	1,360,355	**$5,781,509**
commercial / industrial	$4.25	1,885	$8,011	688,025	**$2,924,106**
construction	$4.83	8	$39	2,920	**$14,104**
municipal	$1.33	96	$128	35,040	**$46,603**
total		**5,716**	**$23,764**	**2,086,340**	**$8,766,322**

As shown by Table 13, the annual cost for water usage in Oak Park is $8,766,322. According to village ordinance 26-2-2.A., a "five percent (5%) utility tax established by the Village shall be paid by the Village, a municipal corporation, from the water charges set forth herein." This five% water utility tax is not itemized in the Village of Oak Park water bill. When applied to the above annual costs, this equates to a municipal water utility tax of $438,316 per year. This municipal tax appears to be budgeted as utility tax revenue in the village's General Fund, but this needs to be confirmed.

WATER > OUTPUTS

Effective January 1, 2009, the sewer service charge is $1.70 per one thousand (1,000) gallons of water consumed, with a maximum rate in any quarter for single-family user of $69.00. There is no sewer service charge for municipal use. At these sewer service charges, the annual costs for each user type is provided as follows (Table 14);

Table 14. Village-wide daily and annual sewer service costs

User Type	Charge (1,000 gallons)	Daily		Annual	
		Usage (1,000 ga.)	Cost	Usage (1,000 ga.)	Cost
residential	$1.70	3,727	$6,336	1,360,355	**$2,312,640**
commercial / industrial	$1.70	1,885	$3,205	688,025	**$1,169,825**
construction	$1.70	8	$14	2,920	**$5,110**
municipal	$0.00	96	$0	35,040	**$0**
total		**5,716**	**$23,764**	**2,086,340**	**$3,487,575**

As shown by Table 14, the annual cost for sewer service in Oak Park is $3,487,575. According to village ordinance 26-2-2.B., a "five percent (5%) utility tax established by the Village shall be paid by the Village, a municipal corporation, from the water charges set forth herein." This five% water utility tax is not itemized in the Village of Oak Park sewer bill. It is not clear whether this 5% utility tax is the same as assessed for water usage, or in addition, and needs to be confirmed. When applied to the above annual costs, this equates to a municipal sewer (water) utility tax of $174,379 per year.

The Village of Oak Park bill is not the only payment for sewer service. The Metropolitan Water Reclamation District (MWRD) of Greater Chicago is a Cook County taxing district, and assesses a property tax on property owners for the treatment of combined sewer/stormwater.

WATER > ASSESSMENT

Any reduction in stormwater or sewer outputs will not reduce costs. This is because the sewer service charge is based on water usage. Conversely, a reduction in water usage will not only reduce the water service charge, but the sewer service charge as well.

Any proposed policy to address this cost accounting needs to be assessed from a cost-benefit viewpoint. Three water usage reduction policy scenarios are provided below (Table 15) relative to the previously established inventory baseline of existing housing types. Policy scenarios are provided for 10%, 20%, and 30%c water use reductions, along with associated impacts to water and sewer service costs savings to users and municipal utility tax reduction.

Since any combined stormwater/sewer outputs will be treated at the MWRD's Stickney Water Reclamation Plant, there are associated greenhouse gas emissions from the treatment processes, in the form of N2O, CH4, and CO2. All three types of greenhouse gases are emitted during the aeration batteries. While it is beyond the scope of this report to calculate those greenhouse gases attributed to wastewater being treated at SWRP from Oak Park, it is recommended for inclusion in a comprehensive and detailed greenhouse gas inventory of Oak Park.

A 10% water use reduction is typically accomplished with behavioral change only (example: shorter showers), turning off faucets when not in use), with little of no costs or expertise. A 20% water use reduction is typically accomplished with minimal costs and low expertise (example: water-efficient appliances). A 30% water use reduction is typically accomplished with a higher level of investment and may require the hiring of expertise (example: drip irrigation, permaculture).

Table 15. Potential policy scenarios involving residential water use reduction

Annual Energy Usage Reduction Scenarios	Baseline	10% Reduction	20% Reduction	30% Reduction
Usage (gallons) [usage reduction]	2,086,340 ---	1,877,706 [208,634]	1,669,072 [417,268]	1,460,438 [625,902]
Costs ($) [cost reduction water] [cost reduction sewer]	$8,766,322 --- ---	$7,889,690 [$876,632] [$]	$7,013,058 **[$1,753,264]** [$]	$6,136,425 [$2,629,897] [$]
Costs ($) [cost reduction sewer]	$3,487,575 ---	$3,138,818 [$348,758]	$2,790,060 **[$697,515]**	$2,441,303 [$1,046,273]
[combined cost reduction water and sewer]	---	[$1,225,390]	**[$2,450,779]**	[$3,676,170]
Municipal Utility Tax ($) [tax revenue reduction]	$438,316 ---	$394,484 [$43,832]	$350,653 **[$87,663]**	$306,821 [$131,495]

A policy that affects a 20% water use reduction would be achievable with minimal cost investment and expertise. An investment of $87, 663 per year (equivalent to the annual utility tax revenue reduction) would result in the following direct community benefits;

- Reduce village-wide water and sewer service costs by $2,450,779 / year, an annual return 28 times the amount of reduced utility tax revenue.
- Reduce downstream N2O, CH4, and CO2. greenhouse emissions at MWRD's Stickney Water Reclamation Plant.

Other indirect community benefits from the same investment amount are as follows;

- Local economy would be enhanced, due to money being redirected from village utility tax revenue stream to local residential water efficiency trades, materials and products.
- Increase in local purchases of water efficiency materials and products would positively impact local sales tax revenues, and increase in use of local water efficiency trades would positively impact local employment market.
- Increased water efficiency would positively impact residential property values, which in turn would generate increased property tax revenues.

Oak Park receives an annual rainfall of 35.82" / year, or 2.8 billion gallons. About 60% of this rainfall falls upon impervious surfaces (streets, alleys, roads, parking lots, rooftops, etc.) whereupon it is channeled to Oak Park's combined stormwater / sewer system. This system is connected 6 miles downstream to the Metropolitan Water Reclamation District (MWRD) of Greater Chicago.

The Village of Oak Park pays a sewer usage fee to MWRD which is based upon the amount of supply water provided to Oak Park. Property owners in Oak Park also pay a sewer usage fee to MWRD through their property tax bills, based on their property's estimated assessed value. Therefore, there is no incentive for the Village of Oak Park or property owners to reduce or pre-treat their sewer discharge, as there will be little, if any, realized cost savings.

While approximately 1.7 billion gallons per year of unused rainfall is being sent to MWRD, Oak Park imports over 2 billion gallons per year of Lake Michigan supply water from the City of Chicago, at a cost to Oak Park end users of $8,766,322. In other words, while free and plentiful rainfall is being diverted to MWRD, Oak Park is paying for importing water for sprinkling lawns, landscape irrigation, washing cars, and other nonpotable water uses.

VII. GREEN BLOCKS INITIATIVE

BACKGROUND

The Green Blocks Initiative is a community-based network created in April 2007 as an outcome of the *Green Tuesdays in the Village 2007* public environmental lecture series[5]. The Green Blocks Initiative is a citizen-based, incremental block-by-block approach to achieving integrated and ecological neighborhoods throughout the Village of Oak Park. One of the volunteer residential blocks that emerged from the Green Blocks Initiative is the 300 S. Humphrey Ave. block. The following is an assessment and report of the 300 S. Humphrey Ave. block through the frameworks selected for this study. It is suggested that the Green Blocks Initiative may serve as a model to affect incremental change from the framework of this report, and any subsequent environmentally-sustainable policy.

INTRODUCTION

Frameworks for Assessment

The two frameworks selected for assessing the selected place are urban ecology[6] and social change. These two frameworks were selected because urban ecology can be used to establish a baseline of a place's ecological footprint and energy / material flows, while social change can be used as the means for effecting change with community-based social networks.

While there are various methods for assessing a place through the framework of urban ecology, ecological footprint and an energy and materials audit will be used for this paper in assessing place. Developed in 1996 by Canadian ecologist William Rees and Mathis Wackernagel (a graduate student of Rees at the University of British Columbia), an ecological footprint analysis is an "accounting tool that enables us to estimate the resource consumption and waste assimilation requirements of a defined human population or economy in terms of a corresponding productive land area"[7]. Since ecological footprints are scaleable, this method will be applied to individuals, households and residential blocks for the purpose of this paper. Assessment criteria will be on based on consumption of food, mobility, shelter and goods/services, and expressed in acres of biologically-productive land area[8]. Additional assessment of place will be provided by audits for energy usage (gas, electric), water usage, and waste production (sewer, refuse), through a review of utility billings pertaining to the selected place.

