CONSERVATION DESIGN FORUM

*Landscape Architecture ● Community Planning ● Ecological Restoration ● Resource Management*

# VILLAGE OF OAK PARK: SYSTEM MODEL


*prepared for:*

**VILLAGE OF OAK PARK**

Village Hall
123 Madison St.
Oak Park, IL 60302-4272
Phone: 708.358.5770
http://www.oak-park.us/

*prepared by:*

**CONSERVATION DESIGN FORUM**

375 W. First Street
Elmhurst, Illinois 60126
phone: 630.559.2000
www.cdfinc.com

**October 6, 2009**

**TABLE OF CONTENTS**

**ACKNOWLEDGEMENTS**

**Environmental and Energy Advisory Commission**

2-21-2: Duties: The Environmental and Energy Advisory Commission (EEAC) shall advise the Board of Trustees with regard to the following: energy-related matters of concern to the Village; methods of promoting energy efficiency and energy conservation for the Village government and Village residents; the best methods of maintaining an environment beneficial to the Village and as free from pollution as is practical and is reasonable; methods to promote recycling and reduce waste in the Village; and solid waste management-related matters generally in the Village. (Ord. 1997-0-32, 8-4-97) *(Village Code: Chapter 2, Article 21. November 17, 2008)*

**EEAC Members** (as of October 6, 2009)

Edward Malone (chair)

Carolyn Cullen

Frank Fletcher

Michele Gurgas

Laura Haussmann

Robert Peterson

McLouis Robinet

Betsy Williams

**EEAC trustee liaison**

Jon Hale

**EEAC staff liaison**

Karen Rozmus, Solid Waste Manager / Department of Public Works / Village of Oak Park

**Village of Oak Park**

Tom Barwin, Village Manager

**Kathryn Poulos**

Sustainability Manager

## Resource Advisors

Mary Ashley, PI / NSF IGERT Landscape, Ecological & Anthropogenic Processes / UIC
Bill Berth / Roy Strom Refuse
James Budrick, Village Engineer / Village Of Oak Park
Mark Burger, Owner / Kestrel Development (formerly with Spire Solar Chicago)
Marcus de la fleur, RLA, ASLA, Landscape Architect / Conservation Design Forum
Mark Duntemann, Owner / Natural Path Urban Forestry Consultants
Philip and Kathi Elwood, residents and renewable energy homeowners / Oak Park
Ron Fantetti, Superintendent of Fleet Services / Public Works Dept. / Village of Oak Park
Mike Fenwick, Streets Superintendent / Public Works Dept. / Village of Oak Park
Redd Griffin, Board Member/ Illinois State Historical Society
Victor Guarino, Sr., Master Steward / Thatcher Woods Oak Savannah Restoration
Frank Heitzman, AIA, ASID, Principal / Heitzman Architects
Brian Jack, Superintendent of Water & Sewer / Public Works Dept. / Village of Oak Park
Martin Jaffe, Director, Associate Professor / Department of Urban Planning and Policy / UIC
Gregory Kramer, Director of Public Works / Village of River Forest
Craig Lesner, Chief Financial Officer / Village of Oak Park
Frank Lipo, Executive Director / Historical Society of Oak Park and River Forest
Edith Makra, Community Trees Advocate / The Morton Arboretum
Ellen McKenna, Civil Engineer / Public Works Department / Village of Oak Park
Dennis Nyberg, Associate Professor / Dept. of Biological Sciences / UIC
Karen Rozmus, Solid Waste Manager / Public Works Department / Village of Oak Park
Vic Sabaliauskas, Assistant to the Director / Public Works Dept. / Village of Oak Park
Jim Semelka, Forestry Superintendent / Public Works Department / Village of Oak Park
Tom Theis, Associate Director / Institute for Environmental Science and Policy / UIC
Brian Urbaszewski, Environmental Health / American Lung Association of Metro Chicago
Betsy Vandercook, Chair / Chicago Recycling Coalition
John Walton, Fleet Services Manager / Forest Preserve District of DuPage County
John Wielebnicki, Director of Public Works / Village of Oak Park

**PROJECT TEAM**

This report was prepared and completed by Conservation Design Forum (CDF).

CDF provides integrated water-based ecological design, using a collaborative process that results in the enduring qualities of beauty, authenticity, and community - tailored to the unique attributes of people, place, and program. CDF is a nationally recognized design firm that explores and creates integrated, water-based design strategies that promote economic, social, and ecological sustainability.

CDF staff members worked collaboratively with key representatives of Village government, elected officials, the Green Team staff, relevant citizen commissions (such as the Environmental and Energy Advisory Commission), and other project participants listed on the previous page as resource advisors. The primary CDF staff members assigned to serve on this project included:

James M. Patchett, RLA, LEED AP
*Founder and President*

David Yocca, RLA, AICP, LEED AP
*Lead Project Principal*

Dr. Gerould Wilhelm
*Principal Botanist and Ecologist*

Tom Price, P.E.
*Principal Civil Engineer/ Hydrologist*

Jason Navota
*Project Manager*

Michael Iversen, RA, LEED AP
*Planning Intern*

# I. EXECUTIVE SUMMARY

While the Village of Oak Park has several exceptional attributes towards achieving environmental-sustainability relative to other communities, it still has the challenge of having an ecological footprint that far exceeds the carrying capacity at various local, regional, and global scales (see *Ecological Footprint* section of this report). While most of this ecological footprint is inherent for any community that is located within the infrastructure and standard of living of the United States, there are two primary issues that became apparent during the course of this study that are specific to Oak Park, as follows;

- The lost opportunity of not taking advantage of available renewable resources, while instead relying on an energy intensive, inefficient, and costly infrastructural system.
- The existing disconnect of accountability between those who derive the benefits of any environmentally-sustainable strategy, and those who bear the costs. During our investigation, there appeared to be not only a lack of incentives to initiate environmentally-sustainable policies and strategies, but often disincentives as well.

The following are a few examples of these issues.

*Water*

Oak Park receives an annual rainfall of 35.82” / year, or 2.8B 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 Stickney Waster Reclamation Plant of the Metropolitan Water Reclamation District (MWRD) of Greater Chicago.

The Village of Oak Park pays a wastewater treatment fee to MWRD which is based upon the amount of supply water provided to Oak Park from Lake Michigan. Property owners in Oak Park also pay an additional wastewater treatment fee to MWRD through their property tax bills, based on their property’s estimated assessed value. Therefore, there is no economic incentive for the Village of Oak Park collectively, or property owners individually, to reduce or pre-treat their stormwater / sewer discharge, as there will be little, if any, realized cost savings benefit.

While approximately 1.7B gallons per year of unused rainfall is being sent to MWRD, Oak Park imports over 2B gallons (2008) per year of Lake Michigan supply water from the City of Chicago, at a cost to Oak Park resident end users of $8.8M. While free and plentiful rainfall is being diverted to MWRD, Oak Park is paying the City of Chicago to pump, process, and deliver water from Lake Michigan for watering yards and gardens, washing cars, and other nonpotable water uses.

*Commonwealth Edison Franchise Agreement*

The Village of Oak Park has an agreement with Commonwealth Edison (ComEd) which allows the utility company use of the public way in exchange for the supply of electricity, without charge, to the Village that is used for traffic lighting, building lighting and various other uses in municipally-owned and occupied buildings. This agreement was adopted by the village in 1993, and lasts for a term of 58 years.

Therefore, the Village has no economic incentive to implement energy-efficiency measures with regard to traffic lighting, municipal building lighting and other electrical loads, as they will incur an initial cost investment without benefit of energy cost savings.

*Energy*

Oak Park receives a vast amount of solar radiation within its 4.5 sq. mi. of land area. In terms of energy, Oak Park receives between 67M Btu/day during December, and 256M Btu/day during June. While this supply of solar energy is largely unused, Oak Park residents import about 161M kWh (2008) per year of electricity from ComEd at a cost of $21.9M. Residents also import over 26.4M (2008) therms per year from Nicor at a cost of $30.3M.

The resultant annual greenhouse gas emission (2008) from this consumption of electricity includes over 77,000 lbs. of carbon dioxide (CO2). Resultant air pollution emissions also include 375,000 lbs. per year of sulfur dioxide (SO2), and 1,278 lbs of high level nuclear waste.

Despite this disconnect between free and plentiful sunlight with expensive, fossil-fuel or nuclear-based energy sources, it was found that the Village of Oak Park has a disincentive for reducing this imported energy use. The municipal utility tax on ComEd residential energy billings is nearly $1.0M per year, while the municipal utility tax on Nicor billings is approx. $1.6M per year. Therefore, any reduction in electrical or natural gas usage will significantly reduce a primary revenue stream in the village operating budget's General Fund.

*Challenges*

Although Oak Park was originally planned and developed as a highly decentralized and walkable community, recent growth and development trends in the Chicago metropolitan area have exerted pressure on inner-ring suburbs, such as Oak Park, towards becoming a more centralized, auto-centric community. For example, in 1917, there were 2,372 autos registered in the Village of Oak Park. With a population at that time of 34,876 persons, that was one vehicle for every 15 residents. There are currently over 30,756 vehicles registered in Oak Park, with a population of 52,524 (U.S. Census, 2000), which is one vehicle for every 1.7 persons.

The net result is more Oak Park residents are being influenced to use their vehicles for local destinations, such as stores, parks, and schools, rather than walking or biking. To accommodate the increased vehicular traffic, the Village invests significant capital funding to construct, operate, maintain, and secure an infrastructure that is necessary for a more auto-centric community. Additional adverse impacts are also incurred from increased pollution emissions and resultant public health risks (such as asthma), increased traffic accidents and resultant casualties, decreased walking/exercise and resultant public health effects (such as obesity), and increased fossil fuel usage associated with global warming and security risks.

*Opportunities*

This report discusses several opportunities that exist towards affecting a more environmentally-sustainable village. They are being provided for consideration for an updated Village of Oak Park *Comprehensive Plan*, and therefore are broadscope in scale, as appropriate for use with this primary planning policy document.

*Summary*

As explained in the *Methods* section of this report, the approach for this report is comprised of three phases: Scoping, Inventory, and Assessment. The emphasis is on the first two phases, as the Assessment Phase relies upon discussion and feedback from the village upon completion and review of the Scoping and Inventory Phases. The amount of data and information gathered and compiled for this report has been comprehensive, and every effort has been made to compile, organize and integrate this information in a meaningful manner for various users.

Essentially, this report provides a model of the energy, material, monetary, cultural, and information flows throughout the system defined as the Village of Oak Park. This latest representation of Oak Park is historically aligned with the first pre-European settlement representation provided by John Walls, a Federal field surveyor whose field notes (1821) and subsequent plat map (1834) scoped and inventoried this area’s pre-European settlement flora and fauna (fig. 1).

The next step would be to continue this process further, and provide a detailed Improvement Analysis given the benefit of this model. This next step would also include the input of the inventoried data sets representing the energy, material, monetary and information flows of Oak Park, within multiple and integrated Excel workbooks. This functionality would allow causal relationships between data sets to be realized for scenario building and projections, allowing village officials the capability of interactive decision- and policymaking that is necessary with regard to the complex adaptive system known as the Village of Oak Park.

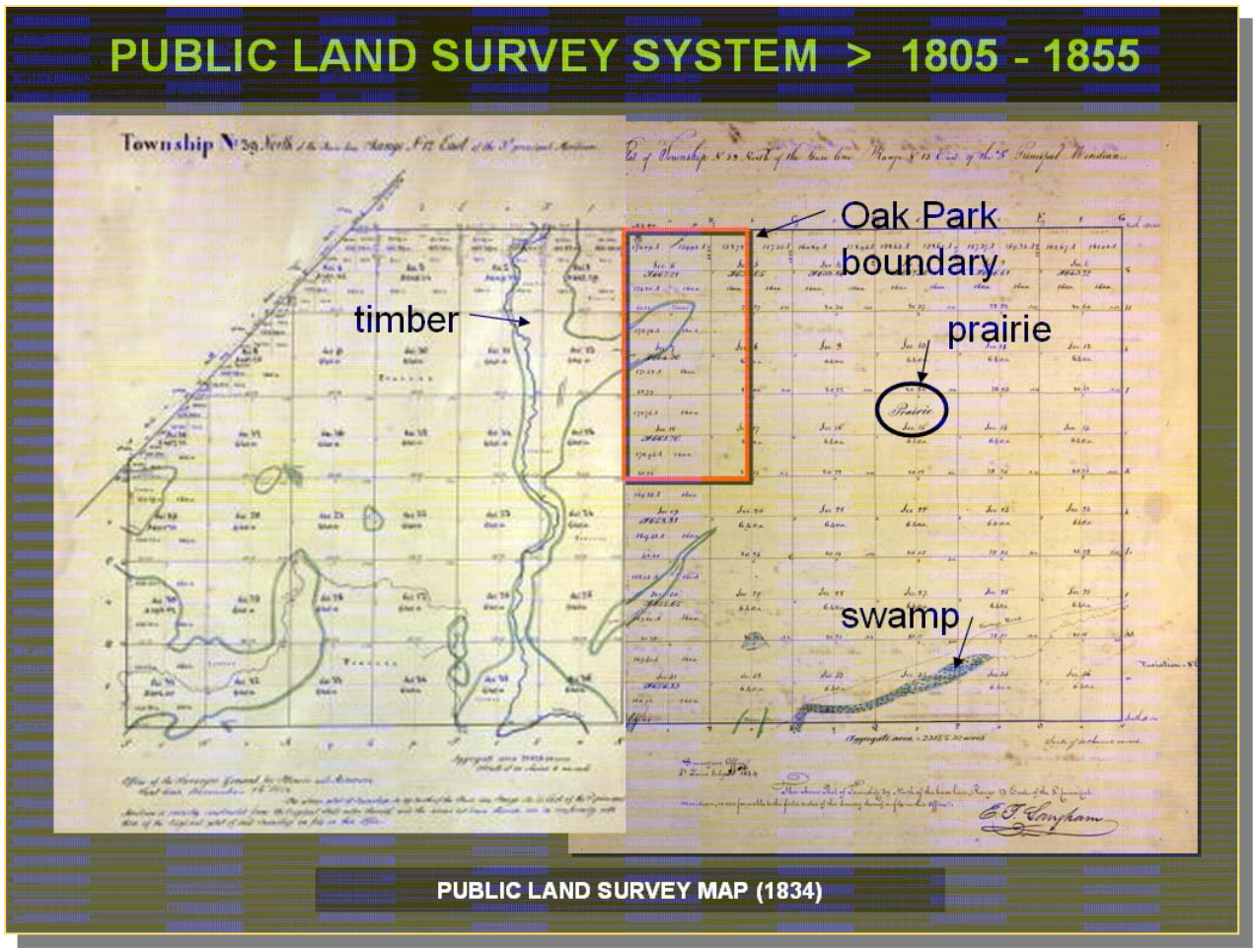



Fig. 1. Public land survey map (1834) of pre-European settlement in the Oak Park area.
(image by M. Iversen)

# II. INTRODUCTION

*On what basis shall it be decided to allocate X dollars to Activity A instead of Activity B, or instead of allowing the taxpayer to use the money for his individual purposes?*[2] *(Key, 1940)*

This study is based on the investigation of the Village of Oak Park as an urbanized ecosystem. Instead of addressing each component independently, this holistic approach views the village as an ecosystem in which components are interconnected and interdependent. This approach allows for a complex, dynamical system model based on scoping, inventorying, and assessing the system's critical variables and relationships, as represented by the flux and cyclic processes of energy, materials, costs, and information. A system model serves as a basis for how energy, materials, information, people and costs interact on a complex and dynamic urban scale. How energy and materials are processed, the impacts of densification, economic performance, and the rate at which change occurs can all be informed by a model of the system that links size to scale and form through information, material, and social networks that constitute the essential functioning of communities.

For most municipalities, the decision- and policymaking process relative to environmental-sustainability is somewhat fragmented and ad hoc. There is a need for a more formalized system and process that accesses relevant, reliable, and accurate information relative to the current and projected impacts of any proposed village policy.

A system model conceptualizes the Village of Oak Park within a socio-ecological framework, so as to allow a more formalized level of inquiry[1]. From this conceptualization, scenarios may be assessed relative to their alignment with the village's overall vision. This is intended to enhance informed decision- and policymaking, prioritized within the municipal budget and allocation of public expenditures.

For a decision-making process to be more than a checklist of issues and strategies, a systems-based integrative approach is needed to seek interrelationships, patterns and synergies. Towards this end, a decision-making model may be used to identify 'synergies' and 'conflicts' between interrelated strategies. 'Synergies' are the interaction of two or more agents or forces so that their combined effect is greater than the sum of their individual effects 'Conflicts' include any strategies that adversely effect the performance or outcome of another strategy.

And finally, a model provides the 'logic' to assign rank order (prioritization) relative to the potential effectiveness of issue / strategies, so as to provide a basis for informed decision- and policymaking. Towards this end, the intent of a model is to understand and improve the urbanized ecosystem of Oak Park according to; 1) the level of difficulty relative to implementing the strategy in terms of expertise and technology (i.e., readily achievable, not readily achievable, not achievable); 2) the applicable time scale relative to implementation (immediate, near-term, and long-term); and 3) the initial and life-cycle cost of implementing the strategy relative to a municipality's budget, external funding, and return on investment.

# III. BACKGROUND

In the history of Oak Park, there have been four benchmark issues that have shaped Oak Park's future, as follows;

1901: **self-rule**: in response to the approaching threat of annexation by the City of Chicago, the village voted to separate itself from Cicero Township, thereby preserving village autonomy and self-rule.

1921: **balance**: in response to the approaching threat of proliferation of new multi-family dwellings, the village board adopted one of the first zoning ordinances in the U.S., which restricted density in residential districts, thereby preserving neighborhood balance and scale.

1968-73: **diversity**: in response to the approaching threat of segregated housing, the village board passed the Fair Housing Ordinance (1968) and later adopted the landmark policy statement, "Maintaining Diversity in Oak Park" (1973), thereby preserving diversity.

1970: **preservation**: in response to the approaching threat of new development, the village board adopted the Landmark Ordinance, which codified historic preservation in Oak Park, thereby preserving its architectural heritage.

The common thread running through all of these issues was that visionary village leaders had a heightened awareness of an impending threat, as well as the foresight to formulate and implement action in a proactive manner that managed the threat towards a desirable outcome. Interestingly enough, the village response to each issue was started with an initial vision, a touchstone which guided village policy at that time and thereafter. Examples were Roberta Raymond's thesis, *The Challenge to Oak Park: A Suburban Community Faces Racial Change* (1972), and Hasbrouck and Sprague's, *A Survey of Historic Architecture of the Village of Oak Park* (1974).