Social change may occur via various methods, with one of them being community-based social networks. Social networks are based on the premise that; a) people who live in a particular place are the experts of that place, as derived from their collective experiences and wisdom; b) people are more likely to get involved and be committed to activities that affect their own block; and c) there are advantages that exist that may be better realized by the collective group

relative to the individual. Assessment criteria is based on ability to effect change, as evaluated with meetings and observations.

Place

The selected place for assessment is the 300 S. Humphrey Ave. block in Oak Park, IL. This residential block is comprised of twenty single-family homes (ten on each side) along a cul-de-sac street of north-south orientation (Appendix E). This is a typical block in a typical neighborhood in Oak Park, in terms of housing (vintage, style, condition and improvements) and demographics (household size, diversity, income). The lot sizes are all 50' x 175', which is an average lot size in Oak Park for single-family homes. Housing typology is provided by Appendix E.

URBAN ECOLOGY FRAMEWORK: ECOLOGICAL FOOTPRINT

The method used to assess the block's ecological footprint was for individual households to complete an Ecological Footprint Quiz made available at the Redefining Progress web site at http://www.myfootprint.org/. The analysis of user input is primarily based on data published by United Nations agencies and the Intergovernmental Panel on Climate Change. It allows a

Table 16. Results from Ecological Footprint Quiz (June, 2007)

Household		Footprint (acres)					Planets
		Food	Mobility	Shelter	Goods/Services	Total	
Household A							
individual 1	adult	5.4	2.5	6.4	8.2	22.5	5.0
individual 2	adult	5.9	0.7	6.9	6.9	20.4	4.5
individual 3	child	5.2	0.7	6.9	5.2	18.0	4.0
individual 4	child	5.9	0.7	6.9	6.9	20.4	4.5
Household B							
individual 1	adult	5.6	3.4	7.0	7.0	23.0	5.1
individual 2	adult	4.5	3.8	7.0	6.1	21.4	4.8
individual 3	child	5.5	1.2	7.0	4.3	18.0	4.0
Household C							
individual 1	adult	5.4	6.4	6.9	9.1	27.8	6.2
individual 2	adult	5.4	2	6.7	5.9	20.0	4.4
individual 3	child	6.2	1.7	6.9	5.9	20.7	4.6
individual 4	child	5.4	1.7	6.9	7.9	21.9	4.9
Household D							
individual 1	adult	5.2	1	8.9	6.7	21.8	4.8
4	12.0	**5.5**	**2.2**	**7.0**	**6.7**	**21.3**	**4.7**

comparable measure with other footprints, and therefore is of particular use as an urban ecology indicator.

The Ecological Footprint Quiz consists of sixteen questions in four categories; food, mobility, shelter and goods/services (see Appendix G for cover page). Each member of a household was requested to complete the Quiz, with the sum total representing the entire household's ecological footprint.

Four households consisting of 12 individuals completed the Quiz during June, 2007. The results of their ecological footprint are provided in Table 16. The average individual footprint is 21.3 acres, which would require 4.7 Earths if the global population had an equivalent footprint. In comparison, the average ecological footprint in the U.S. is 24 acres per person. Worldwide, there exist 4.5 biologically productive acres per person.

The average individual footprint of 21.3 acres for this block is slightly less (11%) than the U.S. average of 24.0 acres. This difference is mainly realized in a smaller mobility footprint (average of 2.2 acres), which is the likely result of Oak Park being a compact, walkable community, with the 300 S. Humphrey Ave. block being within walking distance of two CTA mass transit lines[9]. The Humphrey Ave. block has a relatively high shelter footprint (average of 7.0 acres), due to the large (1900-2500 sq ft) houses, which require significant energy for heating, cooling and lighting.

Energy, Water and Waste Audit

The second component used for assessing urban ecology for the Humphrey Ave. block was an Energy, Water and Waste Audit. Households were asked to complete a *General Energy Profile Form* (Appendix H), which consisted of eighteen questions, which ranged from house size to age of refrigerator. In addition, households were requested to submit the last three years of their utility bills from Nicor (gas), ComEd (electric) and the Village of Oak Park (water, sewer, refuse).

Household		Nicor (annual)		Nicor (monthly)		ComEd (annual)		ComEd (monthly)	
		Therms	Costs	Therms	Costs	kWh	Costs	kWh	Costs
A		2,016	$2,979	168	$248	23,341	$2,269	1,945	$189
B		2,844	$2,318	237	$193	15,783	$1,191	1,315	$99
C		3,026	$2,619	252	$218	22,252	$2,186	1,854	$182
D		2,208	$1,895	184	$158	7,644	$823	637	$69
E		2,172	$1,521	181	$127	18,599	$1,403	1,550	$117
Sampling	5	12,266	$11,335	1,022	$945	87,619	$7,872	7,301	$656
Individual	**1**	**2,453**	**$2,267**	**204**	**$189**	**17,524**	**$1,574**	**1,460**	**$131**
Block	**20**	**49,064**	**$45,339**	**4,088**	**$3,778**	**350,476**	**$31,490**	**29,204**	**$2,624**

Table 17: Energy Audit: Nicor (Gas) and ComEd (Electric) (June, 2007) (costs rounded to nearest $1)

Three years was requested to balance year-to-year weather fluctuations that may influence heating, cooling and water usage. A sampling of five households completed the *General Energy Profile Form* in June, 2007 and provided their utility bills from the last 1-3 years. The results of the Energy Audit are provided in Table 17.

The relatively high Nicor gas costs are largely due to the vintage of the houses, as many have little, if any, exterior wall and roof insulation. As shown in the photos of the houses (Appendix F), many have large attics that are being used as habitable space, and therefore are conditioned space that adds to the heating and cooling loads. Homes of this vintage and various styles have many windows, which are excellent for daylighting and cross-ventilation, but represent significant areas of heat loss, especially if the original single-pane glazing remains in place.

From meeting with the block residents, it was learned that many houses have low or moderate efficiency furnaces or boilers (80% AFUE), water heaters and air conditioners. Local heating and cooling contractors often install and service a limited selection of equipment, many of which have moderate energy efficiency. Contractors are resistant to installing high-efficiency equipment, as they are not familiar with their service, parts and warranty. A sampling of five households provided their water bills from the last 1-3 years. The results of the Water Audit are provided in the following Table 18.

Household		Water (annual)		Water (quarterly)		Water (monthly)	
		Gallons	Costs	Gallons	Costs	Gallons	Costs
A		85,000	$264	21,250	$66	7,083	$22
B		156,000	$493	39,000	$123	13,000	$41
C		73,000	$230	18,250	$58	6,083	$19
D		61,000	$193	15,250	$48	5,083	$16
E		135,000	$425	33,750	$106	11,250	$35
Sampling	5	510,000	$1,605	127,500	$401	42,499	$134
Individual	**1**	**102,000**	**$321**	**25,500**	**$80**	**8,500**	**$27**
Block	**20**	**2,040,000**	**$6,419**	**510,000**	**$1,605**	**169,997**	**$535**

Table 18: Water Audit: Village of Oak Park (June, 2007) *(costs rounded to nearest $1)*

All potable water in Oak Park is sourced from Lake Michigan. In 2005, the village purchased 1,913.64 million gallons of water from the City of Chicago for $2.5 million. On average, residential water use totaled 3.727 million gallons per day. This water is distributed to customers at a rate of $3.11 per 1000 gallons (as of June, 2007), which is relatively inexpensive in comparison to other U.S. communities. In reviewing the resident's completed General Energy Profile Form, it would appear that simple water conservation strategies such as low-flow faucets and showerheads, ultra-low flush toilets (1.1 gallons/flush), and less water-intensive native landscaping

would reduce their water consumption by about 20%. This would lower the annual water usage for the entire block from 102,000 gallons to 81,600.

A sampling of five households provided their sewer and refuse bills from the last 1-3 years. The results of the Sewer and Refuse Audit are provided in the following Table 19.

Household		Sewer			Refuse		
		Annual	Quarterly	Monthly	Annual	Quarterly	Monthly
A		$105.40	$26	$9	$192	$48	$16
B		$195.68	$49	$16	$192	$48	$16
C		$91.78	$23	$8	$192	$48	$16
D		$76.78	$19	$6	$192	$48	$16
E		$152.38	$38	$13	$192	$48	$16
Sampling	5	$622	$156	$52	$962	$240	$80
Individual	**1**	**$124.40**	**$31**	**$10**	**$192**	**$48**	**$16**
Block	**20**	**$2,488.08**	**$622**	**$207**	**$3,846**	**$962**	**$321**

Table 19: Sewer and Refuse Audit: Village of Oak Park (June, 2007) (costs rounded to nearest $1)

The Village of Oak Park has a combined stormwater and wastewater system, which discharges into the Metropolitan Water Reclamation District (MWRD) of Greater Chicago's Tunnel and Reservoir Plan (TARP) System. Sewer costs for residential water customers in Oak Park (Table 4) are based on the amount of metered water usage (Table 19). The current sewer disposal rate is $1.24 per 1000 gallons (as of June, 2007). Therefore, the focus for the 300 S. Humphrey Ave. block should be on decreasing water usage, with decreased costs benefits in both water and sewer.

In summary, the total utility costs from the above Energy, Water, and Waste Audits for the 300 S. Humphrey Ave. block are provided in the following Table 20.

Households		Nicor	ComEd	Water	Sewer	Refuse	Total
Individual	1	$2,267	$1,574	$321	$124	$192	**$4,479**
Block	20	$45,339	$31,490	$6,419	$2,488	$3,846	**$89,582**

Table 20: Total Utility Costs (June, 2007) (costs rounded to nearest $1)

SOCIAL CHANGE

Social change may occur via various methods, with one of them being community-based social networks. Assessment criteria for the purpose of this paper is based on the ability to effect change within a specific place, in this case the 300 S. Humphrey Ave. block, as evaluated by

meetings and observations with block residents. The criteria is defined by the question; 'how can a group of residents empower themselves by creating a citizen-led, block-by-block approach to a more livable community?'

Background

It was the intent of the Green Blocks Initiative to effect incremental change with the use of community-based social networks, as reflected by the motto; "Building a Greener Oak Park, Block-by-Block". User-created content[10] and shared (distributed) knowledge networks allow citizens to participate via self-initiative and collective wisdom, rather than waiting for the traditional forms of leadership. Each of the 500 blocks in Oak Park is unique upon itself, and who better to address their path towards change than those who reside on these blocks.

Therefore, the Green Blocks Initiative is intended as an open source program, in that residents (users) are encouraged to contribute user-created content through incremental collaborative efforts. This is intended to embody and integrate the unique sense of place of village neighborhoods that can only be provided by village residents. Oak Park has historically been socially organized by neighborhood blocks, and therefore appears to be well-suited for effecting social change by way of social networking. The next step is to create a collaborative network that allows each green block their own autonomy while at the same time being connected to an overall network of green blocks.

Meetings and Observations

Since the 300 S. Humphrey Ave. block began participation in the Green Blocks Initiative (April, 2007), their progress has been monitored by attending their block meetings, which occur approximately every other month. The Humphrey Ave. block has been successful in effecting change in the following ways;

Core Group of Residents: With twenty households residing on the blocks, it has become apparent that most efforts and leadership has emerged from 4-5 households. With an additional 3-4 households that intermittently participate, the core group of households maintains a critical mass of organizational and leadership skills essential for any progress.

Incremental Change: The block has wisely decided to focus on one project per year. The annual project is selected on the basis of common interests, the ability to engage the block residents, and taking advantage of the benefit(s) of collaborating as a group, rather than individually. Towards this end, the block decided to focus on the purchase of rain barrels this past summer.

One resident was able to negotiate a group discount for rain barrels from a local supplier, and several households have now installed rain barrels to their homes. The knowledge gained by the first installers of the rain barrels (which involved several problems) was then shared with other residents.

Knowledge Base: Several block residents were identified as having key knowledge of value to the other residents. For example, one resident is a certified Master Gardener with University of Illinois Extension. Her expertise and relationship with the Oak Park Conservatory has already led to several ideas on native landscaping for block residents.

Communication Network: While Green Blocks Initiative envisioned the use of online social networking as a means of contributing, sharing, communicating, and collaborating with other blocks residents, the Humphrey Ave. block has relied upon daily face-to-face (f2f) interaction with each other, as supplemented with email communication. Residents take turns hosting block meetings in their on home or yard, which is a quasi-social event. The annual block party this past August was used as a means to communicate with other block residents who were not participating, and has been successful in garnering interest.

While f2f communications have proved effective for the 300 S. Humphrey Ave. block, it has been difficult to share their information with other blocks in the village, so that their lessons learned can be used by other blocks. In a shared (distributed) knowledge network, there needs to be a process for identifying and distributing the lessons learned by individual green blocks for the benefit of all other blocks, so as not to reinvent the wheel block-by-block. Perhaps this could be served by a wiki network, which would allow individual block autonomy while still connected to a collective green block network. It will become necessary to take advantage of online technologies to enhance communication, capture and store information resources, distribute shared knowledge and experience, and allow individual and groups to work together via a collaborative working environment.

COMED COMMUNITY ENERGY CHALLENGE

In March 2009, the Village of Oak Park became one of twelve communities selected to participate in the ComEd Community Energy Challenge. The Challenge is intended to assist municipalities in the ComEd service territory develop and implement cost-effective energy efficiency pilot projects to support municipal sustainability objectives (see press release, Appendix I).

As part of their Challenge application to be submitted to ComEd, the village expressed an interest in using the Green Blocks Initiative as part of their actionable energy efficiency plan.

A recommended problem definition for using Green Blocks Initiative for this type of application would be; how can the selection of neighborhood blocks be optimized for; a) housing that has attributes that represent the most potential for energy cost savings, and b) blocks that are conducive to the Green Blocks Initiative process. As previously discussed, these housing attributes are size (larger size consumes more energy), and age (pre-1940 housing is significantly more energy inefficient). Another distinction would be owner-occupied housing, as ownership of rental housing often does not typically pay utility costs (paid by tenants), and thus discourages energy savings capital investments.

Figure 20: NNH, first- and second-order clusters (Mitchell, 2005)

Methods

Due to the need to; a) identify housing by size, age, and ownership attributes that represent the most potential for energy cost savings, and b) identify housing in close proximity that allows face-to-face interaction, *nearest neighbor hierarchal clustering (NNH)* is the selected GIS-based method to be applied for this project. Finding clusters of housing with discrete features within a specified distance from each other is the strength of nearest neighbor hierarchal clustering (Mitchell, 2005). It is also hierarchal, because first and second order clustering can be obtained (fig. 20), which allows the village to identify various scales of potential green block clusters.

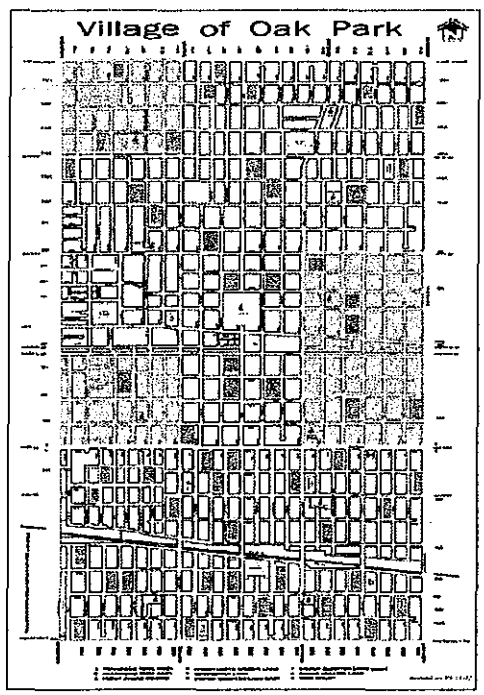


Figure 21.: Green blocks clusters (M. Iversen, 2009)

A manageable amount of Green Block clusters for a village pilot demonstration used in the ComEd Community Energy Challenge would be four or five. To optimize the selection based on this amount of clusters, one could specify a probability level and confidence

level so as to result in this amount of clusters, with some trail and error, by making adjustments to the distances. NNH could be supported, if possible, by field work to capture the more nuanced characteristics of an area (Schlossberg, 2007).

The time period is based on the static features of housing provided during the *2005-07 American Community Survey 3-Year Estimates* data set for the Village of Oak Park, IL. (U.S. Census, 2007), as explained in the below section on Data Sources. The clusters will be identified based on a distance that is conducive to community-based social networks, which is two blocks. In Oak Park (fig. 21), the majority of housing is oriented along north-south streets on blocks typically 660' in length (east-west blocks are typically 330' in width). Therefore, the nearest neighbor distance will be 1320' (Manhattan, due to the street grid) between features.