A fifth benchmark issue has emerged recently in Oak Park and other municipalities- **sustainability**. This global issue concerns our ability to live in a healthy and prosperous way that is harmonious with the environment and the needs of future generations. In 2008, for the first time in human history, half of the people on Earth will live in cities, or 50% of 6.6 billion humans. By 2030, it is projected that the world will have almost five billion urban residents (United Nations, 2008).

Urbanization, as an anthropogenic process, has resulted in one of the most rapidly expanding ecosystems today - the urbanized ecosystem. The manner that cultures, especially in the United States, have chosen to design, build and operate cities (and the suburban and rural landscapes that support cities) is energy-intensive, depletes water and other finite natural resources, and disconnects cultures from nature. Alternatively, cities that embrace integrated environmentally-sustainable practice at every level provide a healthier, more productive living environment in concert with a more vibrant economy.

These circumstances pose not only a threat to the way of life for residents of Oak Park as did the previous benchmark issues, but an opportunity to improve the quality of life by leading the way towards environmentally-sustainable urban living.

# IV. METHODS

**OVERVIEW**

Analogous to a natural ecosystem, an urbanized ecosystem is a dynamic and interrelating complex system (fig. 2). The input environment (IE) is composed of energy and materials, which are then processed by the system into resultant outputs. The output environment (OE) is composed of processed energy (stored, converted, consumed) and material exports. Within each system there are processes (feedback loops, energy circuits, heat sinks, etc.) which are governed by the laws of nature (photosynthesis, decomposition, etc.) and thermodynamics.

In the built environment, such as the Village of Oak Park, energy flows out of the system in the form of heat and other transformed or processed forms such pollution emissions. Material flows are processed as outputs that are also wastes (solid waste, wastewater, leaf litter, etc.). Waste is the by-product of an inefficient human-fabricated system, whether it is a machine, vehicle, building, or community. The recommended goal in planning for an urban ecology is to model the village as an ecosystem, with zero waste by-products from processed energy and materials.

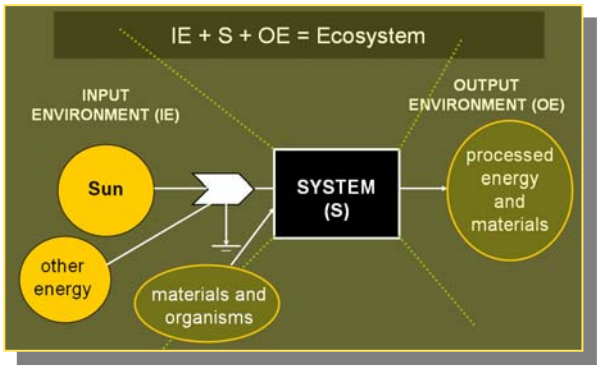



Fig. 2. Ecosystem model
(image by M. Iversen)

Complex adaptive system models are based on equations reflecting known relationships between variables. Ideally, one would complete a comprehensive and detailed model of the Village of Oak Park which would include algorithms of all relevant energy, material and monetary flows. If such a model existed, one might be able to predict with reasonable certainty where the village is headed in the future, foresee problems, and be guided to take action to avoid or mitigate adverse impacts. Unfortunately, no such model exists, and one will likely not be developed in the near-term future due to the overwhelming level of complexity inherent with the social systems of communities.

Despite the inherent uncertainty of complex urban systems, it remains essential to inventory the essential components of the village system, so as to establish baseline indicators that can provide accurate and reliable information about the viability and efficiency of the system. This necessary completion of an inventory is independent of any particular ideological view currently adopted by a community. How much value the village assigns to each of the system components is a matter for public dialogue, and should be derived from an Environmentally-Sustainable Vision Plan (refer to Timeline section of report for further discussion).

An inventory is required to provide all essential information about the viability of a system, and to serve as a benchmark for evaluating its future rate of change. It can also measure the system's performance relative to the village's overall vision and goals. Specific services include an intensive inquiry involving in-depth research of the village's physical / cultural / natural history coupled with an inventory of energy and material flows and biological processes. This requires a reasonably detailed model of the total system and its components, which involves three separate phases:

*1 - Scoping:* Identify the boundaries of the major components that are relevant to the system;

*2 - Inventory*: Complete a historic survey and current inventory of energy, materials, and information related to the village, as well as their interrelationships and costs.

*3 - Assessment*: Determine how to use this information for assessing the viability and sustainability of current and future developments, and to compare with alternative development paths.

*Phase 1 - Scoping*

Scoping defines the extent of analysis and the system boundaries (fig. 3). The boundaries for this project will be defined as the geographic municipal boundaries of the Village of Oak Park.; 1.5 miles by 3.0 miles, or 4.5 square miles. Since externalities (such as the economy) and flows (such as air pollution) do not adhere to any human-fabricated boundaries, the scale of the system boundaries is not only local, but regional, national, and even global as well. An example of this range of scales is provided by the carbon cycle; from how a local plant species processes atmospheric CO2 into food via photosynthesis, to excessive atmospheric CO2 from local emission sources which results in global warming.

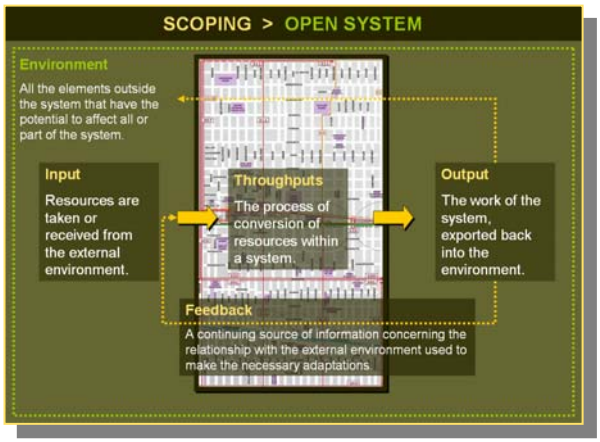



Fig. 3. Village of Oak Park as an open system. (image by M. Iversen)

It should be noted that *Phase I – Scoping* does not include within its scope the inventorying of energy, material, information, and cost flows related to government agencies other than the Village of Oak Park; such as School Districts 97 and 200, Park District of Oak Park, and Oak

Park Township, although it may include the spatial analysis of their land use / land cover in relationship to village- and privately-owned property.

*Phase 2 - Inventory*

This Phase consisted of the data compilation and documentation towards inventorying the current energy, material, information and cost flows to (inputs), through (throughputs), and from (outputs) the system boundaries of the village. This included a quantification of demographics (population, parcels, households, dwellings, vehicles, etc.), infrastructure (streets, alleys, lighting, traffic signals, parking lots, water, sewer, sidewalks, parkways, utilities, etc.), energy inputs (solar radiation, wind profile, electricity, natural gas, motor fuel, etc.), energy outputs (pollution and greenhouse gas emissions), solid waste outputs (refuse, recyclables, yard waste, leaf litter), water inputs (precipitation, water supply, system leakage, etc.), water outputs (stormwater, sewage, surface runoff, combined sewer overflow events, etc.), and biological processes (biodiversity, native species, invasive species, urban landscape, etc.). Energy and material flows are provided in terms of quantity (amount, costs, taxes, waste), type (residential, commercial, industrial, and municipal) and scale (individual, household, property, village-wide).

The inventory includes the associated spatial attributes with the above-described flows; such as land use, gross and net density, housing and property lot typology (fig. 4), permeable / impermeable land cover area, open space, and transportation networks. Relevant footprint analysis will also be included, such as an ecological footprint, greenhouse gas footprint, and carbon footprint, to be completed both on individual household and village-wide scales.


Fig. 4. Housing and property lot typology.
(GIS image and photos by M. Iversen)

An important part of the inventory is identifying the essential networks and relationships within in a system. This requires a process of aggregation and condensation of available information and data, and the directed search for missing information needed for a comprehensive description of the system. The result of this effort is a conceptual model, which is then used to identify indicators providing essential information about the system. The inventory effort will be supported by images, maps, digital orthophotos, and field measurements. The inventory will include GIS applications for representation and process modeling, pending availability of GIS-

related files from the Village of Oak Park. ESRI's ArcView 9.2 will be used, along with such extensions as ArcGIS Spatial Analyst and Network Analyst.

As precision isn't always necessary in this type of inventory, Fermi estimation will be used where appropriate in determining many of the quantities. Named for 20th century physicist Enrico Fermi, Fermi estimation is a method for making justified approximations about quantities that are excessively difficult to compute given limited available information.

*Phase 2 - Inventory* also includes a historic survey concerning the physical, cultural and natural trajectory of the Village of Oak Park, which includes the collection and assessment of relevant available documentation; including geologic, geographic, social and economic data, as well as specific historic land use and development patterns, transportation networks, and urban landscapes. The timeline of interest will span from pre-European settlement to present.

*Phase 3 - Assessment*

In the realm of urban sustainability, baseline indicators have become a mechanism for simplifying complex urban phenomena and relationships. *Phase 3 - Assessment* characterizes and assesses the viability and sustainability of the existing village system and subsequent rate of change by using the baseline data and information obtained from *Phase 2 - Inventory*, as follows:

- Identify baseline indicators that are clearly defined, reproducible, unambiguous, understandable and practical.
- Determine baseline indicators that will assist the village in determining the viability and sustainability of proposed policy and developments, relative to alternative options.
- Complete an assessment that will provide a framework, process and criteria for finding an adequate set of urban sustainability metrics and target indicators that may be used in conjunction with an Environmentally-Sustainable Vision Plan.

*Summary Report and Presentation*

The inventory and assessment phases will be organized under the following primary variables of energy, water, and materials.

- *Energy:* energy performance, energy efficiency / conservation measures, renewable energy.
- *Water* (hydrological management): stormwater management, wastewater technologies, and water efficient landscaping.
- *Materials:* solid waste management and recycling, building preservation and adaptive reuse.

The deliverable outcomes will be a summary report (provided as a digital pdf document for purpose of printing by Village of Oak Park) and presentation that includes the complete baseline inventory, summary of assessment, and a review of critical next steps relative to Phases 2 and 3. CDF will be available to present the report to key representatives of Village government, including the Village Board, Green Team staff, and relevant citizen commissions, as well as any public meetings.

**TIMELINE**

The intent of this report is to serve as the basis for informed decision- and policymaking. As such, it is of particular relevance towards the development of an environmentally-sustainable vision plan, as well as towards any update and/or modification of the Village of Oak Park *Comprehensive Plan* (Oak Park, 1990).

A vision statement is a big picture statement. It is a starting point from which all else flows, towards a desired end-state, while being adaptive to change. A vision serves as a measure by which the validity of a concept can be tested, so that informed decision and policymaking may take place with a frame of reference from which to determine the goals and objectives. Although sustainable initiatives and actions have been identified and recommended (fig. 5) by the Oak Park Environment and Energy Advisory Commission's Environmental Action Plan (2009), an overall vision towards an environmentally-sustainable Village of Oak Park has yet to been articulated. While identifying initiatives and recommending actions is certainly of vital importance, it also needs to be coupled to an overarching theme or vision. A vision statement is the base metric to assess, select and prioritize goals, objectives, issues and strategies.


Fig. 5. *A Sustainable Village* report by EEAC. (2009)

A Comprehensive Plan is a collection of guidelines and policies that state a municipality's visions and values. It is a legal document that defines the city's long term goals that is publicly vetted. It outlines the goals, preferred methods, and strategies for civil servants that guide the growth and maturity of an area of governance. It is a document that covers the long term and is necessarily vague, as it can never cover every situation. Its *raison d'etre* is to give policy makers a direction in vague situations.

Updates of Comprehensive Plans rarely happen as often as desired. In practice, updates usually happen between 10 and 15 years by the time they are written and officially documented. They encompass long term goals and rarely offer immediate benefits, and often

entail politically contested debates. However, we have all been the beneficiaries of comprehensive plans. One only needs to visit Yellowstone National Park, the country's first national park, to understand the affect that proactive thinking can have on future generations. It is imperative that this long term time line is understood to fully value sustainability in planning.

*For the purpose of this report, the timelines were based on a short-term time range to the year 2015, a medium-term time range to the year 2030, and a long-term time range to the year 2050.*

The village currently uses the *1990 Comprehensive Plan* (Village of Oak Park), adopted Sept. 4, 1990 (fig. 6). According to the 1990 Plan, "it is predicated on the community's commitment to human values: a sense that the village exists for its citizens, that the physical manifestations of the community - housing, parks, businesses, streets, etc. - are there to serve its constituents."

The following timeline is excerpted from the 1990 Plan; "Oak Park's first known plan was published in 1925. It was a relatively simple plan that suggested specific projects for a much simpler time. In the 48 years that followed, long-range planning was largely piecemeal. It wasn't until 1973 that the village adopted its first thorough comprehensive plan."


Fig. 6. *Comprehensive Plan* (1990).

"The 1973 comprehensive plan represented the village's first attempt to annunciate its approach to redevelopment and to guide future changes in the community. Its greatest accomplishment was not the document itself but the process that prodded the community to confront issues and develop philosophies."

"The Comprehensive Plan 1979 was an outgrowth of the 1973 plan, although its format was substantially changed to that of a policy plan. It presented statement of goals, objectives and policies to provide guidance to the village's decision-makers ... . The 1990 Comprehensive Plan retains the format of the 1979 Plan."

Environmental-sustainability is an emerging topic in planning, and as such, the Village of Oak Park is seeking to address its challenges. One of the most effective methods of accomplishing this is by incorporating environmental-sustainability into the Village's Comprehensive Plan. They both take long-term views of current actions in spite of limited immediate benefits and paybacks. Both have to address scientific uncertainty for current actions, and must attempt to project the results of current actions with future reactions. Both plans may be used as bar-

gaining chips in negotiations for intergovernmental and regional policy agreements where the village has limited power.

A primary purpose of this report is to study the inherent complexity of environmental-sustainability and its application to a municipality, and to provide tools for the Village of Oak Park to encompass environmentally-sustainable practices in its most current Comprehensive Plan, as well as forthcoming updated versions. Towards this end, a report format has been selected that is similar to that of previous comprehensive plans, so as to be compatible for adoption considerations; organized by the primary flows of energy, water and material.

#### BOUNDARY (SCALE)

The system boundary for this project is the municipal boundary of Oak Park; 1.5 mi. by 3.0 mi., or 4.5 sq. mi. But since externalities (such as the economy) and flows (such as air pollution) do not adhere to any human-fabricated boundaries, the scale of the project is local, regional and even global.

An example of this range of scales is provided by the carbon cycle; from how a plant species processes atmospheric CO2 into food via photosynthesis, to excessive atmospheric CO2 from pollution emissions which results in global warming.

#### URBAN SUSTAINABILITY INDICATORS

An Indicator is a sign which provides evidence of variable conditions. Indicators may be qualitative (a sunburn is a good indicator of overexposure to sunlight at the beach), or quantitative (E. coli levels above 1,000 colony-forming units, or CFUs, will trigger a ban at Chicago beaches. Anything between 235 and 1,000 CFUs will result in an advisory warning).

The use of indicators to support governmental policy and decision-making is not new. In the realm of economics, indexes such as the Gross National Product (GNP), the Dow Jones Industrial Average, or the Consumer Price Index (CPI) are measures that represent some aspect of the economy.

> *“If we could first know where we are, and whither we are tending, we could better judge what we do, and how to do it ...”*
>
> Abraham Lincoln, speech to the Illinois Republican state convention, June 16, 1858

*Background*

Urban Sustainability Indicators (USIs) traces their roots with the social indicators movement, which sought to expand public and policy attention from the limited skill set of concerns addressed by economic indicators.

During the depression, H L Mencken, the famed Baltimore journalist, published a famous series of articles that rated the quality of life in cities and states. In the 1960s, President Lyndon Johnson realized that the success of his Great Society program rested on a clear understanding of social needs, priorities, and objectives, and the ability to evaluate progress toward those goals.

In 1966, LBJ directed the secretary of Health, Education, and Welfare to seek ways to improve the nation's ability to chart its social progress. Specifically, the department was directed "to develop the necessary social statistics and indicators … . With these yardsticks, we can better measure the distance we have come and plan for the way ahead." [3]

*How can we use indicators to measure other facets of quality of life, such as sustainability?*

In the late 80s and early 90s, several communities in the U.S. started developing indicators that represented a more holistic approach than their predecessors. It was during this time that the concept of Urban Sustainability Indicator (USI) programs began. USIs were not narrowly focused on any one aspect – environment, economy or a society's culture - rather, they were to present a more integrated and interconnected reality. USIs were to reveal long-term trends in economic, environmental, and social well-being and help chart the path to a changed future. In other words, USIs were to be "bellwether tests of sustainability [and] reflect basic characteristics that are fundamental to the long term economic, social or environmental health of a community" (Mitra, 2003).

In 1992, at the United Nations Earth Summit, it was agreed upon that indicators of sustainable development needed to be developed so as to provide a solid basis for decision-making at all organizational levels and to contribute to the self-regulating sustainability of integrated environment and development systems.

***Distinguishing Characteristics***

In the realm of urban sustainability, indicators have become a mechanism for simplifying complex urban phenomena and relationships. Over the past decade, the science of USIs has matured. There are five distinguishing characteristics of an Urban Sustainability Indicator program (Mitra, 2003), as follows:

*Holistic:* Rather than measure a single aspect of a community independently of others, USIs should illustrate the linkages between, and within, the system. One way to gauge sustainability holistically is to measure it against community goals. For example, the Village of Oak Park may use indicators to help determine whether the direction the community is headed is consistent with community goals stated in their Comprehensive Plan or Environmentally-Sustainable Vision Plan. Indicators can allow the community to hold itself, its public officials, public staff, citizen's commissions, and supporting institutions accountable to its sustainable goals and objectives.

*Time descriptive:* USIs need to be understood within the context of time, so as reveal and assess changes (trends) over the course of a defined period of time. That is, whether it is moving towards or away from its environmentally-sustainable targets. Indicators must show 'where you are, where you are going, and far you are from your goal' within the context of an overall timeline.

*Contextually relevant:* It is imperative that any USI program to be place-specific, which in this case is the Village of Oak Park. While a basic checklist or best practices could be referenced as a guide for general conditions and broadscope issues, it would not reflect the specific conditions unique to Oak Park. For example, while the recently completed U.S. Green Building Council's (USGBC) LEED-Neighborhood Development (ND) Rating System[4] provides a good generic checklist of sustainable development indicators, they are not responsive to the unique characteristics, concerns and opportunities that are specific to a community. The empirical question of what is environmental-sustainability must be asked *in situ* according to the unique place and time of the Village of Oak Park.