Data Sources

Primary data source will be the selected population and housing unit characteristics from the *2005-07 American Community Survey 3-Year Estimates* (U.S. Census, 2007) data set for the Village of Oak Park, IL. From the U.S. Census Bureau's Population Estimates Program, the *American Community Survey 3-Year Estimates* data set represents the average characteristics over a 3-year period of time, based on data collected between January 2005 and December 2007.

Specific features from the population and housing data sets will be; units in structure, year structure built, rooms (to identify size of housing unit, since area is not provided), housing tenure (owner- or renter-occupied), housing heating fuel, housing value, and selected monthly owner costs as a percentage of household income. These features are available for each of the 560 census blocks within Oak Park.

Variables

The identification of cluster types will be dependent upon what policy the village pursues with regard the ComEd Community Energy Challenge. For example, to optimize housing selection that has the highest potential energy savings, the village would seek to identify housing clusters that include housing feature based on age, size, and ownership. To optimize housing selection that has the most effect on affordable housing, the village would seek to identify monthly owner costs as a percentage of household income. To optimize housing that has the highest density (proximity) which may be most conducive to the Green Blocks Initiative, the village would seek housing units per census tract (fig. 22).

Clusters will occur in a geographic distribution for housing that has the highest amount of specified features found in close proximity to each other. Identifying the locations of these clusters can allow the village to target their limited resources to the four-five clusters that are most conducive to their desired policy.

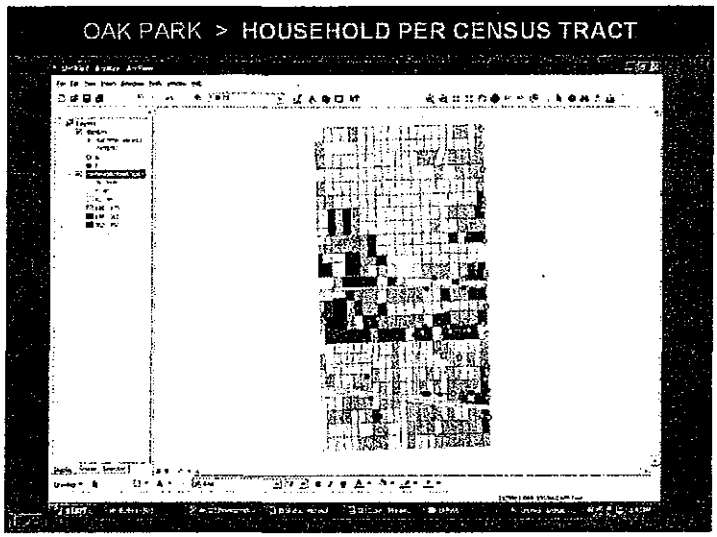


Figure22: Households per census tract in Oak Park (M. Iversen, 2009)

Summary

In general, the use of GIS spatial analyst for specifically investigating the Village of Oak Park as an urbanized ecosystem is potentially a valuable research application in terms of representation, analysis and visualization. Through ArcGIS extensions, such as Spatial Analysis, assessment with specialized tools and functionality available with ArcGIS Desktop is not typically possible through conventional techniques. The visualization of data and information allows more meaningful dialogue between village staff and officials, as well as with the public through participatory planning (Mitchell, 1997).

Specifically, nearest neighbor hierarchical clustering can be used to optimize the selection of neighborhood blocks for use with the Green Blocks Initiative, along with the ComEd Community Challenge as a structured program that can serve as a model for other communities.

The use of urban ecology as a framework for assessing a place can serve the purpose of establishing a baseline of a neighborhood block's ecological footprint and energy and material flows. This baseline can then be used a benchmark to gauge the impact of subsequent actions and social change. For example, the energy consumption baseline can be used to determine the block's pollution emissions from energy generation sources, which in case of the Humphrey Ave. block, would be coal-fired and nuclear generation plants. Any subsequent reduction in electric energy use could be quantified not only in cost savings, but pollution emission reduction as well.

Social networking appears to be an essential ingredient in effecting change. Leadership from a few core residents, along with regular planned and unplanned f2f contact amongst resi-

dents, are the two key factors contributing to the success of the 300 S. Humphrey Ave. Social interaction appears to positively motivate others, and synergistic outcomes are already surfacing. For example, the block has now begun to track and record their individual vehicular usage, in both mileage and time. Another potential project surfaced via word-of-mouth last week, when a local resident offered to meet with the Humphrey Ave. block to discuss creating a shared photovoltaic renewable energy system for the block, which would benefit residents with a 30% group discount. Perhaps the use of the two assessment frameworks, urban ecology and social change, is best exemplified by the 300 S. Humphrey Ave. block's use of a social event, their summer block party, as an annual benchmark for collecting, compiling and updating their individual and collective ecological footprints and utility billings, as a means to gauge the progress of their actions year-to-year.

INFORMATION RESOURCES

VILLAGE OF OAK PARK

Annual Budgets (2006 – 09)

Architectural Survey: Downtown Oak Park and The Avenue Business District: Created by the Oak Park Historic Preservation Commission, and approved by the Village Board on 11.21.05.

Cap the Ike Special Report: Cap the Ike Working Group for the Eisenhower Expressway Citizens Advisory Committee, Village of Oak Park (February, 2003).

Community Profiles (2005 – 09): Includes general demographic information on the Village of Oak Park, including schools, transportation, housing and historic districts.

Comprehensive Plan 1990 (adopted 09.04.90).

Consolidated Housing and Community Development Plan, 2005-2009: The Village of Oak Park 2005-2009 Consolidated Housing and Community Development Plan describes how Community Development Block Grant (CDBG) funds and other available resources will be used in the Village of Oak Park to address affordable housing and community development needs. Very good demographic information specific to Oak Park is included in this Plan.

Park District of Oak Park: Master Plans: The Park District of Oak Park is currently developing master plans for many of its parks.

U.S. Census Bureau 2000: for the geographic area of Oak Park: Profile of General Demographic Characteristics, Selected Social Characteristics, Selected Economic Characteristics, and Selected Housing Characteristics.

UIC-Oak Park Character Plans Project (2002-03): The Village of Oak Park, Illinois (VOP) and the College of Urban Planning and Public Affairs at UIC conducted a joint year-long collaborative planning process using new visualization and communication tools. The joint effort produced character plans for the Harrison Street and Oak Park Eisenhower commercial districts, as well as guidelines and tools to prepare character plans for other business districts in the Village.

Zoning Ordinance and Map, adopted 02.04.02 (revised 03.25.03).

REGIONAL PLANNING ORGANIZATIONS

Regional Planning Board (RPB) www.rpbchicago.org

The Regional Planning Board (RPB) was created through legislation on August 8, 2005. The RPB will combine the previously separate transportation (Chicago Area Transportation Study) and land-use planning (Northeastern Illinois Planning Commission) agencies for northeastern Illinois into a single entity designed to integrate planning for land use and transportation.

Chicago Metropolitan Agency for Planning (CMAP) www.cmap.illinois.gov

CMAP is the official comprehensive planning agency for the greater Chicago metropolitan area, which works with local governments and others to promote sensible growth. The Agency provides the region with comprehensive planning and forecasts of population, employment, and other socio-economic indicators.

Chicago Area Transportation Study (CATS) www.catsmpo.com

CATS is charged with planning and developing a safe, efficient and affordable transportation system for the region. Chicago Area Transportation Study Policy Committee is designated by state and local officials as the Metropolitan Planning Organization (MPO) for the northeastern Illinois region.

Metropolitan Planning Council (MPC) www.metroplanning.org

Founded in 1934, the Metropolitan Planning Council (MPC) is a nonprofit, nonpartisan group of business and civic leaders committed to serving the public interest through the promotion and implementation of sensible planning and development policies necessary for an economically competitive Chicago metropolitan area.

American Planning Association (APA) www.planning.org

APA is a nonprofit public interest and research organization committed to urban, suburban, regional, and rural planning. APA and its professional institute, the American Institute of Certified Planners, advance the art and science of planning to meet the needs of people and society.

American Public Works Association (APWA) www.apwa.net

The American Public Works Association is an international educational and professional association of public agencies, private sector companies, and individuals dedicated to providing high quality public works goods and services.

LINKS

The below online links are to various organizations, municipalities, and programs that are related to some aspect of environmentally-sustainable planning. This is only a partial list from a comprehensive database that was compiled for use in this report.