The same holds true for exemplar USI case studies such as Sustainable Seattle (2003), Central Texas Sustainability Indicators Project (2000), and the Santa Monica's Sustainable City Program (1994). While serving as excellent case studies (Appendix A), any Urban Sustainable Indicators developed for Oak Park would need to be contextually relevant according to its spatial-temporal sense of place.

*Responsive to changing values:* The value of an indicator, or a set of indicators, can vary over time. As the approach to measurement is based on a community's vision of sustainability, it becomes susceptible to change as the mindset changes over time. Indicators should, therefore, be re-assessed for their continued relevance by the applicable village staff (such as the Green Team) and/or citizen's commission (such as the EEAC). Indicators may need to be modified, added or even removed from a USI program during subsequent reviews.

*Technically Valid:* USIs need to be technically and economically achievable within the parameters of local expertise and budgetary constraints. The values of indicators must be measurable, and statistical measures should be available from accessible databases. This can be achieved internally with village staff and relevant citizen's commissions, with technical expertise provided by public works, planning, engineering, and financial personnel. External technical expertise can be used to assure the scientific quality of the data and measures.

> *"Everything that can be counted does not necessarily count; everything that counts cannot necessarily be counted."*
>
> Sign hanging in Albert Einstein's office at Princeton University.

***Systems Approach***

Indicators are both important and risky because they reside at critical points within the decision- and policymaking cycle. Nearly every decision is intended to bring some important system condition to some desired state. Action is taken depending on the discrepancy between the desired state or goal and the perceived state of the system (Meadows, 1998).

Most communities rely upon lists of Urban Sustainability Indicators. While these lists serve some limited benefit as an initial step, they may fail to capture the inherent complexity of the community for several reasons, such as; (a) they are derived ad hoc, without a systems theoretical framework to reflect the operation and viability of the total system; (b) they reflect the general mindset and particular interest of their authors; and (c) as a consequence of (a) and (b), they are overly dense in some areas (multiple indicators for essentially the same concern), and sparse or even empty in other important areas (Bossel, 1999). In other words, they are not a systematic and complete reflection of the total system, i.e., a community integrated within the rules and boundaries of the biophysical environment.

Realizing the inadequacy of current approaches to indicators of urban sustainability, a more advanced approach is to analyze the entire complex of problems and tasks more carefully. This requires a reasonably detailed model of the total urban system and its components, as follows (Bossel, 1999);

- Identify the major urban system components that are relevant in the context of environmentally-sustainable development;
- Develop an approach for identifying indicators of environmental-sustainability for these systems;

- Use this information for assessing the viability and environmental-sustainability of human development at different levels of societal organization.

***Complex System Models***

As previously explained in this report, complex system models are based on equations reflecting known relationships between variables. Ideally, one could complete a comprehensive model of the Village of Oak Park which would include all relevant energy, material and monetary flows. If such a model existed, one might be able to predict with reasonable certainty where we are headed, foresee problems and be guided to take action to avoid them.

Unfortunately, no such model exists and one will likely not be developed in the near term. The real question then, is whether there are practical and useful models somewhere in between this conceptual ideal and a simplistic, linear checklist of indicators.

Some major parts or sub-systems of the whole urban system can be successfully modeled, notably certain physical systems like the flow of stormwater or the transport of air pollutants. As previously described, the methodology used for this report is based on the ecosystem model used by ecologists, where some progress had been made in modeling, but there remains many areas where knowledge is simply too inadequate to construct even a conceptual model of how the system functions, let alone a detailed complex systems model of an urban area.

One recommended approach is to follow the guidelines developed by the International Institute for Sustainable Development's (IISD) Measurement and Indicators Program. The objective of this program is to identify practical guidelines which can assist in the selection and application of Urban Sustainable Indicators. One of the outcomes of the IISD program was the Bellagio Principles - ten selected principles that serve as guidelines for the entire assessment process including the selection and design of indicators.

***Ecological Footprint***

Another type of indicator is termed ecological footprint. 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." (Wackernagel & Rees, 1996)

The ecological footprint is scalable, and applicable to an individual, community, or region. It allows a comparable measure with other footprints, and therefore of particular use as an Urban Sustainability Indicator. The graphic and calculations (fig. 7) shows that Oak Park's

population of 52,524 (U.S. Census, 2000) residents has an estimated footprint of 1,600 sq. mi., which is 356 times larger than it's land area of 4.5 square miles. For this exercise, the average footprint for Oak Park residents was estimated to be 19.5 acres per person, which was estimated to be somewhat less than the average US footprint due to Oak Park's high density, walkability, and access to mass transit.

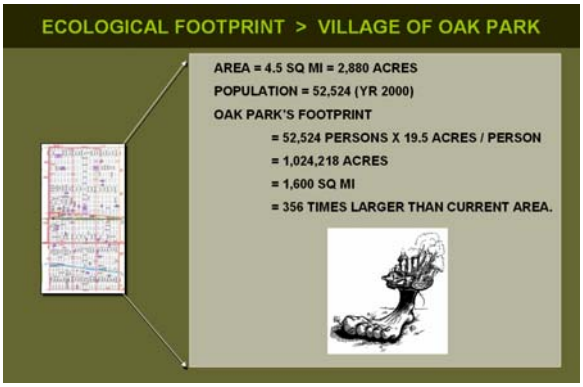



Fig. 7. Ecological footprint of Village of Oak Park (image by M. Iversen)

This means that 1,600 square miles of biologically productive land area is necessary to sustain current levels of resource consumption and waste discharge by Oak Park's current population. Since Oak Park's footprint is larger than its actual land area, it is reliant upon importing resources from beyond its boundaries, which is acceptable if the exporting area footprints are smaller than their respective land area. If not, than the residents of Oak Park (and their supporting land area system) are drawing down on the world's resources, which is essentially unsustainable over the long-term time period.

For comparison, when the total amount of biologically productive land area in the entire world is divided by the human population, there are about 4.5 acres available per person. The average U.S. footprint is about 24 acres per person, an area roughly comparable to 24 football fields. If everyone on Earth lived like the average American, we would need at least five more Earths to provide all the materials and energy to sustain that level of consumption.

The Earth's ecosystems generate an amount of surplus resources that can be consumed by humans without damaging the ecosystems to a certain limit. When the consumption of resources goes beyond this surplus limit, the ecosystems become depleted, and will eventually not be able to support the same size population at the same level of consumption. There is a time-lag between this "overshoot" and its effects, which scientists say we are currently experiencing. We have gone beyond using the surplus generated by the Earth's ecosystems to depleting the natural "capital stock". Using language from economics, we are living not only off the interest, but off the principal.

*Individuals may calculate their own ecological footprint at the Redefining Progress website at www.myfootprint.org.*

*"The real act of discovery consists not in finding new lands but in seeing with new eyes.*
Marcel Proust

***Mindset and Consensus-Building Approach***

Indicators arise from values (we measure what we care about), and they create values (we care about what we measure). The collective mindset defines what is important, what questions should be asked, what goals are possible, what can and should be measured (Meadows, 1998).

Given the multiplicity of values and mindsets, it is essential that any selection of urban sustainability indicators to be place-specific and represent the consensus of the community. The residents of a community have the advantage of being most knowledgeable about the values and workings of their community, and therefore should be engaged in any discussion and selection of USIs specific to their community. The Village of Oak Park's recently approved Public Participatory Planning Guidelines (2006) are well-suited to guide this public process.

***Training and Institutional Capacity Building***

It is a highly recommended that a series of workshops aimed at the provision of in-depth training be provided for applicable Village of Oak Park staff concerning the development and use of an Urban Sustainability Indicators program. After implementation of a USI program, assessing progress towards urban sustainability should be assured by;

- Clearly assigning responsibility and providing support in the decision-making process.
- Providing institutional capacity for data collection, maintenance, and documentation.
- Supporting development of local assessment capacity.

While such training is above and beyond the scope of this project, CDF would be glad to discuss with the Village of Oak Park any opportunity to provide the training necessary for the evaluation, selection, implementation and assessment of Urban Sustainability Indicators. This may entail the development of a comprehensive set of environmentally-sustainable design and development guidelines, "Guiding First Principles", for all aspects of community development.

This guidelines document could be used in support of an environmentally-sustainable vision plan, and would provide a clear, detailed definition of the Village's expectations for all public and private investment in buildings, infrastructure, and operations. It is intended that the guidelines document would be prepared subsequent to and in support of a sustainable visioning process. CDF is available to define a scope and process for this guidelines document as part of identifying "next steps" beyond this report.

# V. CONTEXTUAL TOPICS

**NATURAL HISTORY**

The geologic composition of the land plays an important role in Oak Park's history. Thousands of years ago, the region north to Wilmette, west to LaGrange and south to Blue Island was covered by a glacial layer of ice geologists called "Lake Chicago". (Guarino, 2000) The ice melted and the terrain of the region evolved into a low marshland interspersed with a series of high sandbar spits or ridges (Guarino, 2000). The level of the lake dropped and the land was swampy, except along the spits and ridges, with little vegetation (Evans, 1921).

In the Oak Park area, a high sandbar or ridge known as the "Oak Park Spit" originated at North and Ridgeland Avenues, ran diagonally through Taylor Park, and ended near Madison Street and Des Plaines Avenue (Appendix B). The ridge formed a Continental Divide which passed through the village from the north in a southwesterly direction to the western boundary of the village. It formerly deflected the waters falling upon its western slope to the Des Plaines River and the Mississippi through the Illinois River, and the waters of the eastern slope found their way to the St. Lawrence by way of the west branch of the Chicago River. Due to the reversal of the Chicago River, all drainage now goes through the Mississippi system.

*Vegetation*

The sandy soils of the spit made growing conditions harsh. The vegetation that was initially commonly found on the spit was herbs, thickets or shrubs, and trees. Herbs found could be sweet clover, annual weeds, or certain kinds of asters and grasses. Thickets or shrubs could include junipers, dogwoods and sumac. The trees found within this area were poplars, white pines, red cedars, and oaks. More than 150 years ago, the region took the name of Oak Ridge from the continuous forest of oak trees found along the ridge's crest. White oaks predominated the area, but were cut down by pioneers who discovered it made good lumber.

Large grass plains were found on the east and south sides of the spit. Trees could not grow here because there was too much water. West of the spit, a swamp forest developed. White swamp oaks, burr oaks, red oaks, and maples were the trees found in the swamp forest. Today the impacts of settlement on the natural environment were negative, but primarily unavoidable. Once where prairies stood now has become Kentucky bluegrass. Few trees are left that are significant to Oak Park's heritage. Refer to Appendix C for a location map of heritage bur oak trees that remain in the Village of Oak Park.

**HISTORIC PRESERVATION**

By many accounts, preserving an old structure will save more time, money and natural resources than building a new one. Historic preservation is inherently environmentally-sustainable - the “greenest” building is one that is already built. Adaptive reuse of buildings preserves embodied energy, reduces the amount of raw materials that are harvested, and saves salvageable materials from being sent to the landfill as waste. Embodied energy is a rational for saving buildings that is too often overlooked. Initial embodied energy can be direct from transportation and construction processes, indirect energy from acquisition and manufacturing of materials, or recurring energy that collects during regular maintenance and renovation of the building. All of this embodied energy is lost when that building is demolished and landfilled.

Often, “green” developers reject adaptive reuse in favor of building entirely new buildings. In fact, LEED standards for green buildings award only 1-2 credits (a fraction of what’s required for LEED certification) for adaptive reuse of existing buildings. This is unfortunate for several reasons.

First of all, most older buildings are inherently energy-efficient. Most can be brought up to efficiency standards through doing small-scale improvements, such as replacing windows and adding insulation. Also, much more energy and materials are consumed up front in new construction, whether that construction is LEED certified or not. In addition, most new green development is often larger than it needs to be, which can cause several problems. One problem is that even though new buildings consume less energy per square feet than older ones, since they are so much larger, they often end up using just as much or more energy. A new, energy-efficient building needs to operate for over thirty-four years to equal the total energy of an existing building (Trusty, n.d.).

Also, the building footprint and orientation of new development may alter the streetscape, causing historic streets to lose their human scale and walkability. Too often new construction is not built to be oriented towards the street so as to be pedestrian friendly. Another point to consider is that once a single building has been torn down, the historic architectural pattern of the street has been interrupted, making it easier for developers to make the case to tear down others.

Cities often site economic development as a reason for demolishing historic buildings; getting rid of old buildings to make way for new construction in downtown business districts. For most towns, particularly Oak Park, perhaps the best way to stimulate economic growth is to rehabilitate the buildings they already have. In many cases, this practice is ultimately more prof-

itable and less wasteful. “Sustainable cities seek to *manage* economic growth and development to be more consistent with their visions of what kind of community they desire to achieve (Portney, 2003).” In other words, when Oak Park attempts to compete with communities that are building huge strip malls and condo developments, the village may be trying to be something it’s not. The Village of Oak Park already has a historic context and fabric that has the potential to be even more successful, when fully supported, as it is unique, organic and authentic.

*Assessment*

Eighty percent of the housing in Oak Park was built before 1940. Nearly 50% was built before 1920. Furthermore, roughly a third of the homes in Oak Park are located within one of three historic districts: Ridgeland/Oak Park Historic District, Frank Lloyd Wright Prairie School of Architecture District, and Gunderson Historic District. Oak Park also has nine buildings listed on the National Register of Historic Places. It is important to note that while the National Register designation does not guarantee that the buildings will never be torn down, it does offer property tax abatement for rehabilitating owner-occupied residences. The historic districts supplement the underlying zoning regulations, rather than replacing them.

The Village of Oak Park has a Historic Preservation Commission (HPC) that identifies landmark buildings and historic districts, works to preserve the historic character of the village, and provides free architectural advice to owners of property in historic districts. The HPC is an important tool to help preserve the historic character of Oak Park’s residential streets.

However, the buildings in the historic downtown business district are still vulnerable to demolition. In July 2005, the Village of Oak Park Historic Preservation Commission created a map showing the distribution of historically significant structures in the downtown core. A vast majority of the buildings are labeled as being structures of merit or significant. Yet no regulations guarantee the survival of any of them. Currently, the only tool that preservationists have is the ability to delay demolition permits; regulations related to historical preservation are not binding.

*Strategies*

Cities often achieve the most success when they combine historic preservation with economic development. The most effective strategies included giving local tax credits, on top of federal tax credits, to businesses that invest in existing downtown structures, and by providing grants and technical assistance for rehabilitation. By concentrating new investment in the historic downtown core and neighborhood commercial districts, cities can alleviate development pressure on the

urban fringe and direct private funds to save historic places. Gaining support from a combination of private and public funds is essential.

Adaptive reuse can take many forms, although can be challenging in the case of larger structures, such as churches or schools. Popular adaptations are loft buildings, but more creative solutions have been successful. For example, a development company in Portland, Oregon rehabilitates old structures like schools and firehouses into hotels and restaurants. Other recommended strategies include;

- Maintain current setbacks and building heights in all new residential construction. New construction in business districts should not be more than 50% taller than existing buildings.
- Implement tax incentives to encourage developers to utilize adaptive reuse strategies.
- Begin a conversation between the Oak Park Historic Preservation Commission and Environmental & Energy Advisory Commission to remove obstacles from implementing environmentally-sustainable methods and materials.
- Promote “green” strategies that incorporate historic elements, including the use of awnings and other types of vernacular architecture.

**EXTERNALITIES**

Strictly from an economic perspective, externalities occur when costs or benefits borne through production spill over to those in society not involved in consuming or supplying the good. This represents either a cost or a benefit that is not accounted for in the market. Although they may be positive, externalities primarily conjure up a negative connotation.

In the context of this report, externalities will represent costs, or threats, produced outside of Oak Park that adversely affect residents living within its boundaries. These should be taken into account when discussing environmentally-sustainable development because they have the potential to hamper progress. Oak Park may find it necessary to work with surrounding communities on environmental issues.

The most apparent externality produced external to the Village of Oak Park is air pollution from industries northwest and southwest of the village. The prevailing winds during the summer carry pollutants released from these industries over Oak Park where some could settle and possibly be inhaled by residents. The prevailing winds during the winter months come from the west and northwest, while during the summer months they shift and come from the southwest. Tables 1 and 2 present the amounts of pollutants released to the air by nearby communities to the south, southwest, west, and northwest of Oak Park.

*Table 1. Pollutants Emitted by Communities South and Southwest of Oak Park (lbs/yr)*[5]

| Pollutants | Berwyn | Cicero | Forest Park | Riverside & North Riverside | Totals |
|---|---|---|---|---|---|
| CFC | 4.8 | 0.0 | 0.0 | 0.0 | 4.8 |
| CO | 10.9 | 47,261.4 | 18.5 | 0.0 | 47,290.8 |
| NO | 31.7 | 737.9 | 31.3 | 0.0 | 800.8 |
| PB | 0.0 | 0.7 | 0.0 | 0.0 | 0.7 |
| $PM_{10}$ | 0.1 | 106.9 | 38.7 | 0.0 | 145.7 |
| PT | 3.3 | 708.4 | 54.6 | 0.0 | 766.3 |
| $SO_2$ | 0.4 | 307.8 | 0.2 | 0.0 | 308.4 |
| VOC | 47.8 | 787.2 | 52.6 | 0.4 | 888.0 |

*Table 2. Pollutants Emitted by Communities West and Northwest of Oak Park (lbs/yr)*[5]

| Pollutants | Elmwood Park | Franklin Park | Melrose Park | Northlake | River Forest | Schiller Park | Totals |
|---|---|---|---|---|---|---|---|
| CFC | 0.0 | 0.4 | 0.1 | 0.0 | 0.0 | 0.0 | 0.5 |
| CO | 8.0 | 107.1 | 469.5 | 79.7 | 7.5 | 23.8 | 695.5 |
| $NO_2$ | 92.4 | 299.8 | 519.0 | 118.6 | 0.9 | 51.2 | 1082.1 |
| PB | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.3 |
| $PM_{10}$ | 1.0 | 7.9 | 104.4 | 50.5 | 0.1 | 1.7 | 165.6 |
| PT | 583.7 | 3,657.6 | 497.3 | 356.7 | 6.0 | 481.3 | 5,582.6 |
| $SO_2$ | 2.5 | 7.6 | 6.0 | 280.6 | 0.9 | 3.9 | 301.5 |
| TCA | 0.0 | 6.2 | 0.0 | 0.0 | 0.0 | 17.8 | 24.0 |
| VOC | 58.9 | 2,287.6 | 314.3 | 556.6 | 8.4 | 169.7 | 3,395.4 |

Note that Table 1 presents communities that would affect air quality during the summer and that the biggest threat stems from industries and businesses located in Cicero. While not as immediately harmful to residents in Oak Park, the communities in Table 2 would affect air quality during the winter. For more information on the pollutants and their related health effects, see the *Illinois Annual Air Quality Report 2007* (IEPA, 2007), which is also available online at; http://www.epa.state.il.us/air/air-quality-report/2007/index.html.

Other externalities presenting health risks to residents of Oak Park are toxic emissions from diesel engines coming from the Union Pacific trains, especially when they are left running in place over night. Toxic emissions coming from the exhaust pipes of cars, trucks, and semi-trucks traveling on the Eisenhower Expressway also present health risks, more so during times of congestion. According to the *Illinois Annual Air Quality Report 2007* (IEPA, 2007), while the dangers associated with high concentrations of carbon monoxide (CO), for example, are well known, lower concentrations can aggravate cardiovascular disease.

Although not directly related to health, the estimated population of the Northeastern Illinois region may exacerbate existing conditions surrounding Oak Park. The communities listed above are those communities in closest proximity to Oak Park, but that does not mean that communities further away do not affect air quality within Oak Park. If the population in municipalities to the west of Oak Park increase as predicted by the Northeastern Illinois Planning Commission, by 2030 the Eisenhower could have more cars traveling to and from Chicago for work. Some municipalities west of Oak Park are likely to see an increase of 30,000 in their populations. Employment in those municipalities, however, could also increase up to 20,000 and keep some residents from traveling to and from Chicago five days a week.

Lastly, factors mitigating these air pollution externalities are quality public transportation (i.e., Metra and the CTA), education, forests, trees, and green space (e.g., parks). Ideally, public transportation could reduce the number of cars on the Eisenhower, if more residents in municipalities west of Oak Park would choose to take public transportation rather than drive. Public education on the environment would hopefully increase awareness and respect. Thatcher Woods, which is directly west of Oak Park, is an example of a forest preserve that helps to increase air quality. According to the Environmental Protection Agency, approximately 1.35 acres of trees are needed to absorb 10,000 pounds of carbon dioxide in one year. Finally, any green space is an asset that provides vegetation and trees to help counteract air pollution.

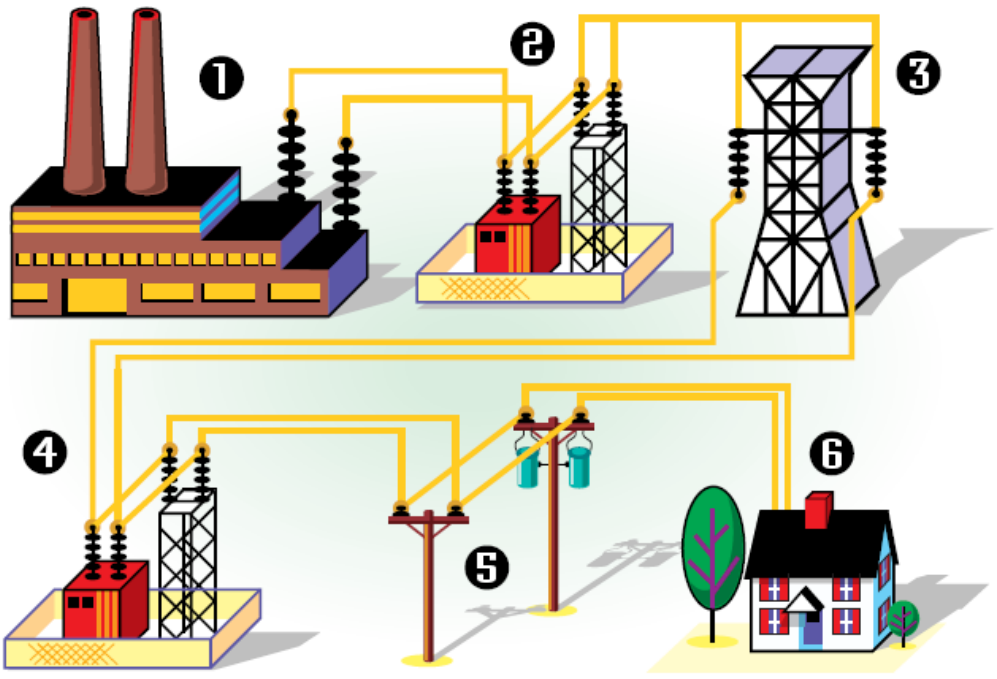
# VI. INVENTORY

**OVERVIEW**

The Inventory Phase consists of data compilation and documentation towards inventorying the current energy, material, information and cost flows to (inputs), through (throughputs), and from (outputs) the system boundaries of the village. This included a quantification of demographics (population, parcels, households, dwellings, vehicles, etc.), infrastructure (streets, alleys, lighting, traffic signals, parking lots, water, sewer, sidewalks, parkways, utilities, etc.), **energy inputs** (solar insolation, wind profile, electricity, natural gas, motor fuel, etc.), **energy outputs** (pollution and greenhouse gas emissions), **solid waste outputs** (refuse, recyclables, yard waste, leaf litter), **water inputs** (precipitation, water supply, leakage), **water outputs** (stormwater, sewage, surface runoff, combined sewer overflow events, etc.), and **biological processes** (biodiversity, native species, invasive species, urban landscape, etc.). Energy and material flows are provided in terms of quantity (amount, costs, taxes, waste), type (residential, commercial, industrial, municipal) and unit scale (individual, household, property, village-wide).

**ENERGY > ELECTRIC > SYSTEM OVERVIEW**

There are three steps in providing electricity to the Village of Oak Park: generation (production




When electricity leaves a power plant (1), its voltage is increased at a "step-up" substation (2). Next, the energy travels along a transmission line to the area where the power is needed (3). Once there, the voltage is decreased, or "stepped-down," at another substation (4), and a distribution power line (5) carries the electricity until it reaches a home or business (6).

Fig. 8. Transmission network. (Edison Electric Institute, 2001).

of electricity from coal-fired, natural gas-fired and nuclear power plants), transmission (sending high voltage power from the power plant to distribution points), and distribution (delivering power to homes, businesses, and municipal facilities). This electrical energy pathway is further detailed in fig. 8.

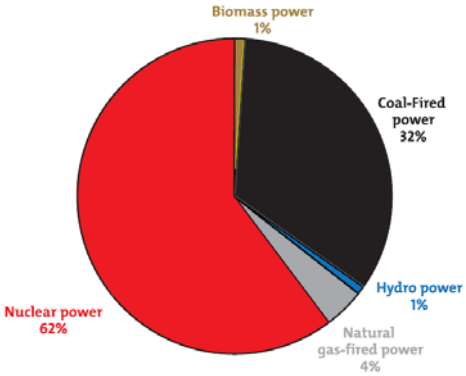



Fig. 9. ComEd's sources of electricity twelve months ending June 30, 2009. (Commonwealth Edison. (2009, September 28)

**Generation:** Electricity provided for the Village of Oak Park is generated primarily from regional nuclear power plants and coal-fired plants. According to Commonwealth Edison's most recent *Environmental Disclosure Statement* for twelve months ending June 30, 2009 (Appendix D), nuclear power plants generated 62% of electricity to the local electric grid, while coal-fired power plants generated 32% (fig. 9). This electric power mix has fluctuated in recent years, and should be taken in consideration for forthcoming projections. For example, as recently as the twelve months ending September 30, 2005, nuclear power plants generated 84% of electricity to the local electric grid, while coal-fired power plants generated 14%.

Natural gas usage to generate electric power was 4% in 2009, mostly confined to gas peaking plants and utilized for ignition/start-up at certain coal-fired power plants.

Due to the 1990 Clean Air Act, high sulphur content from Illinois was replaced with low sulphur coal from other sources. The Chicago area now gets its coal for electric power plants from western states, such as Wyoming, where the sulphur content is significantly lower. Coal is transported to the power plants via rail or barge. For example for the Crawford Generating Station is delivered by barge via the Chicago Sanitary and Ship Canal.

There are six operating nuclear power plants in Illinois: Braidwood, Byron, Clinton, Dresden, LaSalle, and Quad Cities, all of which are owned and operated by the Exelon Corporation.

Fig. 10. Crawford Generating Station. (photo by M. Iversen)

The nearest regional coal-fired plants are the Fisk Generating Station, located in Chicago's Pilsen neighborhood (1111 W. Cermak Ave.), and the Crawford Generating Station (fig. 10), located in Chicago's Little Village neighborhood (3501 S. Pulaski), which are owned and operated by Midwest

Generation, LLC, a subsidiary of California-based Edison International. Midwest Generation, LLC also owns and operates other coal-fired plants in Waukegan, Will County (Romeoville) and Joliet. The State Line Generating Plant is a coal-fired electrical generating station located in Hammond, Indiana, currently owned and operated by Dominion Resources.

**Transmission**: When electricity leaves a nuclear or coal-fired power plant, it is transmitted by Commonwealth Edison, better known as ComEd, a unit of the Exelon Corporation. Its voltage is increased at a "step-up" substation and then along a transmission line to the Village of Oak Park. For example, electric power from Midwest Generation's Crawford Generating Station is stepped up at ComEd's adjacent Station 13 (fig. 11) and then travels via high-voltage transmission lines along the Eisenhower Expressway to the Village of Oak Park's electric substations, where it is 'stepped-down' to a lower voltage.


Fig. 11. ComEd Station 13.
(photo by Michael Iversen)

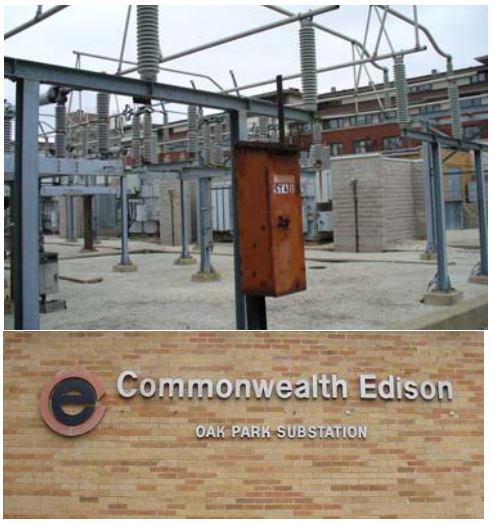



Fig. 12. ComEd's Oak Park Substation.
(photo by M. Iversen)

**Distribution:** Electric power is distributed from ComEd's local substations, such as the one located along the 600 block of North Blvd. (fig. 12), to all electric users throughout the village. This electrical distribution is accomplished via overhead distribution wires, utility poles (fig. 13), and other utility facilities to individual customer electric meters.

ComEd's utility distribution systems deliver electricity locally to neighborhoods, businesses, and municipal facilities throughout the village. Step-down substations connect transmission lines to primary distribution lines by lowering the voltage for

Fig. 13. ComEd's distribution network.
(photo by M. Iversen)

local distribution. Secondary distribution lines carry electricity at a lower voltage for use in homes and businesses. Residential voltage levels are usually 120- 240 volts; commercial levels are 240-2,400 volts.

The distribution of electric power is administered per the terms of the 58-year franchise agreement[6] (dated May 17, 1993) between the Village of Oak Park and ComEd. In exchange for the authority to access the public way in conjunction with its construction, operation and maintenance (fig. 14), ComEd supplies electricity without charge to the Village for lighting and various other uses in municipal buildings, as well as traffic signals.


Fig. 14. ComEd's access to public way. (photo by M. Iversen)

**ELECTRIC POWER > INPUTS**

The below pie chart (fig. 15) presents energy use (kWh) by user type (revenue class) in Oak Park for 2008. The total amount of electric power for all users was 343,653,471 kWh. Residential energy use was most prevalent with 160,951,051 kWh (47%), and will be the focus of this report's assessment of electric inputs.

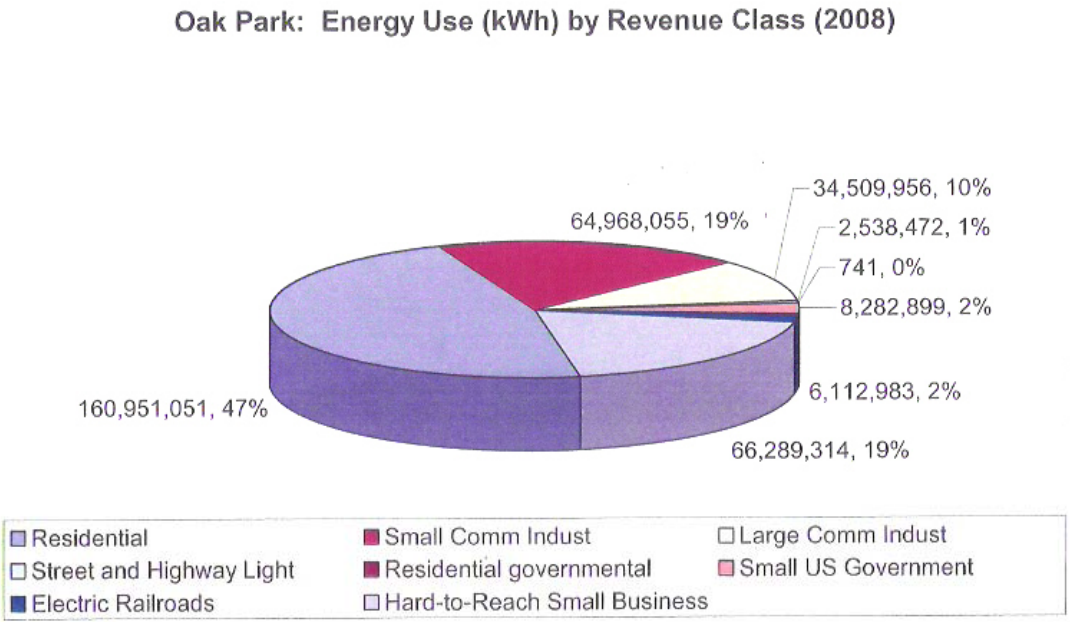



Fig. 15. Energy use (kWh) in Oak Park by revenue class. (Oak Park, 2008c)

According to ComEd, in 2008 there were 23,111 residential customers. This amount was compared with the total amount of housing units (24,086) provided by the U.S Census (2005-2007)[7]. By providing an estimated factor to account for variance of floor area in housing unit types, an estimate of electric energy usage per housing unit type was determined (Table 3).

*Table 3. Electrical Energy Usage per Housing Unit Type*

| Housing Unit Type | Units[1] | Unit Area Factor[2] | Unit Monthly Usage (kWh) | Total Monthly Usage (kWh) | Total Annual Usage (kWh) |
|---|---|---|---|---|---|
| Single family | 9,394 | 1.0 | 691 | 6,488,380 | 77,860,560 |
| Townhomes | 685 | 0.9 | 622 | 425,887 | 5,110,644 |
| 2-4 units | 2,856 | 0.8 | 553 | 1,577,889 | 18,934,663 |
| 5+ units | 10,177 | 0.7 | 484 | 4,920,432 | 59,045,184 |
| Total | 23,111 | --- | 580 | 13,412,588 | **160,951,051** |

1. Amount from U.S. Census (2005-07) adjusted to reflect ComEd's amount of residential customers.
2. Based on estimate of unit floor area size per housing unit type.

Now that the electrical 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 ComEd's standard monthly residential customer service billing charges, adjustments and taxes to the Unit Monthly Usage (kWh) amounts (Table 3). The monthly charges, adjustments and taxes were based on monthly billing averages for the twelve months ending September 2009[8].

*Table 4. Electrical Energy Costs per Housing Unit Type*

| Housing Unit Type | Units | Unit Area Factor | Unit Monthly Cost | Total Monthly Cost | Total Annual Cost |
|---|---|---|---|---|---|
| Single family | 9,394 | 1.0 | $91.54 | $859,927 | $10,319,124 |
| Townhomes | 685 | 0.9 | $83.56 | $57,239 | $686,868 |
| 2-4 units | 2,856 | 0.8 | $75.59 | $215,885 | $2,590,620 |
| 5+ units | 10,177 | 0.7 | $67.61 | $688,067 | $8,256,804 |
| Total | 23,111 | --- | $78.80 | $1,821,118 | **$21,853,416** |

As shown by Table 4, the annual cost for electrical energy for ComEd's residential customers in Oak Park is $21,853,416. A closer assessment of the customer billings shows that a municipal tax is assessed at $0.006/kWh. When applied to usage (kWh), the municipal tax is $80,476 per

month, or $965,706 per year. This municipal tax is budgeted as utility tax revenue in the village's General Fund.

**ELECTRIC POWER > OUTPUTS**

Any inefficiency in the generation, transmission, distribution and use of electricity will result in a waste byproduct of heat, air pollution and/or nuclear waste. The generation of electricity is the primary cause of waste byproducts in the form of air pollution and nuclear waste, although there are significant amounts of wastewater as well. Since any usage of electricity within the Village of Oak Park is reliant upon the generation of electricity supplied by nuclear and coal-fired plants (fig. 16) to the regional electric grid system, the use of electricity has a downstream effect on pollution emissions and nuclear waste generation.

According to Commonwealth Edison most recent *Environmental Disclosure Statement* for twelve months ending June 30, 2009 (Appendix D), the amount of pollution emissions and nuclear waste may be determined by using ComEd's average amounts of emissions and nuclear waster per 1000 kilowatt-hours (kWh), as provided by Table 5.

*Table 5. ComEd Emissions and Nuclear Waste Amounts*

| **Average Amount of Emissions and Nuclear Waste per 1000 kilowatt-hours (kWh)** (produced from known sources for the 12 months ending June 30, 2009) | |
|---|---|
| Carbon dioxide ($CO_2$) | 703.19 lbs. |
| Nitrogen oxides ($NO_x$) | 1.03 lbs. |
| Sulphur dioxide ($SO_2$) | 3.41 lbs. |
| High level nuclear waste | 0.006 lbs. |
| Low level nuclear waste | 0.0004 cubic feet |

Fig. 16. Crawford Generating Station. (photo by M. Iversen)

As described earlier, for twelve months ending June 30, 2009, nuclear power plants generated 62% of electricity to the local ComEd electric transmission and distribution grid, while coal-fired power plants generated 32% (fig. 9). This means, relative to total electrical usage in Oak Park (343,653,471 kWh), nuclear power plants generated 213,065,152 kWh of electricity (62% of 343,653,471 kWh), and coal-fired plants generated 109,969,111 kWh (32% of 343,653,471

kWh). Therefore, the total amount of pollution emissions and nuclear waste generated by the use of electricity by all user types (ComEd revenue classes) is shown by Table 6.