CATS: Walking and Biking for Transportation	www.catsmpo.com/prog-bikeped.htm
Center for Neighborhood Technology (CNT)	www.cnt.org
City of Austin: Smart Growth Initiative	www.ci.austin.tx.us/smartgrowth
Civic Economics	www.civiceconomics.com
Congress for the New Urbanism (CNU)	www.cnu.org
CoolTown Studios	www.cooltownstudios.com
Demographia	www.demographia.com
Environmental Simulation Center	www.simcenter.org
ICLEI - Local Governments for Sustainability	www.iclei.org/index.php?id=643
LEAM: Land Use Evolution and Impact Assessment Model	www.leam.uiuc.edu
Lincoln Institute of Land Policy	www.lincolninst.edu/index-high.asp
Metro Area Research Corp	www.metroresearch.org/index.asp
Metro Chicago Information Center	http://info.mcfol.org/www/index.aspx
Place Matters	www.placematters.com
Planetizen	www.planetizen.com
Portland Office of Sustainable Development	www.portlandonline.com/osd
Project for Public Spaces (PPS)	www.pps.org
San Francisco Sustainable City	www.sustainable-city.org/index.htm
Sustainable City Plan / City of Santa Monica	www.santa-monica.org/epd/scp
Sustainable Communities Network	www.sustainable.org
Univ. of Louisville / Sustainable Urban Neighborhoods Program	www.louisville.edu/org/sun
USEPA Green Communities	www.epa.gov/region03/greenkit

APPENDIX A: URBAN SUSTAINABILITY INDICATORS – EXEMPLAR PROGRAMS

Sustainable Seattle www.sustainableseattle.org/

In December 2004, Sustainable Seattle resumed the process of selecting and producing Indicators of Sustainable Community through an inclusive participatory process. Previous reports were released in 1993, 1995 and 1998. Called the King County/Seattle Indicator & Strategies for Action Project, the aim of this program is to move the King County region toward sustainability with compelling indicators and strategies for action.

Central Texas Sustainability Indicators Project www.centex-indicators.org/index.html

The Sustainability Indicators Project is intended to increase awareness in the Austin region and commitment to sustainable community development. This goal will be accomplished through an ongoing public discussion that defines Central Texas residents' vision of sustainability, and creates sustainable indicators will track their progress towards sustainable development.

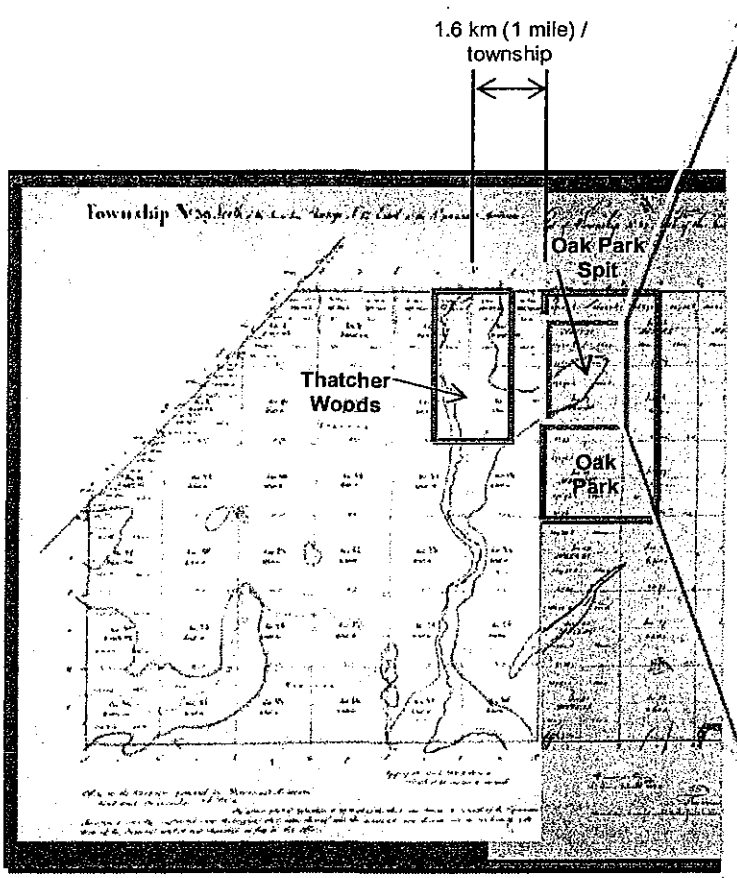
The Sustainability Indicators Project completed its first report in the spring of 2000, compiled from numerous Advisory Board meetings and input from area residents. The process included a community forum where the community input was evaluated for determining the inaugural 42 indicators. Subsequent annual reports will follow a similar process of development and dependence on community input.

Santa Monica Sustainable City Program http://santa-monica.org/epd/scp

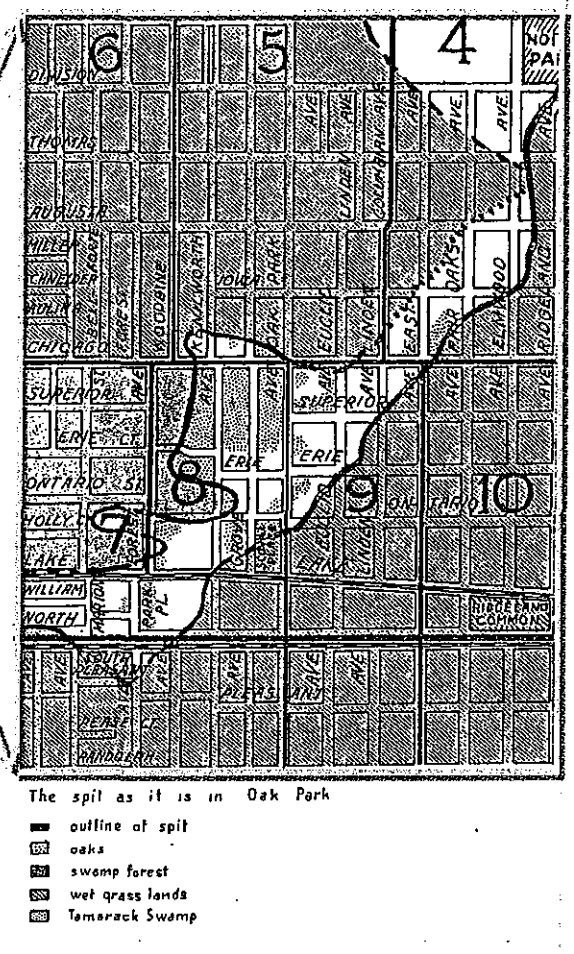
Specific indicators have been developed to measure progress of each goal of the program. Indicators are used as the means to determine the condition of a system, or the impact of a program, policy or action. When tracked over time, indicators tell Santa Monica whether they are moving toward sustainability, and provide them with useful information to assist with decision-making.

Two types of indicators are tracked as part of the Sustainable City Plan. System level indicators measure the state, condition or pressures on a community-wide basis for each respective goal area. Program level indicators measure the performance or effectiveness of specific programs, policies or actions taken by the City government and stakeholders within the community.

APPENDIX A: LOCATION MAP OF THE OAK PARK SPIT



Public Land Survey Map (1834)

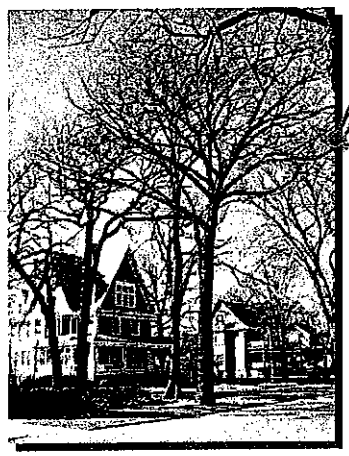


Oak Park Spit with Street Layout (Evans, 1921)