*Table 6. Annual Emissions and Nuclear Wastes Amounts Generated by all Electrical Users in Oak Park*

| Type of Emission or Nuclear Waste | Produced from 1000 Kilowatt-hours (kWh) | Total Annual Electrical Usage (kWh) | Total Annual Emissions and Nuclear Waste |
|---|---|---|---|
| Carbon dioxide ($CO_2$) | 703.19 lbs. | 109,969,111 | 77,329,179 lbs. |
| Nitrogen oxides ($NO_x$) | 1.03 lbs. | 109,969,111 | 113,268 lbs. |
| Sulphur dioxide ($SO_2$) | 3.41 lbs. | 109,969,111 | 374,995 lbs. |
| High level nuclear waste | 0.006 lbs. | 213,065,152 | 1,278 lbs |
| Low level nuclear waste | 0.0004 cubic feet | 213,065,152 | 85 cubic feet |

For residential electrical usage only, Table 7 provides the associated annual emissions and nuclear wastes.

*Table 7. Annual Emissions and Nuclear Wastes Amounts Generated by Residential Electrical Users in Oak Park*

| Type of Emission or Nuclear Waste | Produced from 1000 Kilowatt-hours (kWh) | Total Annual Electrical Usage (kWh) | Total Annual Emissions and Nuclear Waste |
|---|---|---|---|
| Carbon dioxide ($CO_2$) | 703.19 lbs. | 51,504,338 | 36,217,335 lbs. |
| Nitrogen oxides ($NO_x$) | 1.03 lbs. | 51,504,338 | 53,049 lbs. |
| Sulphur dioxide ($SO_2$) | 3.41 lbs. | 51,504,338 | 175,630 lbs. |
| High level nuclear waste | 0.006 lbs. | 99,789,655 | 599 lbs |
| Low level nuclear waste | 0.0004 cubic feet | 99,789,655 | 40 cubic feet |

#### ELECTRIC POWER > ASSESSMENT

It is apparent there are significant costs associated with electrical use for ComEd customers in Oak Park. Electrical costs have historically been increasing, and despite a current rate decrease due to the economic recession, Energy Information Administration projections (United States, 2009) indicate electricity prices will continue their trend upwards into the foreseeable future (fig. 17). Since these are local costs that are not reinvested in the local economy, there are local economic benefits to reducing costs associated with electrical use.

That being said, the Village of Oak Park receives a revenue stream of $965,706 (2008) per year that is budgeted as utility tax revenue in the village's General Fund. Any decrease in electrical usage and/or costs would also decrease this utility tax revenue.

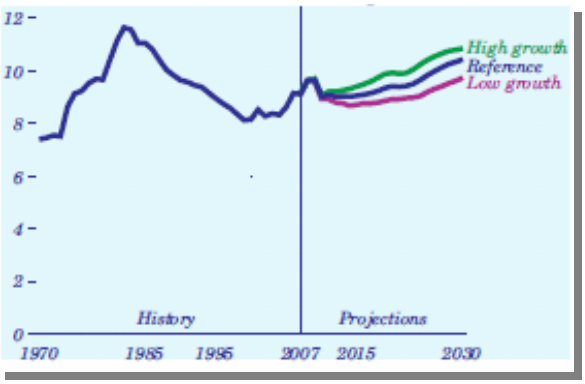



Fig. 17. Average U.S. retail electricity prices in three cases, 1970-2030 (2007 cents per kilowatt). (United States, 2009)

It is also apparent that the use of electricity has significant upstream impacts on pollution emissions and nuclear wastes. While Oak Park is fortunate to be located upwind from the nearby coal-fired power plants in Pilsen and Little Village, there remain significant regional public health impacts associated with the pollution emitted by these power plants. Regional nuclear plants pose a risk to public health as well, as they continue to store low- and high-level nuclear waste at these sites. While storage of nuclear waste at regional nuclear power plant sites is categorized as temporary, there currently is no federal policy or plan to transfer this nuclear waste to a permanent facility.

Lastly, coal-fired power plants generate a significant amount of carbon dioxide (CO2), a primary greenhouse gas (GHG). Annual CO2 emissions from Oak Park's total electrical use (2008) are 36,217,335 lbs. This is a primary contributor to Oak Park's carbon footprint (724 lbs./capita/year), but is often unrecognized due to its downstream impacts. If the Village of Oak Park intends on developing a climate action plan and/or policy to reduce its collective carbon footprint, it is necessary to complete a comprehensive and detailed greenhouse gas inventory along with targeted goals for GHG reductions, as per a projected timeline that includes GHG emissions reduction amounts from a baseline year.

Any proposed policy to address this multiple variables needs to be assessed from a cost-benefit viewpoint. Three electrical energy usage reduction policy scenarios are provided below (Table 8) 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, municipal utility tax reduction, greenhouse gas (CO2) reduction, and high-level nuclear waste reduction.

A 10% energy use reduction is typically accomplished with behavioral change only (example: turning off lights when the room is not in use), with little of no costs or expertise. A 20% energy cost reduction is typically accomplished with minimal costs and low expertise (example: EPA ENERGY STAR appliances). A 30% energy reduction is typically accomplished

with a higher level of investment and may require the hiring of expertise (example: energy-efficient lighting retrofit).

*Table 8. Potential Policy Scenarios Involving Residential Electric Energy Use Reductions*

| Annual Energy Usage Reduction Scenarios | Baseline | 10% Reduction | 20% Reduction | 30% Reduction |
|---|---|---|---|---|
| Usage (kWh)<br>[usage reduction] | 160,951,051<br>--- | 144,855,946<br>[1,609,511] | 128,760,841<br>[3,219,021] | 122,665,736<br>[4,828,532] |
| Costs ($)<br>[cost reduction / savings] | $21,853,416<br>--- | $19,668,074<br>[$2,185,342] | $17,782,732<br>[$4,370,683] | $15,297,391<br>[$6,556,025] |
| Municipal Utility Tax ($)<br>[tax revenue reduction] | $965,706<br>--- | $869,135<br>[$96,571] | $772,565<br>[$193,141] | $675,994<br>[$289,712] |
| CO2 (lbs.)<br>[CO2 reduction] | 36,217,335<br>--- | 32,595,601<br>[3,621,734] | 28,973,868<br>[7,243,467] | 25,352,134<br>[10,865,200] |
| High-level nuclear waste<br>[waste reduction] | 599<br>--- | 539<br>[60] | 479<br>[120] | 419<br>[180] |

An energy policy that affects a 20% energy use reduction would be achievable with minimal cost investment and expertise. An investment of $193,141 per year (equivalent to annual utility tax revenue reduction) would result in the following direct community benefits;

- Reduce residential electrical costs by $4,370,683 / year, an annual return 23 times the amount of reduced utility tax revenue.
- Reduce CO2 emissions and village carbon footprint by 7,243,467 lbs. / year.
- Reduce the amount of high-level radioactive nuclear waste by 120 lbs. / year.

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 (ComEd) 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.

**ENERGY > 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. 18). 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.

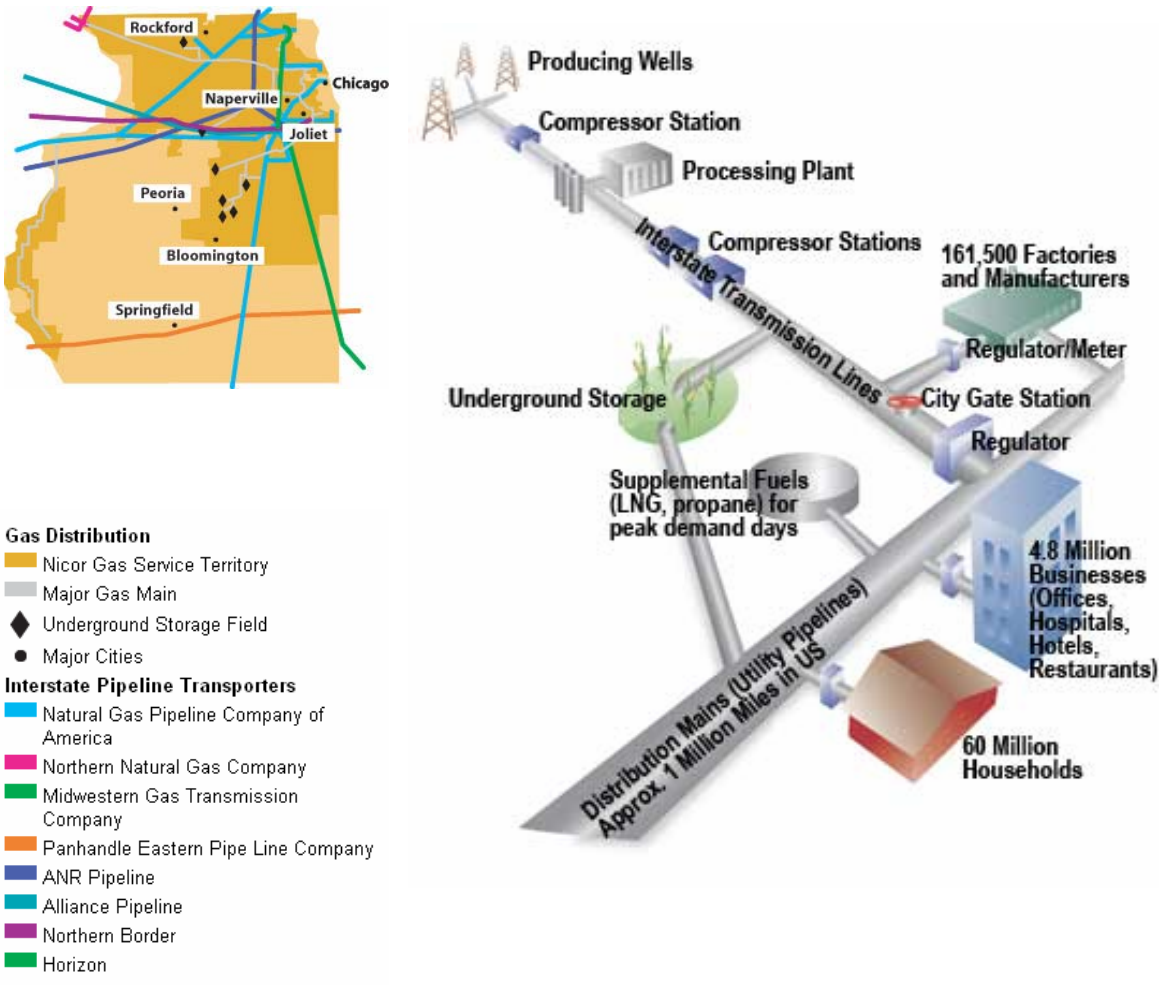



Fig. 18. Gas distribution and pipeline system. (Nicor Gas, 2009)

**Distribution:** New gas lines are installed at about 3' underground: The 10" gas main line (header) runs under streets. From the gas main (fig. 19), 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. 19. ComEd's access to public way. (photo by M. Iversen)

**NATURAL GAS > INPUTS**

According to the U.S. Census (2005-2007)[9], 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 9).

*Table 9. 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 9). The monthly delivery charges, natural gas costs, and taxes were based on monthly billing averages for the twelve months ending September 2009[10].

*Table 10. 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 10, 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 E).
- 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 11). In summary, the existing housing stock in Oak Park is relatively old, large in size, and energy inefficient.

*Table 11. 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 decrease 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. 20). 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.

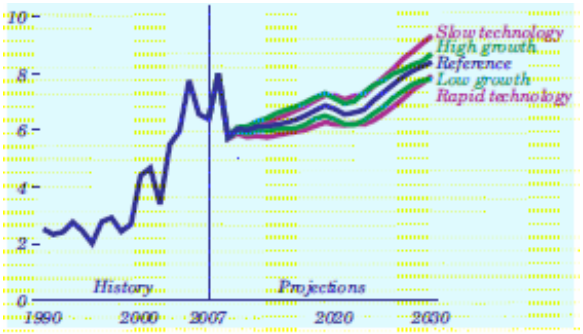



Fig. 20. Lower 48 wellhead natural prices in five cases, 1990-2030 (2007 dollars per thousand cubic feet). (United States, 2009)

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 12) 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 12. Potential Policy Scenarios Involving Residential Natural Gas Energy Use Reductions*

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

### SYSTEM 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, such as the Main (Central) Pumping Station (fig. 21). From these reservoirs, water is pumped through 105 miles of 6”-16” diameter water mains to about 12,470 water billing customers.


Fig. 21. Main (Central) Pumping Station, Village of Oak Park.
(photo by M. Iversen)

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, and valves (fig. 22). 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.


Fig. 22. Typical municipal water system supply valve cover in Oak Park.
(photo by M. Iversen)

### WATER > INPUTS (SUPPLY)

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 of 105 gallons. As per the *Village of Oak Park Annual Water Use Audit (IEPA 2005)*, the following represents (Table 13) the village-wide daily water usage;

*Table 13. Village-Wide Daily Water Usage*

| User Type | Usage (million gallons / day) | Percentage of Total |
|---|---|---|
| Residential | 3.727 | 65% |
| Commercial / industrial | 1.885 | 33% |
| Municipal | 0.096 | 2% |
| Construction | 0.008 | Negligible |
| **Village-Wide Totals** | **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 are provided as follows (Table 14);

*Table 14. 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 | $15,840 | 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** |
| **Village-Wide totals** | | **5,716** | **$24,018** | **2,086,340** | **$8,766,322** |

As shown by Table 14, the annual cost for total village-wide 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 5% water utility tax is not itemized in the Village of Oak Park water bill. When applied to the above total annual water 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 needs to be confirmed with the village.

#### WATER > OUTPUTS (SEWER AND STORMWATER)

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 are provided as follows (Table 15);

*Table 15. 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 | **$2,312,604** |
| Commercial / Industrial | $1.70 | 1,885 | $3,205 | 688,025 | **$1,169,643** |
| Construction | $1.70 | 8 | $14 | 2,920 | **$4,964** |
| Municipal | $0.00 | 96 | $0 | 35,040 | **$0** |
| **Village-Wide Totals** | | **5,716** | **$9,555** | **2,086,340** | **$3,487,211** |

As shown by Table 15, the annual cost for sewer service in Oak Park is $3,487,211. 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 5% 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 with the village. When applied to the above annual costs, this equates to a municipal sewer (water) utility tax of $174,361 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 imposes a property tax rate on property for the treatment of combined sewer/stormwater.

#### WATER > ASSESSMENT (SUPPLY, SEWER AND STORMWATER)

Any reduction in stormwater or sewer outputs will not reduce costs. This is because the sewer service charge is based on supply water usage. Conversely, a reduction in supply 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 16) relative to the previously established inventory baseline of village-wide user 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.

*Table 16. Potential Policy Scenarios Involving Village-Wide Water Use Reduction*

| Annual Water Usage Reduction Scenarios | Baseline | Water Usage 10% Reduction | Water Usage 20% Reduction | Water Usage 30% Reduction |
|---|---|---|---|---|
| Usage (gallons)<br>[usage reduction] | 2,086,340<br>--- | 1,877,706<br>[208,634] | 1,669,072<br>[417,268] | 1,460,438<br>[625,902] |
| Costs ($)<br>[cost reduction water] | $8,766,322<br>--- | $7,889,690<br>[$876,632] | $7,013,058<br>[**$1,753,264**] | $6,136,425<br>[$2,629,897] |
| Costs ($)<br>[cost reduction sewer][1] | $3,487,211<br>--- | $3,138,490<br>[$348,721] | $2,789,769<br>[**$697,442** | $2,441,048<br>[$1,046,163] |
| [combined cost reduction water and sewer] | --- | [$1,225,353 | **[$2,450,706** | [$3,676,060] |
| Municipal Utility Tax ($)<br>[tax revenue reduction] | $438,316<br>--- | $394,485<br>[$43,831] | $350,653<br>[**$87,663**] | $306,821<br>[$131,495] |

1. Sewer service charge (cost) is based on supply water usage; therefore any sewer cost reduction is based on water usage reduction.
2. Municipal utility tax (5%) is based on water charge (cost).

A 10% water use reduction is typically accomplished with behavioral change only (example: turning off faucets when not in use), with little or 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: tankless water heater).

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 resultant municipal utility tax revenue reduction) would result in the following direct community benefits;

- Reduce village-wide water and sewer service costs by $2,450,706 / year, an annual return of nearly 28 times the amount of reduced municipal 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 municipal utility tax revenue stream to local residential water-efficiency trades, materials and products.
- Increase use of local water-efficiency trades would positively impact local employment market.
- Increase in local purchases of water-efficiency materials and products would positively impact local sales tax revenues.
- 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% (Table 17) 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 (fig. 23). This system is connected 6 miles downstream to the Metropolitan Water Reclamation District (MWRD) of Greater Chicago.

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 residents are paying for importing Lake Michigan water for sprinkling lawns, landscape irrigation, washing cars, and other nonpotable water uses.

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 tax rate 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 individual property owners to reduce or pre-treat their stormwater/sewer discharge, as there will be little, if any, realized cost savings.

Since any combined stormwater/sewer outputs will be treated at the MWRD's Stickney Water Reclamation Plant (SWRP), 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 primarily by the aeration batteries (Bellucci et al., 2009). While it is beyond the scope of this report to calculate those greenhouse gases attributed to combined stormwater/sewer wastewater being treated at SWRP from Oak Park, it is recommended as a next step for inclusion in a comprehensive and detailed greenhouse gas inventory of the Village of Oak Park.


Fig. 23. Typical impermeable land cover in central Oak Park. (GIS image by P. Bonvoisin, M. Iversen)

*Table 17. Land Cover and Urban Area Runoff Coefficients (Ritter, Kochet & Miller, 2006)*

| Land Cover Type | Runoff Coefficient |
|---|---|
| Dense pavement, asphalt or concrete | 0.70-0.95 |
| Ordinary pavement or brick | 0.70-0.85 |
| Roofs of buildings | 0.75-0.95 |
| Lawns (turf grass, slopes less than 2%) | 0.05-0.17) |
| **Use of Urban Area** | **Runoff Coefficient** |
| Commercial (downtown district) | 0.70-0.95 |
| Commercial (other districts) | 0.50-0.70) |
| Residential (suburban, with yards) | 0.25-0.40 |
| Parks (green space) | 0.10-0.25 |

## SOLID WASTE (REFUSE, RECYCLING, YARD WASTE, LEAF LITTER)

### SYSTEM OVERVIEW

The Village of Oak Park has contracted for the collection and disposal of solid waste since the Village elected to privatize the function in 1993. The Solid Waste Division of the Public Works Department manages the Villages solid waste collection and a comprehensive recycling program. Waste collection and recycling is provided through contract services for single-family units and multi-unit residents up to five unit buildings.

The primary solid waste paths and waste streams, along with outputs, destinations and end uses, are shown in Table 18.

*Table 18. Primary Solid Flow Paths in the Village of Oak Park*

| SOLID WASTE FLOW PATHS | | | |
|---|---|---|---|
| **Waste Stream** | **Output** | **Destinations** | **End Use** |
| Refuse | landfill | Waste Management - Metro / Allied Liberty Transfer Station (McCook, IL), and then to Livingston Landfill (Pontiac, IL) | none |
| Recyclables | Materials Recovery Facility (MRF) | Waste Management – CID Recycling and Disposal Facility (Calumet City, IL) | Recyclables sold to various mills, manufacturers and other end users for use as material feedstocks. |
| Recyclables: large size metals | Often collected by independent scavengers via pick-up trucks. | Haul to various local area metal recycling facilities. | Recyclable metals sold to various mills and other end users for use as material feedstocks. |
| Yard Waste | Farm | Waste Management - Metro / Stickney Transfer Station (Stickney, IL), and then to yard waste land application facility, Hamman Farms (Yorkville, IL) | Soil amendment for agricultural use. |
| Leaf Litter | Farm | Waste Management - Metro / Stickney Transfer Station (Stickney, IL), and then to yard waste land application facility, Hamman Farms (Yorkville, IL) | Soil amendment for agricultural use. |

**REFUSE > INPUTS**

Refuse, or municipal solid waste, is all nonhazardous solid waste from a community that requires collection and transport to a processing or disposal site. Refuse is also known as trash, garbage or rubbish. Refuse collection service in the Village of Oak Park is provided once a week for all residential buildings with up to five units (fig. 24). Larger multifamily dwelling and commercial building refuse collection service is contracted for directly by the building owners[11]. All refuse, recyclables and yard waste are scheduled to be picked up on the same day of the week. The Village's solid waste collection contractor provides 96-gallon and 64-gallon, tightly covered, green wheeled containers for refuse. Previously issued refuse containers are brown and gray.

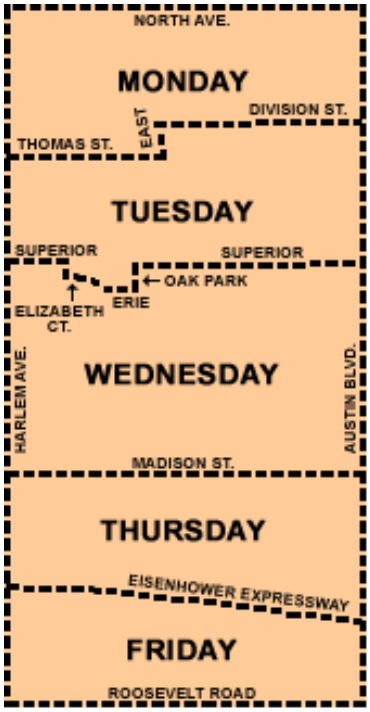



Fig. 24. Garbage collection areas / days. (Oak Park, 2009, September 28)

Pink refuse stickers are available for additional bags of trash or collection of bulk items. Stickers can be purchased for $1.80 each at grocery and hardware store locations throughout the Village, including Village Hall. Each residential unit may place out one bulk item per week, provided that two pink refuse stickers are attached. Bulk items are defined as discarded furniture, white goods[12], water tanks (capable of being handled by one person) and trash items not exceeding 50 pounds.

Residents may place out rolls of used carpeting provided that two pink refuse stickers are attached to each roll. Rolls of carpeting must not be more than 50 pounds and must be no longer than four feet in length (folded over). Additional bulk items, construction materials from do-it-yourself projects or general waste over the allowable one bulk item requires a special pick-up and will be collected only if prior arrangements have been made.

Fig. 25. WM garbage truck. (photo by M. Iversen)

The following items are either prohibited by landfills, or unacceptable for collection:

- car parts
- dirt and soil
- concrete
- tires

- motor oil
- pesticides
- acid
- gasoline
- anti-freeze
- pool chemicals
- automotive batteries
- paint in liquid form

**REFUSE > OUTPUTS**

Refuse is collected weekly from 64 or 96-gallon mobile carts and tagged bulk items by the current solid waste hauler, Waste Management-Metro (WM), via diesel-fuel garbage trucks (fig. 25).

WM transports collected refuse 8 miles (fig. 26) to the Allied Waste Liberty Transfer Station, located at 5100 S. Lawndale Ave., McCook, IL (fig. 27). From there, the refuse is transferred to diesel-fuel trailer trucks and long-hauled 90 miles (fig. 28) to the Livingston Landfill, located at 14206 East 2100 North Road, Pontiac, IL (fig. 29). Therefore, refuse is transported a total of 96 miles from point of collection to destination.

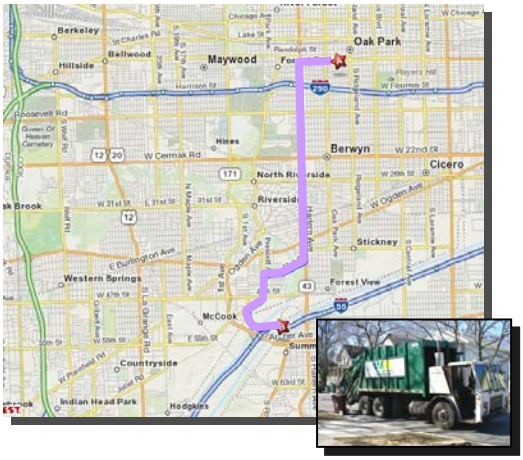



Fig. 26. **Refuse**: WM garbage truck route from Oak Park to Allied Waste Liberty Transfer Station. (MapQuest, 2009, October 2)

Since 1994, the Village contracted and passed the actual cost of collection and disposal with various solid waster haulers to the residents based upon a fixed cost associated with the individual home pick-up charges (Oak Park, 2008b).

Waste Management-Metro is currently under a three-year contract with the Village for the collection and transportation (but not the transfer or disposal) of refuse, and the collection, transportation and disposal of white goods, until December 31, 2011. The cost of the WM contract is approximately $1,709,000 in the first


Fig. 27. Allied Liberty Transfer Station. (Naseef, 2009, October 5)

year (2009) which includes recycling and yard waste collection, transportation and processing. With years two (2010) and three (2011) to increase at the rate of cost living, not to exceed 5 percent annually (Oak Park, 2008a).

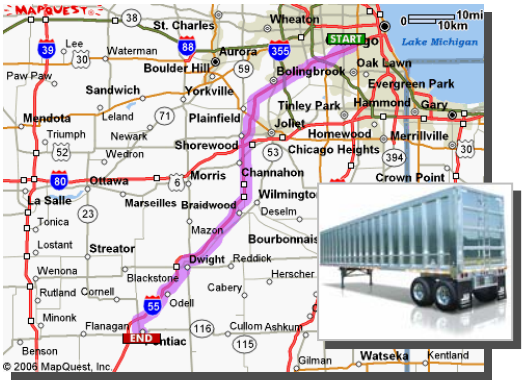



Fig. 28. **Refuse**: WM long-hauler route from Allied Waste Liberty Transfer Station to Livingston Landfill (MapQuest, 2009, October 3)

In 1998, the Village became a member of the West Suburban Solid Waste Agency (the Agency) that requires participating members to contract its waste haulers to utilize the disposal/landfill services of the agency and to also pay the Agency, not the hauler, for the disposal and related tipping fees of the solid waste generated by the community. In doing so, it then became a requirement that the Village determine the average cost per resident for the disposal component of the bill, since that cost then became a municipal cost responsibility, not the responsibility of the hauler. (Oak Park, 2008b)

Disposal fees are paid by the Village directly to West Cook County Solid Waste Agency for the agreement using the Regional Disposal Project, which will expire on December 31, 2018. As per Table 19, the Village disposal costs in 2008 for 12,243 tons of refuse was $474,177, which includes include roll-off containers used by public works for street sweeping debris, institutional locations, municipal properties, and public works trash dumpsters.

Fig. 29. Livingston Landfill, Pontiac, IL. (IEPA, 2009)

Residential refuse was 11,924 tons, which equals 1,920 lbs. (0.96 tons) per household per year, or 36.9 lbs. of refuse per household per week. The apportioned monthly disposal fee per household is $3.29. While the amount of residential refuse in 2008 increased 7 percent from 2007, it has decreased 16.5 percent from 2000 (Table 20).

The rates that are charged to residents include administration costs and disposal (tipping) fees. Village rates (effective January 1, 2009) for collection of refuse for residential buildings containing five units or less (not including condominium or mixed-use buildings) are $56.78/quarter for each 96-gallon refuse container, and $47.86/quarter for each 64-gallon refuse container. Additional charges for more than one refuse container will apply. There is no fee for the refuse container.

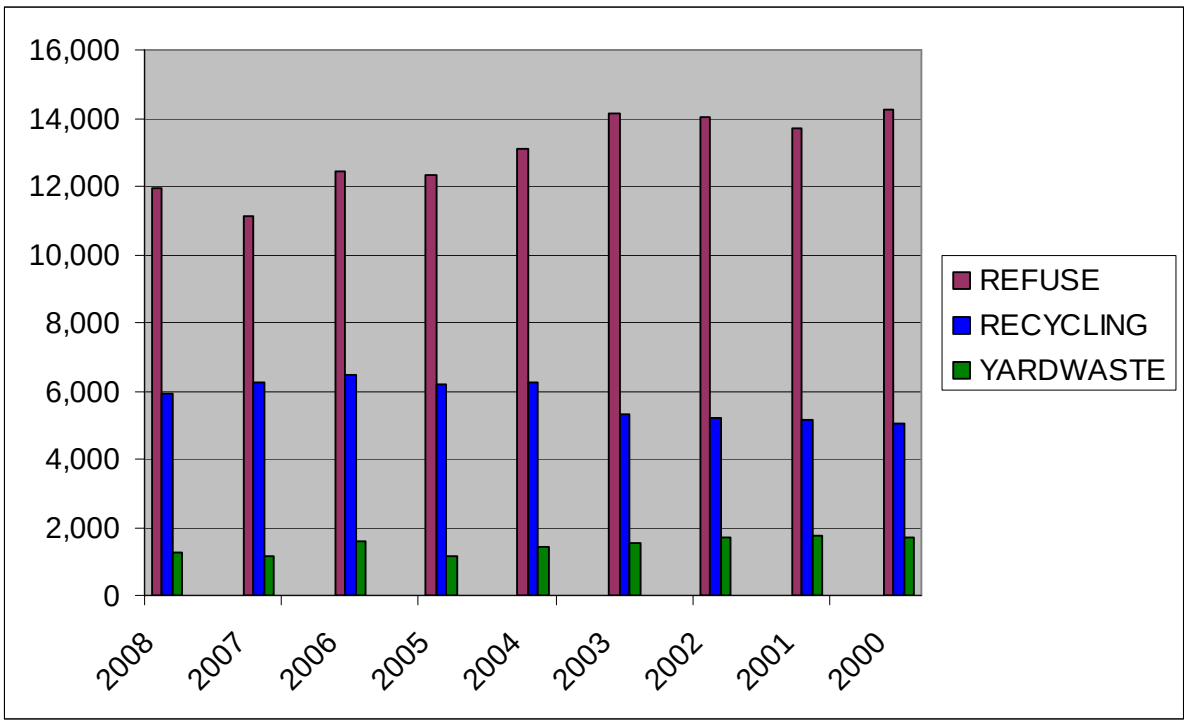
*Table 19. Disposal Rates for Refuse, Recycling and Yard Waste (2008) in the Village of Oak Park (Oak Park, 2009)*

| 2008 DISPOSAL REPORT | | | | |
|---|---|---|---|---|
| **Month** | **Refuse (in tons)** | **Actual Disposal Costs** | **Recycling (in tons)** | **Yard waste (in tons)** |
| **January** | 1,053.93 | $40,818.71 | 517.80 | 46.80 |
| **February** | 877.48 | $33,984.74 | 443.00 | |
| **March** | 926.23 | $35,872.92 | 453.30 | |
| **April** | 1,119.87 | $43,372.57 | 490.40 | 205.40 |
| **May** | 1,180.64 | $45,726.22 | 514.10 | 218.00 |
| **June** | 1,033.04 | $40,009.67 | 490.10 | 249.70 |
| **July** | 1,119.32 | $43,351.26 | 499.00 | 169.10 |
| **August** | 1,005.68 | $38,949.94 | 454.40 | 138.90 |
| **September** | 1,072.38 | $41,533.27 | 507.80 | 108.70 |
| **October** | 979.25 | $37,926.38 | 489.00 | 85.00 |
| **November** | 883.25 | $34,208.31 | 462.50 | 59.30 |
| **December** | 992.08 | $38,423.25 | 605.40 | |
| **TOTALS** | 12,243.15 | $474,177.24 | 5,926.80 | 1,280.90 |
| | | | | |
| **Total for refuse disposal costs include roll-off containers used by Public Works for street sweeping debris, institutional locations, municipal properties, and Public Works trash dumpsters.** | | | | |
| **Institutional** | **1,220 tons** | **$50,203.00** | Commercial routes not incl. in total | |
| These figures include municipal buildings, schools and churches. | | | | |
| | | | | |
| **Litter Baskets*** | **188.94** | **$7,561.38** | Actual cost included in monthly totals. | |
| (est. 3.5 tons/week) | | | | |
| | | | | |
| **Special Pick-Ups*** | **130 tons** | **$5,349.50** | Est. cost included in monthly totals. | |
| | | | | |
| **Formula for estimating monthly disposal fees for residents.** | | | | |
| | | | | |
| **Est. Residential** | **11,924.21 tons** | Total Refuse less above items* (318.94 tons) | | |
| | | | | |
| **Divided by 12,365 units** | 0.96 ton per unit per year X $41.15 (per ton) = $39.50 per unit per year | | | |
| | | | | |
| **Monthly charge** | **$3.29** | $39.50 divided by 12 months | | |
| In 2008, the average amount of refuse set out for collection was 36.92 pounds per household per week. | | | | |

*Table 20. Year-to-Year Change of Refuse, Recycling and Yard Waste Streams (2000-2008) in the Village of Oak Park (Oak Park, 2009)*

| 2000-08 RESIDENTIAL WASTE STREAM COMPARISONS (TONS) | | | | | | |
|---|---|---|---|---|---|---|
| **Year** | **Refuse** | **% Change** | **Recycling** | **% Change** | **Yard Waste** | **% Change** |
| 2008 | 11,924 | 7% (increase) | 5,927 | 5% (decrease) | 1,281 | 7% (increase) |
| 2007 | 11,143 | 10% (decrease) | 6,220 | 3% (decrease) | 1,170 | 25% (decrease) |
| 2006 | 12,414 | 1% (increase) | 6,445 | 4% (increase) | 1,563 | 25% (increase) |
| 2005 | 12,334 | 6% (decrease) | 6,172 | 1% (decrease) | 1,175 | 8% (decrease) |
| 2004 | 13,107 | 7% (decrease) | 6,236 | 15% (increase) | 1,412 | 9% (decrease) |
| 2003 | 14,134 | 1% (increase) | 5,296 | 2% (increase) | 1,561 | 9% (decrease) |
| 2002 | 14,033 | 2% (increase) | 5,214 | 1% (increase) | 1,719 | 3% (decrease) |
| 2001 | 13,703 | 4% (decrease) | 5,170 | 2% (increase) | 1,766 | 3% (increase) |
| 2000 | 14,271 | 1% (increase) | 5,067 | 1% (increase) | 1,717 | 14% (decrease) |

**The totals used for refuse do not include R/O boxes, litter or institutional tonnages.**
The percentage of change is measured from year to year. For example, the amount of refuse collected in 2008 shows an increase of 7% over the amount of refuse that was collected in 2007.



**RECYCLING > INPUTS**

Recyclables are picked up on the same day as the trash and yard waste. In 2004, the Village replaced the smaller blue recycling bins with 64-gallon, blue recycling containers to encourage more recycling, by connecting refuse collection rates to the amount of refuse set out for pickup. Residents are allowed to opt for a smaller 64-gallon refuse container (from 96-gallon) at a reduced rate ($47.88/quarter, from $56.78/quarter). Larger carts with wheels and lids mean residents are better able to take full advantage of the latest *single-stream collection approach* that eliminates the need to separate recyclables. Single-stream programs allow all recyclable materials, whether paper, glass, plastic, aluminum or most metal containers, to be tossed into the same collection container, with separation occurring at the Materials Recovery Facility (MRF).

Introduction of the larger recycling bins coincided with modest, but steady, increases in the amount of recyclables collected in Oak Park over the past five years. The range of containers that can be recycled has grown, too, and now includes containers such as those from household cleaners, beauty products and grocery items. The growing amount and expanding range of recyclables, coupled with greater consumer awareness, has led to an increasing amount of recycling in the Village, from 5067 tons in 2000, to 5927 tons in 2008 (17 percent).

Items for single-stream recycling include;

- Glass bottles and jars (all colors)
- Steel, aluminum and bi-metal cans
- Plastics – check for these numbers on or near the bottom of the container:
- #1 PETE (plastic soft drink bottles)
- #2 HDPE (milk or water jugs, detergent bottles#3 PVC narrow neck containers like household cleaners, health and beauty products
- #4 LDPE (margarine tubs and plastic rings from beverage cans)
- #5 PP (yogurt cups, narrow neck syrup and ketchup bottles
- #7 OTHER (plastic resin grocery narrow neck containers)
- Aluminum foil and formed containers
- Empty paint cans
- Empty aerosol cans
- Newspapers and inserts, magazines, telephone books, paperback books
- Chipboard (cereal and cracker boxes)
- Wet-strength cardboard (beverage cartons)

- Junk mail
- Office paper, gift wrapping paper, brown paper grocery bags
- Corrugated cardboard (place small pieces in the cart; cut and flatten larger pieces into three-foot-square pieces and place next to cart)

**RECYCLING > OUTPUTS**

Recyclables are collected weekly from 64-gallon blue mobile carts by the current recyclable waste hauler, Waste Management-Metro (WM), via diesel-fuel garbage trucks. WM transports the collected recyclables 27 miles (fig. 30) to their CID Recycling and Disposal Facility, which is a 'clean'[13] Materials Recovery Facility (MRF), located at138th St. and I-94, Calumet City, IL.