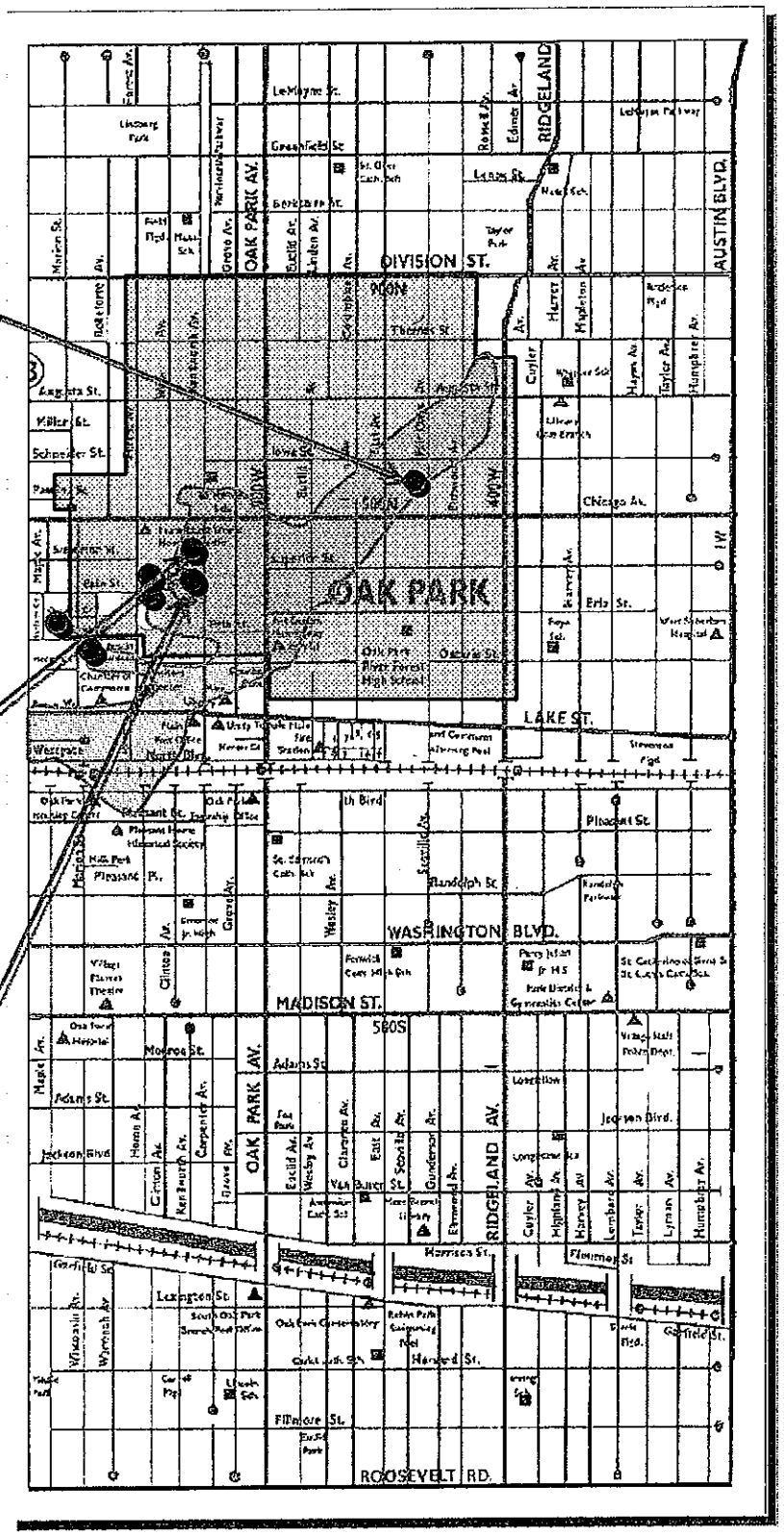
APPENDIX B: LOCATION MAP OF HERITAGE BUR OAK TREES IN VILLAGE OF OAK PARK

Bur Oak
535 N. Fair Oaks Ave.

Bur Oak
427 N. Kenilworth Ave.



Bur Oak
417 N. Kenilworth Ave.



Legend ● Heritage Tree ▭ Oak Park Spit

▭ Frank Lloyd Wright / School of Prairie Architecture Historic District

Photos and graphics by Michael Iversen. Map from Village of Oak Park.

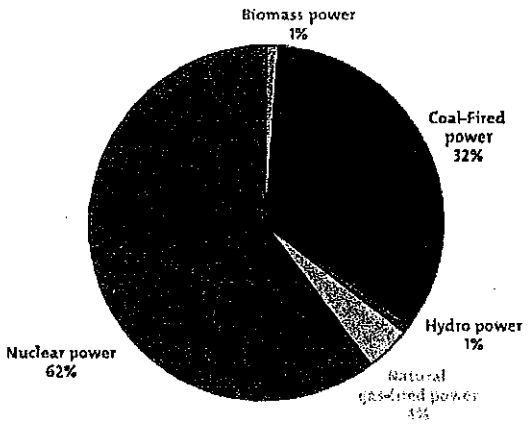
APPENDIX C: COMMONWEALTH EDISION ENVIRONMENT DISCLOSURE STATEMENT

ComEd's Environmental Disclosure Statement

The disclosure of this information is required under Section 16-127 of the Electric Service Customer Choice and Rate Relief Law of 1997 and the rules of the Illinois Commerce Commission, 83 Ill Admn. Code 421.

Sources of Electricity Supplied for the 12 months ending June 30, 2009	Percentage of Total
Biomass power	1%
Coal-fired power	32%
Hydro power	1%
Natural gas-fired power	4%
Nuclear power	62%
Oil-fired power	0%
Solar power	0%
Wind power	0%
Other resources	0%
Unknown resources purchased from other companies	0%
TOTAL	100%

Sources of Electricity Supplied for the 12 months ending June 30, 2009



AVERAGE AMOUNTS OF EMISSIONS[2] and AMOUNT OF NUCLEAR WASTE[3] per 1000 kilowatt-hours (kWh) PRODUCED FROM KNOWN SOURCES for the 12 months ending June 30, 2009	
Carbon dioxide	703.19 lbs.
Nitrogen oxides	1.03 lbs.
Sulfur dioxide	3.41 lbs.
High level nuclear waste	0.006 lbs
Low level nuclear waste	0.0004 cubic feet

[1] These figures constitute the aggregation of information provided by ComEd's wholesale energy suppliers, many of whom have indicated that their source is the "PJM system mix." The PJM system mix is the collective generation produced within the PJM Interconnection, which is the regional transmission organization that maintains the safety, reliability, and security of the transmission system and operates an efficient and effective wholesale electric market in 13 states and the District of Columbia. ComEd's electric service territory is within the PJM footprint.

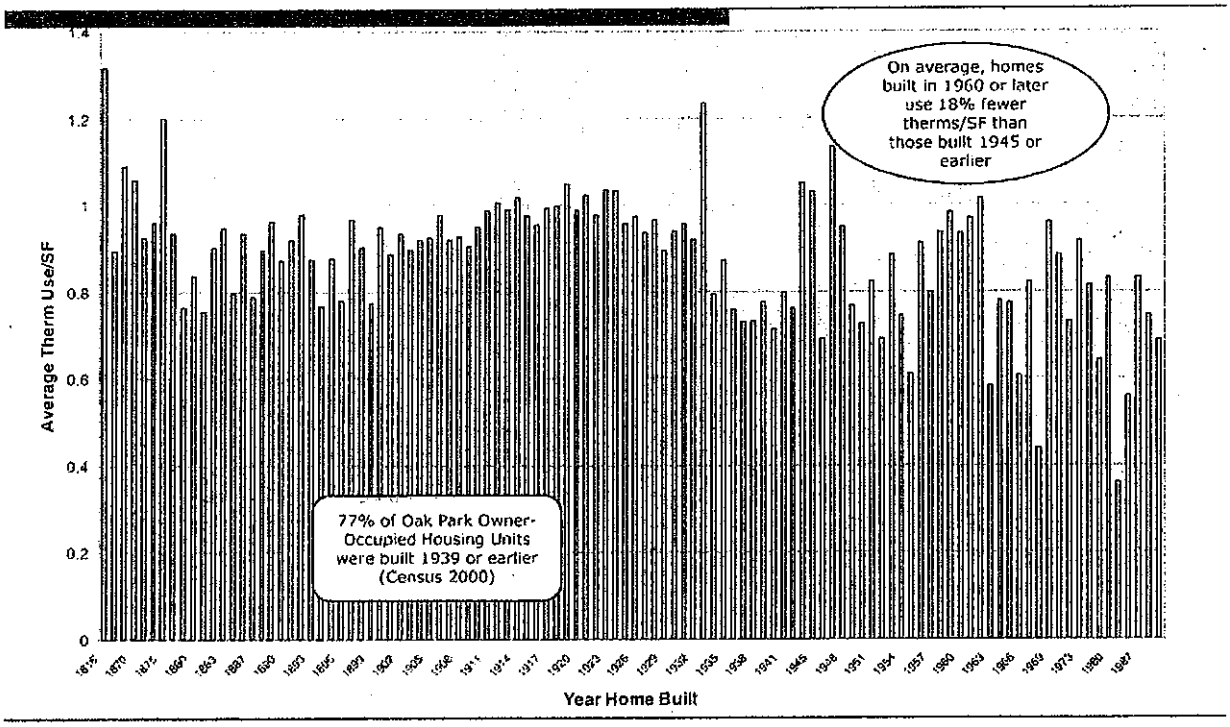
[2] The source for the baseline emissions data for that portion of the emissions that are associated with PJM system mix is PJM Environmental Information Services, Inc. (www.pjm-eis.com) For energy that is sourced from the PJM system mix, emissions rates are calculated using the most current emissions data from the Quarterly PJM System Mix by Fuel Reports. These reports exclude the effects of energy imports, exports, external generation and behind-the-meter generation. Those quarterly reports also exclude the effects of any claims on any specific component(s) of the mix.

[3] Nuclear Waste rates were calculated based on Generation Net for Sale.

Additional information on companies selling electrical power in Illinois may be found at the Illinois Commerce Commission's World Wide Web site www.icc.state.il.us.

APPENDIX D: AVERAGE PREDICTED ANNUAL THERM USE / SQUARE FOOT BY YEAR HOME BUILT

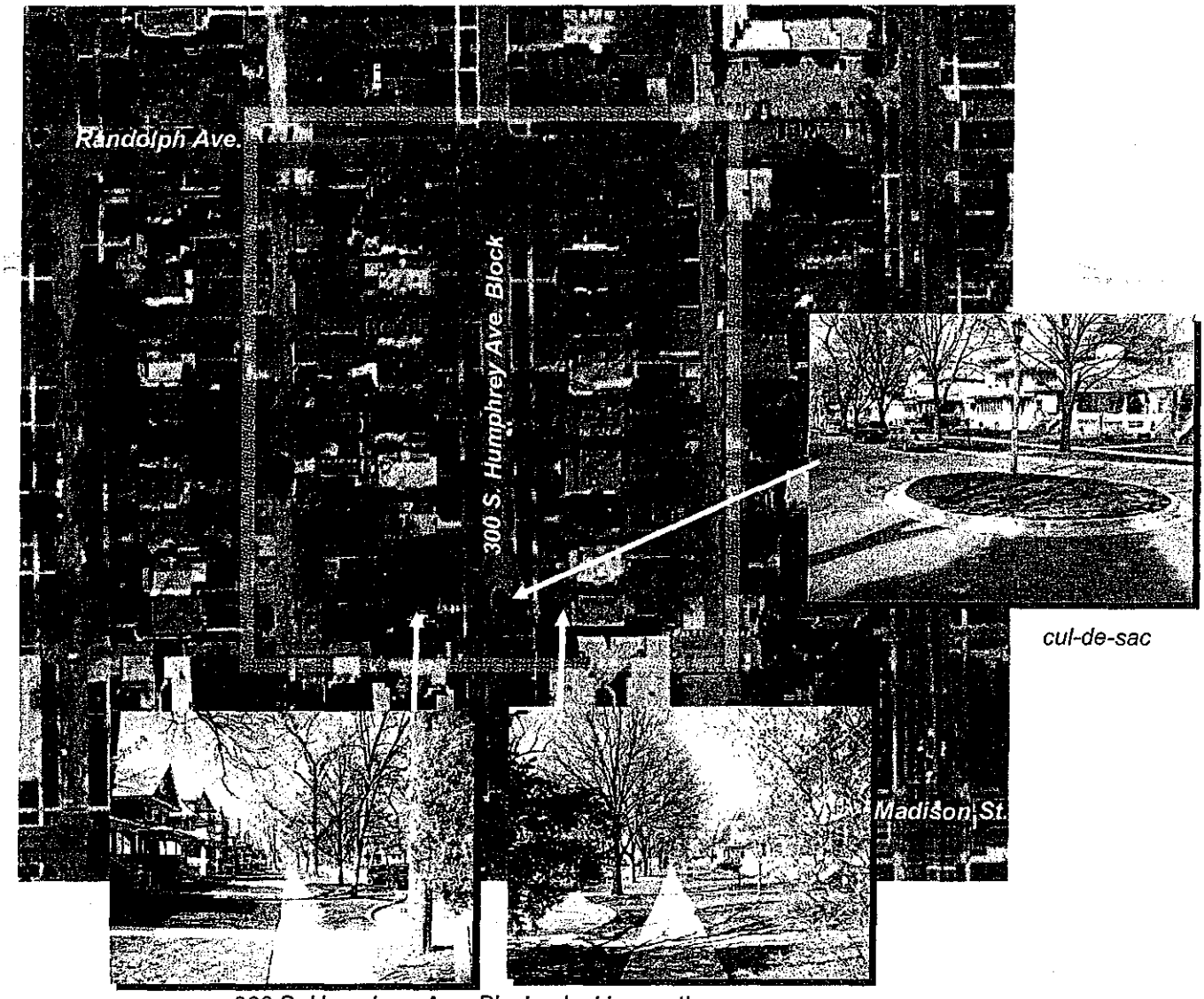
Average Predicted Annual Therm Use/Square Foot by Year Home Built (Oak Park)
(n=8,395)



Provided by Village of Oak Park
Prepared for Commissioner Lieberman (Nicor Gas, 2008)

APPENDIX E: 300 S. HUMPHREY AVE. BLOCK

300 S. Humphrey Ave. Block – looking south



300 S. Humphrey Ave. Block – looking north

APPENDIX F: BUILDING TYPOLOGY

APPENDIX G: ECOLOGICAL FOOTPTINT QUIZ

ECOLOGICAL FOOTPRINT QUIZ

Complete the Ecological Footprint Quiz at http://www.myfootprint.org/. It will only take a few minutes to respond to the 15 questions to estimate one's individual Ecological Footprint. *Each member of the household should complete this exercise, with the sum total representing the entire household's Ecological Footprint.*

The Ecological Footprint measures how much land and water we need to produce the resources we consume and to absorb the waste we make. Then you can compare your Ecological Footprint with the biological capacity that exists on this planet. For each of the 6.2 billion people on Earth, an average of 4.5 acres of biologically productive space exists.

In order to track and compile individual responses to the Ecological Footprint Quiz for the 300 S. Humphrey Ave. block, I have provided the same 15 questions below. Upon completion of the online Ecological Footprint Quiz, please complete and return this form to my attention via email. I will then create a representative household ecological footprint composite of the 300 S. Humphrey Ave. block.

From the Ecological Footprint web site, please submit your *individual* results in the following table.

Category (footprint)	Acres
Food	
Mobility	
Shelter	
Goods / Services	
Total Footprint	

If everyone lived like you, we would need _____ planets.

Remember, each member of your household should complete the Ecological Footprint Quiz and return this form. Identify your name and address on the email message only, as individual results will be kept private. Thanks for your time and effort in completing this form and determining your block's footprint.

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Food Footprint

1. How often do you eat animal based products? (beef, pork, chicken, fish, eggs, dairy products)

- ☉ Never (vegan)
- ☐ Infrequently (no meat, and eggs/dairy a few times a week) (strict vegetarian)
- ☐ Occasionally (no meat or occasional meat, but eggs/dairy almost daily)
- ☐ Often (meat once or twice a week)
- ☐ Very often (meat daily)
- ☐ Almost always (meat and eggs/dairy in almost every meal)

Ecological Footprint Quiz (page 1 of 5)

APPENDIX H: GENERAL ENERGY PROFILE QUESTIONS

GREEN BLOCK INVENTORY FORM 300 S. HUMPHREY AVE.

GENERAL ENERGY PROFILE QUESTIONS

Your responses to the following questions will be compiled with other responses from your block, and then assessed to determine green design strategies that are specifically applicable to homes on your block.

1. What is your property lot dimensions and size (ex.: 50' x 175' = 8,750 sf)?
2. What is your approx. home size (habitable space only, exclude unfinished attic and basement)?
3. What is your home's approx. physical footprint (lot area occupied by home)?
4. How many garage and outdoor parking spaces does your property have?
5. How old is your home (approx.)?
6. How well would you say your home is insulated (poorly, moderately, well-insulated)?
7. What type is your main heating system (gas furnace, gas boiler, oil furnace, oil boiler, electric)?
8. What year was your main heating system installed (approx.)?
9. What type is your main air conditioning system (central, window unit, none)?
10. What year was your main air conditioning system installed (approx.)?
11. What type is your water heater (gas, electric)?
12. What year was your water heater installed?
13. How many and what type of windows do you have (double-pane, single-pane w/ storms, single-pane w/o storms)?
14. Do you have a programmable thermostat?
15. List your appliances (refrigerator, dishwasher, washer, dryer, etc.), and note which ones are rated EPA energy star?
16. Is your dryer gas or electric?
17. How old is your refrigerator?
18. How many light fixtures (interior and exterior) do you have, and how many use CFL lamps (bulbs), motion sensors and/or daylight sensors?