Fig. 30. **Recyclables**: WM garbage truck route from Oak Park to their CID Recycling and Disposal Facility. (MapQuest, 2009, October 7)

From there, the recyclables are sold to various mills, manufacturers and other end users, and hauled via domestic van trailers, overseas export containers or rail box cars. According the Chicago Recycling Coalition, some recyclables are even exported to China, where there is a significant need for material feedstocks (production) for the U.S. market (consumables).

Large-sized recyclable metals, such as appliances, are often collected by independent scavengers via pick-up trucks rummaging through alleys, who haul their loads to local area metal recycling facilities.

The success of the Village's recycling program can be measured in recycling amounts (Table 21), overall diversion rates (Table 22), and cost savings, primarily in avoided disposal rates.

*Table 21. Monthly Residential Recycling Amount (2008) in the Village of Oak Park (Oak Park, 2009)*

| 2008 ANNUAL RESIDENTIAL RECYCLING REPORT | | | |
|---|---|---|---|
| **Month** | **Recycling (in tons)** | **Average Weekly Total** | **Average Route Per Week** |
| **January** | 517.80 | 119.58 | 7.97 |
| **February** | 443.00 | 102.31 | 6.82 |
| **March** | 453.30 | 104.69 | 6.98 |
| **April** | 490.40 | 113.26 | 7.55 |
| **May** | 514.10 | 118.73 | 7.92 |
| **June** | 490.10 | 113.19 | 7.55 |
| **July** | 499.00 | 115.24 | 7.68 |
| **August** | 454.40 | 104.94 | 7.00 |
| **September** | 507.80 | 117.27 | 7.82 |
| **October** | 489.00 | 112.93 | 7.53 |
| **November** | 462.50 | 106.81 | 7.12 |
| **December** | 605.40 | 139.82 | 9.32 |
| **TOTAL** | 5,926.80 | | |
| **Average Weekly Collection** | | 113.98 | |
| **Average Weekly Route** | | | 7.60 |
| **Average # Units Per Route** | | | 825 |

There are 15 recycling routes, 3 per day Monday through Friday.
On average, each household set out approximately
18.43 pounds of recyclable items for collection each week.
Recycling collection costs are approximately 60% less
than collection costs for refuse. In addition, the tonnages
outlined above equate to $243,887.82 in avoided disposal fees.

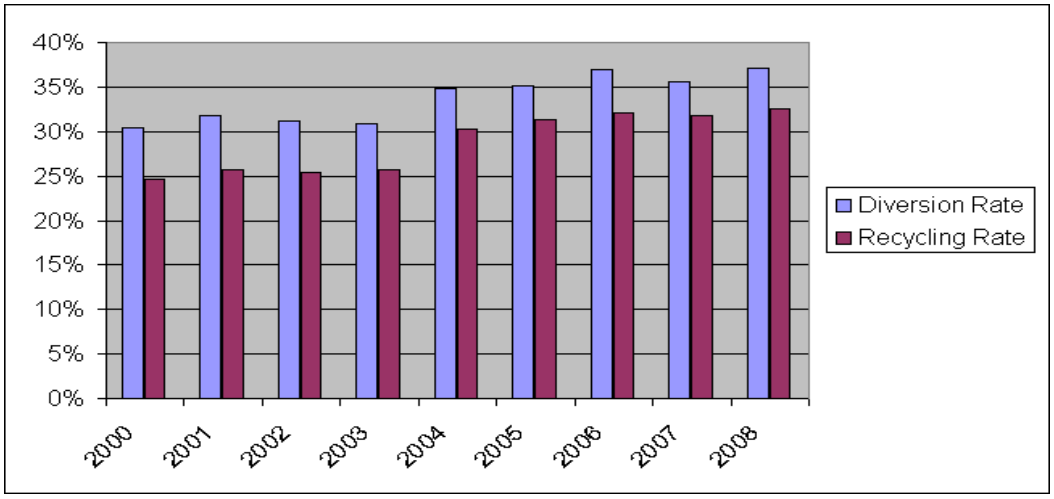
*Table 22. Refuse Diversion and Recycling Rate Comparison (2000-08) in the Village of Oak Park (Oak Park, 2009)*

| 2000-08 DIVERSION AND RECYCLING RATE COMPARISONS | | | | | | |
|---|---|---|---|---|---|---|
| **Year** | **Refuse** | **Recycling** | **Yard Waste** | *** Total MSW** | **Tons Diverted** | **Diversion Rate** |
| **2000** | 15,491 | 5,067 | 1,717 | 22,275 | 6,784 | 30% |
| **2001** | 14,923 | 5,170 | 1,766 | 21,859 | 6,936 | 32% |
| **2002** | 15,253 | 5,214 | 1,719 | 22,186 | 6,933 | 31% |
| **2003** | 15,354 | 5,296 | 1,561 | 22,211 | 6,857 | 31% |
| **2004** | 14,327 | 6,236 | 1,412 | 21,975 | 7,648 | 35% |
| **2005** | 13,554 | 6,172 | 1,175 | 20,901 | 7,347 | 35% |
| **2006** | 13,634 | 6,445 | 1,563 | 21,642 | 8,008 | 37% |
| **2007** | 13,391 | 6,222 | 1,170 | 20,783 | 7,392 | 36% |
| **2008** | 12,243 | 5,927 | 1,281 | 19,451 | 7,208 | 37% |

***** Total Municipal Solid Waste (MSW) stream is calculated for all recycling locations contained in the contract including 12,365 household units and 82 institutional locations.
Note: Yard waste can vary depending on other factors such as weather.

| **Year** | **Refuse** | **Recycling** | | **Total** | | **Recycling Rate** |
|---|---|---|---|---|---|---|
| **2000** | 15,491 | 5,067 | | 20,558 | | 25% |
| **2001** | 14,923 | 5,170 | | 20,093 | | 26% |
| **2002** | 15,253 | 5,214 | | 20,467 | | 25% |
| **2003** | 15,354 | 5,296 | | 20,650 | | 26% |
| **2004** | 14,327 | 6,236 | | 20,563 | | 30% |
| **2005** | 13,554 | 6,172 | | 19,726 | | 31% |
| **2006** | 13,634 | 6,445 | | 20,079 | | 32% |
| **2007** | 13,391 | 6,222 | | 19,613 | | 32% |
| **2008** | 12,243 | 5,927 | | 18,170 | | 33% |

The recycling rate is calculated only on these portions of MSW and does not include yard waste.



Waste Management-Metro is currently under a three-year contract (until December 31, 2011) with the Village for the collection, transportation, processing, marketing of all recyclable materials set out for collection by residential units. This contract also includes refuse, white goods and yard waste, as per the terms of the agreement previously described in the Refuse > Outputs section of this report.

#### RECYCLING > ASSESSMENT

Currently, residents dispose of nearly one million pounds of recyclables per month, or 11 million pounds per year. According to the Environmental Protection Agency, this means that the Oak Park residents are helping to conserve over 40,000 trees, one million gallons of fuel and 19 million gallons of water each year.

Collected recyclables in the most recent reported year, 2008, was 5,927 tons (Table 22). While this represented a 5 percent decrease from 2007 (6,222 tons), it was a 17 percent increase from 2000 (5,067 tons), as shown by Table 22. The recycling waste diversion rate from the total municipal solid waste stream in 2008 (not including yard waste) was 33 percent, a steady increase from the 25% diversion rate in 2000 (Table 22)

#### YARD WASTE > INPUTS

Illinois was the first state in the nation to ban yard waste from landfills, as it was banned by Illinois EPA from Illinois landfills in July 1990. Yard waste is prohibited from being put in refuse or recycling containers include grass clippings, leaves, branches, brush, shrubs, vines and any greenery produced from gardening or landscaping.

Residents are urged to look for alternatives to bagging yard waste for collection such as mulching mowers, leaf shredders, or backyard compost piles. For those residents who wish to have their yard waste collected, the Village offers the following program:

Green yard waste stickers are required for collection of bundles of brush and other yard waste. Stickers can be purchased for $2.05 at grocery and hardware store locations throughout the Village, including Village Hall Cashier's Office. Regularly scheduled yard waste collection begins the first full week of April and ends December 1.

Each year, the Village also provides collection for Christmas and holiday trees during the second and third weeks of January. WM collects the trees at regular collection points on regularly scheduled pick up days if the trees are free of plastic bags, decorations and tree stands. All collected trees are mulched at a licensed composting facility and used for soil enrichment.

**YARD WASTE > OUTPUTS**

Yard waste is collected weekly from April to November in tagged paper bags (up to 32-gallons), rigid containers (up to 32-gallons) and bundles of brush (up to 2' diameter, 4' long, 50 lbs.) by the current solid waste hauler, Waste Management-Metro, via diesel-fuel garbage trucks.

WM transports yard waste 6 miles to their Stickney Transfer Station, located at 3815 S. Laramie Ave., Stickney, IL. From there, yard waste is long-hauled 53 miles via trailer-trucks to Hamman Farms, a yard waste land application facility near Yorkville, IL, where it is used as agricultural soil amendment.

Waste Management-Metro is currently under a three-year contract (until December 31, 2011) with the Village for the collection, transportation, treatment and/or disposal of yard waste set out for collection by residential units. This contract also includes refuse, white goods and recyclables, as per the terms of the agreement previously described in the Refuse > Outputs section of this report.

**YARD WASTE > ASSESSMENT**

Collected yard waste in the most recent reported year, 2008, was 1,281 tons (Table 22). While this represented a 7 percent increase from 2007 (1,170 tons), it was a 25 percent decrease from 2000 (1,717 tons), as shown by Table 22. The combined recycling and yard waste diversion rate from the total municipal solid waste stream in 2008 was 37 percent, of which yard waste represented 7 percent of the total (Table 22).

**LEAF LITTER > INPUTS**

The annual fall leaf collection program is scheduled from mid-October to the end of November, and consists of six pick ups in all residential areas regularly scheduled throughout the season (fig. 31). The pick-up schedule divides the Village into four sections. Leaves raked into the street area pushed into piles by Department of Public Works crews for collection by Waste Management workers. When the fall leaf collection program is not in effect, leaves can be included as part of the regular yard waste collection process.

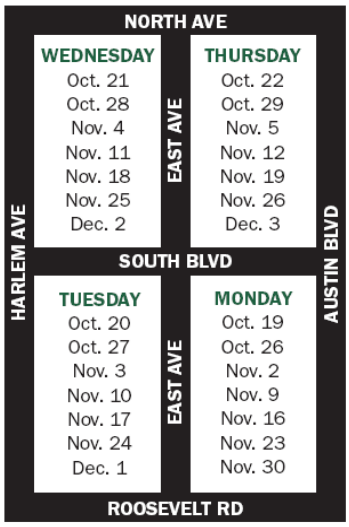



Fig. 31. 2009 fall leaf collection schedule. (Oak Park, 2009, September/October)

**LEAF LITTER > OUTPUTS**

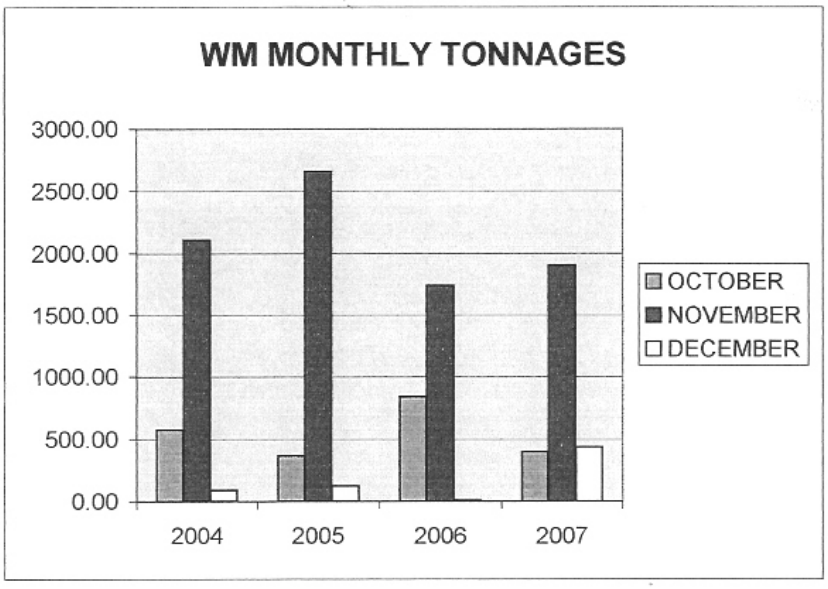
Leaves are collected from the piles in the streets by the current solid waste hauler, Waste Management-Metro, via diesel

garbage trucks (fig. 32 and 33). WM transports leaves 6 miles via same garbage trucks to their Stickney Transfer Station located at 3815 S. Laramie Ave., Stickney, IL. From there, leaves are long-hauled 53 miles via diesel-fuel trailer-trucks to Hamman Farms, a yard waste land application facility near Yorkville, IL, where it is used as agricultural soil amendment. Hamman Farms is a 'yard waste land application' facility, and not a composting facility, which falls outside the jurisdiction of IEPA. Hamman Farms takes leaves and yard waste and grinds them on site, and then uses the end product as a soil amendment on their own farm fields, which are north and south of Rte. 71. The grinder is a mobile unit, and there is no central facility.

**LEAF LITTER > ASSESSMENT**

Collected leaves in the most recent reported year, 2007, were 2,747 tons (Table 23). The average village leaf collection is 2,818 tons per year (2004-07). This is from approximately 19,000 village-owned trees and approximately 30,000 privately-owned trees, as well as trees on park and school district grounds. Assuming an even distribution of fallen leafs, this is approx. 275 lbs. of leafs per average-sized single-family lot (35' x 175').

*Table 23. Fall Leaf Collection Data (2004-07) in the Village of Oak Park (Oak Park, 2009)*




| | OCTOBER | NOVEMBER | DECEMBER | TOTAL |
|---|---|---|---|---|
| 2004 | 577.27 | 2,109.60 | 91.20 | 2,778.07 |
| 2005 | 368.30 | 2,658.10 | 125.50 | 3,151.90 |
| 2006 | 843.70 | 1,740.90 | 9.50 | 2,594.10 |
| 2007 | 402.60 | 1,903.40 | 440.80 | 2,746.80 |

| | |
|---|---|
| **YEARLY AVERAGE** | **2,817.72** |

Direct costs for village leaf collection are $168,000 per year (as per previous contract with Waste Management-Metro in 2008). The primary outputs associated with leaf collection are; direct costs (hauling fees), indirect costs (wear and tear on streets and alleys), and pollution emissions.

Pollution emissions are unknown, but would be based on; 1) the village using diesel-fueled (PM2.5, CO, NOx, SOx and CO2) heavy equipment to stage the leaves at the end of each block; 2) Waste Management diesel-fueled garbage trucks collecting leaves throughout the entire village (112 miles) six times/year, with a high amount of idling, and then hauling them 6 miles to Stickney Transfer Station; and 3) then transporting them 53 miles via diesel-fueled long-haulers to a yard waste land application facility (Hamman Farms) in Yorkville, IL.

As an alternative to raking and hauling, village residents may consider composting their leaves and yard waste (fig. 34), using them as mulch to cover their garden for the winter, or mixing with other compostables to provide organic matter and nutrients to the soil. Leaves can be used effectively as a component in a compost pile that contains a variety of organic matters. A good balanced compost pile contains materials rich in nitrogen and others rich in carbon. Leaves can provide the carbon component of the compost pile.

Fig. 32. Leaf piles on typical residential street in Oak Park. (M. Iversen, 2009)

Fig. 33. Leaf piles being collected by WM garbage truck. (M. Iversen, 2009)

Fig. 34. Example of backyard compost bins for leaves and yard waste. (Homegrown Edible Landscaping Company, 2009)

# 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[14]. 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[16] 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"[17]. 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[9]. 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 F). 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 G.

**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

*Table 24. Results from Ecological Footprint Quiz (June, 2007)*

United Nations agencies and the Intergovernmental Panel on Climate Change. It allows a com-

| 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** |

parable 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 H 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 24. 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[18]. 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 I), 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).

*Table 25: Energy Audit: Nicor (Gas) and ComEd (Electric) (June, 2007)* *(costs rounded to nearest $1)*

| 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** |

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 25.

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 G), 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 26.

*Table 26: Water Audit: Village of Oak Park (June, 2007)* *(costs rounded to nearest $1)*

| 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** |

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 27.

*Table 27: Sewer and Refuse Audit: Village of Oak Park (June, 2007)* *(costs rounded to nearest $1)*

| 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** |

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 27) are based on the amount of metered water usage (Table 26). 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 28.

*Table 28: Total Utility Costs (June, 2007)* *(costs rounded to nearest $1)*

| 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** |

**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[20] 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 J).

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.

*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. 35), which allows the village to identify various scales of potential green block clusters.

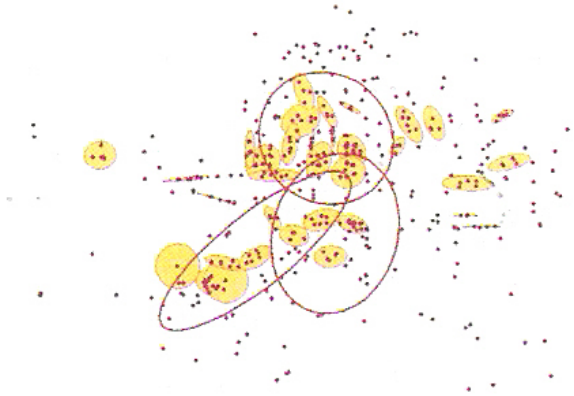


Figure 35: NNH, first- and second-order clusters. (Mitchell, 2005)

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. 36), 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.

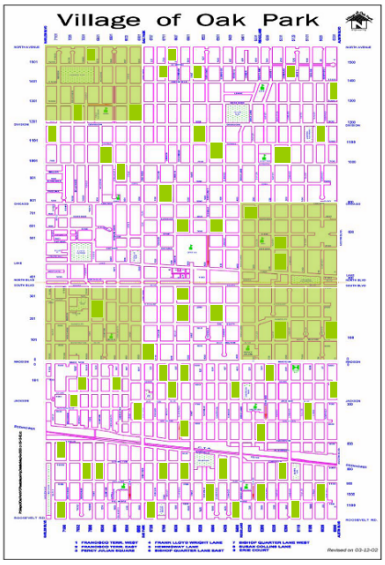



Figure 36. Green blocks clusters (M. Iversen, 2009)

*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. 37).

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.