APPENDIX I: COMED COMMUNITY ENERGY CHALLENGE – PRESS RELEASE

CHICAGO (Nov. 10, 2008) – ComEd today announced its first Community Energy Challenge, one of the first of its kind in the nation. A dozen local municipalities have been chosen to participate due to their demonstrated commitment to sustainability. The Challenge will kick off Nov. 12 with a Mayors' Planning Charrette at the Museum of Science and Industry in Chicago and will run through May 2010.

The Challenge is designed to help municipalities in the ComEd service territory develop and implement cost-effective energy efficiency pilot projects to support municipal sustainability objectives. Environmental sustainability refers to balancing the use of natural resources to meet the needs of the present while ensuring natural resources are available for future generations.

ComEd is engaging these communities in the planning stages to help design the programs. Challenge participants will have the opportunity to secure funding at the conclusion of the Challenge to assist in meeting climate change and other sustainability objectives in their community.

"We're proud to work with these communities in developing actionable energy efficiency plans that are on the leading edge of environmental sustainability initiatives," said Val R. Jensen, vice president, Marketing and Environmental Programs, ComEd. "This pilot program recognizes the past efforts of these communities while ensuring that their energy efficiency focus translates to structured programs that can serve as a model for other communities."

The Community Energy Challenge is the latest addition to ComEd's Smart Ideas portfolio of energy efficiency programs and supports Exelon 2020, a comprehensive strategy announced earlier this year by Exelon, ComEd's parent company, to reduce, offset or displace more than 15 million metric tons of greenhouse gas emitted by its family of companies and customers.

ComEd's other environmental initiatives include the 12 Ways to Green campaign to educate customers about ways to conserve energy, save money and help the environment; operating one of the largest private fleets of biodiesel vehicles; and other efforts to reduce its carbon footprint.

Working in conjunction with the Metropolitan Mayor's Caucus, ComEd selected the participating communities based on their commitment to sustainability. These communities include Aurora, Carol Stream, Elgin, Evanston, Highland Park, Hoffman Estates, Northbrook, Oak Park, Orland Park, Palatine, Schaumburg and Wilmette.

"Northern Illinois municipalities are at the forefront of innovative environmental strategies. This public-private partnership between our member municipalities and ComEd is a tremendous opportunity to work together to reduce electricity consumption," said Dave Bennett, executive director, Metropolitan Mayors Caucus.

Project plans will be judged on their potential to meet energy and sustainability requirements including reducing municipal building energy consumption; reducing community energy consumption; addressing community education surrounding energy efficiency and sustainability; meeting regulatory cost effectiveness requirements, and leveraging resources to meet a sustainability objective. Funding from the reserve will be awarded to municipalities based on their plans' energy reduction potential.

ComEd, the Department of Commerce and Economic Opportunity (DCEO) and the Metropolitan Mayors Caucus (MMC) will provide program design and technical assistance throughout the Challenge.

Commonwealth Edison Company (ComEd) is a unit of Chicago-based Exelon Corporation (NYSE: EXC), one of the nation's largest electric utilities with approximately 5.4 million customers. ComEd provides service to approximately 3.8 million customers across Northern Illinois, or 70 percent of the state's population.

NOTES

1. The National Science Foundation (NSF) has long since recognized the important role of ecological science in furthering the understanding of urbanized ecosystems, as evidenced by the Long-Term Ecological Research (LTER) Program. Within this integrated social-ecological framework, NSF has developed transdisciplinary questions by teams of biophysical and social scientists, which require new socio-ecological observations, experiments, and modeling activities (LTER, 2007).

2. More than 40 years ago. V.O. Key identified the basic budgeting question as: "On what basis shall it be decided to allocate x dollars to activity A instead of activity B?" Despite decades of budgetary research and innovation, the question remains unanswered and probably unanswerable. As Key recognized, a solution to this problem would constitute a full-blown theory of government. Although neither Key nor others have provided a firm answer to this basic question. Key's article is a valuable reminder that budgeting is much more than technique. This lesson is immediately forgotten when the latest reform comes to market promising a neat formula for dividing the budget pie. The lesson is relearned again when administrative and political pathologists seek cause and effect for the

3. The LEED for Neighborhood Development Rating System integrates the principles of smart growth, urbanism and green building into the first national system for neighborhood design. The ballot for LEED for Neighborhood Development opened on August 19, 2009 and will close on September 17, 2009. Voting is open to members of the LEED-ND consensus body that was formed between December 18, 2008, and February 15, 2009, to be the designated body to vote on LEED for Neighborhood Development. Projected issuance is for Fall 2009.

4. The figures in Table 1 and 2 were compiled using information provided by the Envirofacts database of the U.S. Environmental Protection Agency.

5. *Green Tuesdays in the Village* is an annual public lecture series on various environmental topics and issues specifically relevant to the Village of Oak Park. The theme for 2007 was *Green Blocks*, an incremental block-by-block approach to achieving integrated and ecological neighborhoods throughout the Village of Oak Park. *Green Tuesdays in the Village 2007* was co-sponsored by Environmental and Energy Advisory Commission / Village of Oak Park and the Urban Planning and Policy Program / University of Illinois at Chicago.

6. While *sustainability* was listed as one of the frameworks from which to choose, I prefer the use of terms relative to the specific application, such as *urban ecology*. The use of the term sustainability is often arbitrary and ill-defined, which may result in confusion and misinterpretation. The term sustainability is a transitive verb which requires both a subject and object(s). Therefore the use of this term requires the inclusion of 'what is being sustained', and 'who is doing the sustaining'. Since the root word *sustain* is commonly defined as to 'keep in existence, maintaining', the term sustainability connotes something that will persist indefinitely. Since there is no natural or human-designed system that persists indefinitely, the use of the term sustainability needs to be within this conceptual framework.

7. Mathis Wackernagel and William Rees, *Our Ecological Footprint: Reducing Human Impact on the Earth* (Gabriola Island, BC: New Society Publishers, 1996), 158.

8. As defined by Redefining Progress, biologically-productive land consists of crop land, pasture land, forest, fisheries, and carbon storage areas. (Redefining Progress web site, http://www.rprogress.org/ecological_footprint/footprint_FAQs.htm)

9. The CTA Blue Line Austin Station is 0.9 miles south of the 300 S. Humphrey Ave. block, while the CTA Green Line Austin Station is 0.31 miles to the north.

10. "User-created content is all around us, from blogs and photostreams to wikibooks and machinima clips. Small tools and easy access have opened the doors for almost anyone to become an author, a creator, or a film-maker. These bits of content represent a new form of contribution and an increasing trend toward authorship that is happening at almost all levels of experience." Horizon Report (2007). The 2007 Horizon Report is a collaboration between The New Media Consortium and the EDU CAUSE Learning Initiative An EDU CAUSE Program, The New Media Consortium.

11. *An Ordinance Authorizing Commonwealth Edison Company to Use the Public Ways and other Public Property in Conjunction with its Construction, Operation and Maintenance of an Electric System in a Through the Village of Oak Park, Cook County, Illinois* (Ordinance No.1993-0-44), adopted by the Board of Trustees of the Village of Oak Park on May 17, 1993.

12. Data set was the *2007-2007 American Community Survey* for selected housing characteristics (total housing units) in the Village of Oak Park, with a margin of error of +/- 252.

13. For an itemization and explanation of ComEd's monthly residential customer charges, adjustments and taxes, refer to ComEd's web page, *Understanding Your Bill*, at http://www.comed.com/sites/customerservice/Pages/understandingyourbill.aspx.

14. Data set was the *2007-2007 American Community Survey* for selected housing characteristics (house heating fuel) in the Village of Oak Park, with a margin of error of +/- 712.

15. For an itemization and explanation of Nicor's monthly residential customer charges, adjustments and taxes, refer to Nicor's web page, *Understanding Your Bill*, at http://www.nicor.com/en_us/residential/understanding_your_bill/features.htm.

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