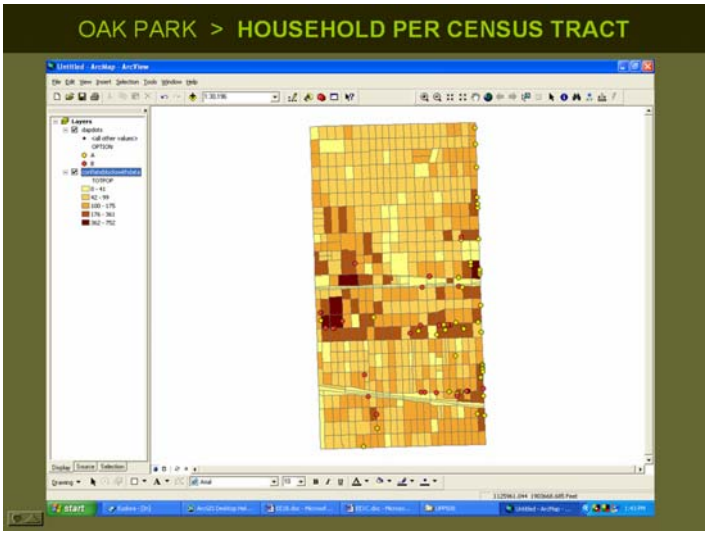



Figure 37: Households per census tract in Oak Park.
(M. Iversen, 2009)

*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.

**SUSTAINABLE PLANNNG 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.

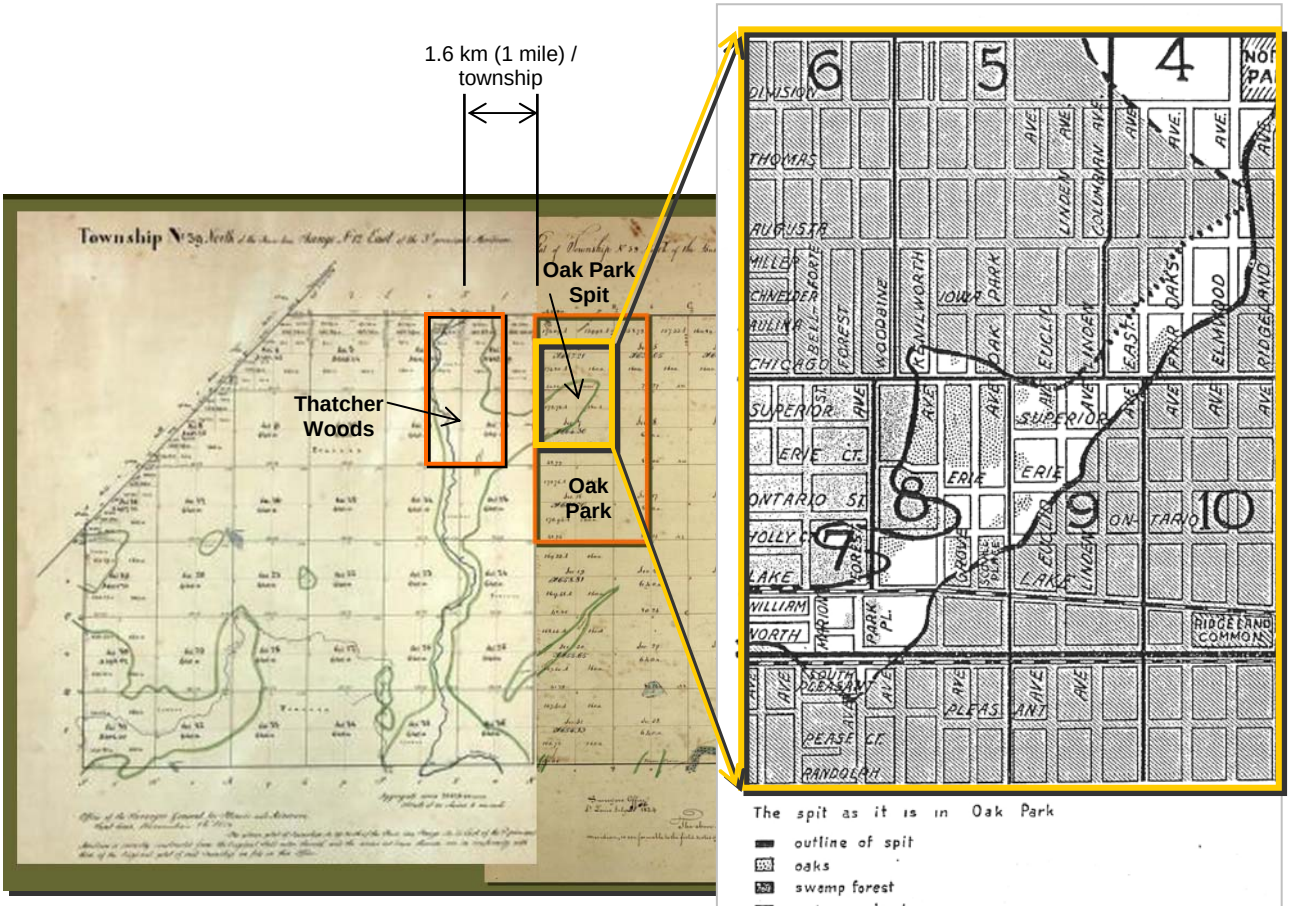
The Sustainability Indicators Project completed its first report in the spring of 2000, compiled from numerous Advisory Board meetings and input from area residents. The process included a community forum where the community input was evaluated for determining the inaugural 42 indicators. Subsequent 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 B: LOCATION MAP OF THE OAK PARK SPIT




**Public Land Survey Map (1834)**

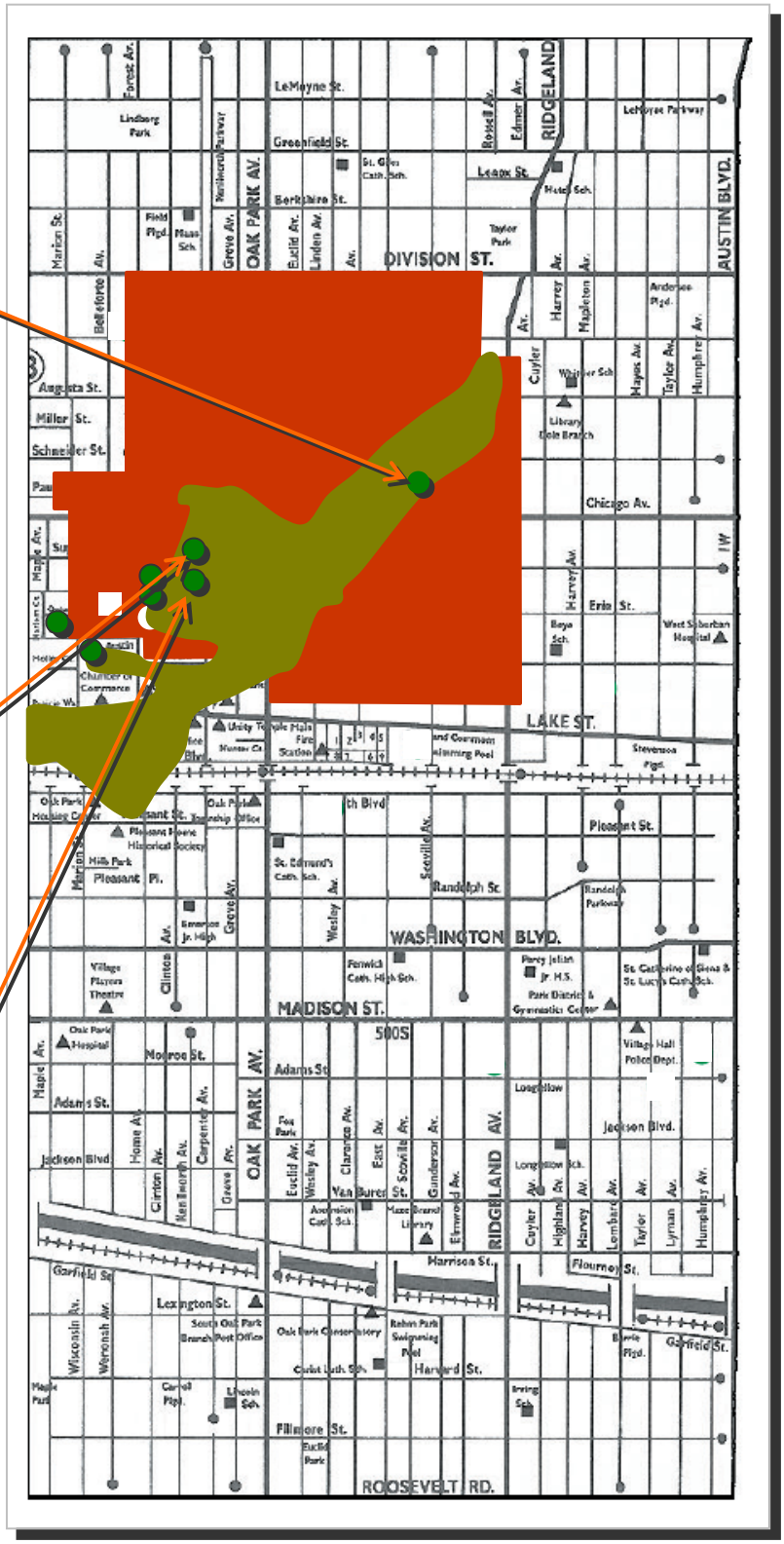
**Oak Park Spit with Street Layout (Evans, 1921)**

## APPENDIX C: 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.**




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

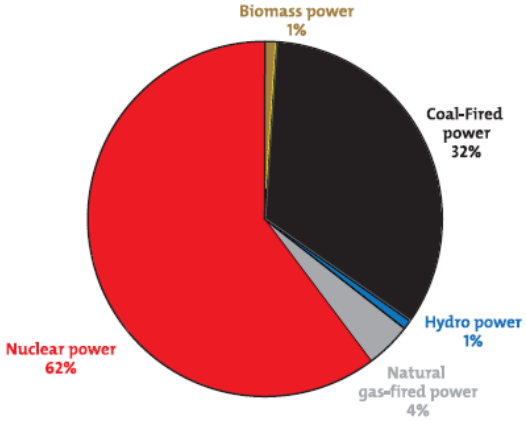
## APPENDIX D: COMMONWEALTH EDISION ENVIRONMENT DISCLOSURE STATEMENT

### 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[1] 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 |

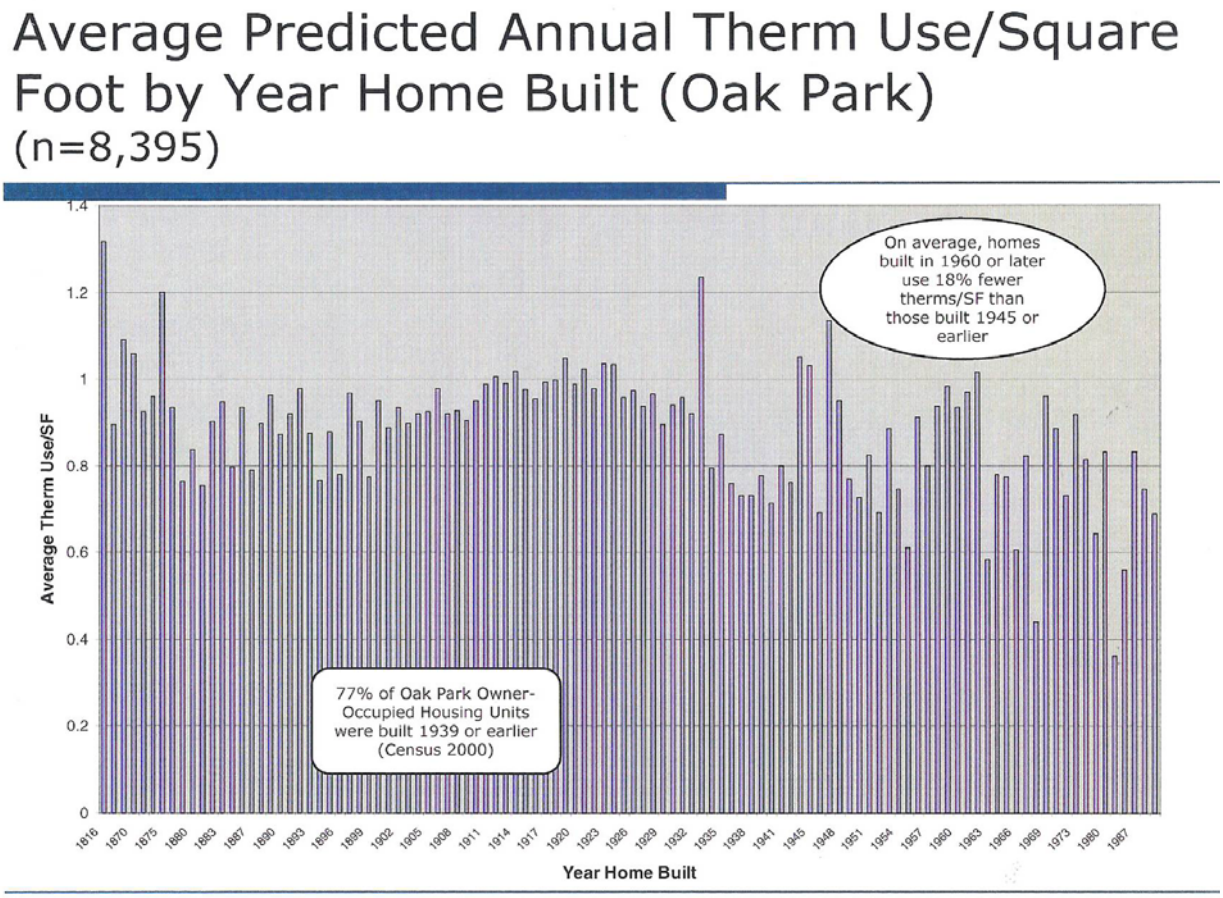
[1] These figures constitute the aggregation of information provided by ComEd's wholesale energy suppliers, many of whom have indicated that their source is the "PJM system mix." The PJM system mix is the collective generation produced within the PJM Interconnection, which is the regional transmission 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 E: AVERAGE PREDICTED ANNUAL THERM USE / SQUARE FOOT BY YEAR HOME BUILT**




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

## APPENDIX F: 300 S. HUMPHREY AVE. BLOCK

*300 S. Humphrey Ave. Block – looking south*


*cul-de-sac*

*300 S. Humphrey Ave. Block – looking north*

**APPENDIX G: BUILDING TYPOLOGY**

## APPENDIX H: ECOLOGICAL FOOTPTINT QUIZ

ECOLOGICAL FOOTPRINT QUIZ 300 S. HUMPHREY AVE. BLOCK

### ECOLOGICAL FOOTPRINT QUIZ

Complete the Ecological Footprint Quiz at http://www.myfootprint.org/. It will only take a few minutes to respond to the 16 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 16 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.

Mike Iversen
miversen@uic.edu

### 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)

GREEN BLOCKS INITIATIVE 1

*Ecological Footprint Quiz (page 1 of 5)*

## APPENDIX I: 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?

GREEN BLOCKS INITIATIVE 2

## APPENDIX J: 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.

3. President Lyndon B. Johnson, Message to the Congress on domestic health and education, May 1, 1966.

4. 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 was closed 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.

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

6. *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.

7. 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.

8. 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.

9. 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.

10. 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.

11. At a village board meeting on September 15, 2008, the village board voted not to proceed with the Oak Park Environmental and Energy Advisory Commission and staff recommendations to enter into agreement for consolidated hauling of refuse and recycling collection services for commercial and multifamily residential buildings.

12. 'White goods' include all ranges, refrigerators, water heaters, freezers, air conditioners, humidifiers, and other similar domestic and commercial large appliances and other items required by law to be treated or processed prior to disposal which are discarded by the resident of a residential unit.

13. 'Clean' MRFs require recyclables to be separated out by the generator and are collected separately: 'Dirty' MRFs take all garbage as a collective and sort out the recyclables at a central facility.

14. *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.

15. While *sustainability* was listed as one of the frameworks from which to choose, terms relative to the specific application, such as *urban ecology*, are preferred. 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.

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

17. 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)

18. 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.

19. "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.

**CITED REFERENCES**

Bellucci, F., Heraty, L.J., Bowley, E., Sturchio, N.C., Jaraula, C., Kozak, J.A., et al. (2009). Greenhouse gas ($N_20$, $CH_4$ and $CO_2$) emissions from the Stickney Water Reclamation Plant, Stckney, IL (USA). *Geological Society of America Abstracts with Programs - North-Central 2009, 41(4)* 12.

Bossel, H. (1999). *Indicators for sustainable development: Theory, method, applications*. Winnipeg, Man: International Institute for Sustainable Development.

Commonwealth Edison. (2009, September 28). *Environmental disclosure information: Twelve months ending June 30, 2009*. Retrieved from the Illinois Commerce Commission website: http://www.icc.illinois.gov/electricity/environmentaldisclosure.aspx

Edison Electric Institute. (2001, June). *Getting electricity where it's needed: Electric transmission systems*. (Available from Edison Electric Institute, 701 Pennsylvania Ave., Washington, D.C. 20004)

Evans, Dorothy. (1921). *History of Oak Park told by the trees*. Essay.

Guarino, J. (2000). *Yesterday: A historical view of Oak Park, Illinois: Prairie days to World War I*. Oak Park, Illinois: Oak Ridge Press.

Hasbrouck, W. R., & Sprague, P. E. (1974). *A survey of historic architecture of the village of Oak Park, Illinois*. Oak Park, Ill: Landmarks Commission.

Illinois Environmental Protection Agency. (2003). *Nonhazardous solid waste management and landfill capacity in Illinois: 2002*. Springfield, IL: Illinois Environmental Protection Agency, Bureau of Land, Division of Land Pollution Control, Waste Reduction and Compliance Section.

Illinois Environmental Protection Agency. (2007). *Illinois annual air quality report 2007.*Springfield, IL: Illinois Environmental Protection Agency, Bureau of Air.

Key, V.O. (1940). The lack of a budgetary theory. *American Political Science Review*, *34*, 1137-1144.

Long-Term Ecological Research Program (LTER). (2007). *The decadal plan for LTER: Integrative science for society and the environment: a plan for research, education, and cyberinfrastructure in the U.S. Long Term Ecological Research Network*. [Albuquerque, N.M.]: U.S. Long Term Ecological Research Network.

MapQuest. (2009, October, 2). *Directions from 1 N. East Ave., Oak Park, IL to 5100 S. Lawndale Ave, McCook, IL.* Retrieved from http://www.mapquest.com

MapQuest. (2009, October, 7). *Directions from 1 N. East Ave., Oak Park, IL to 138th St. and I-94, Calumet City, IL.* Retrieved from http://www.mapquest.com

Meadows, D. (1998). *Indicators and information systems for sustainable development*. Hartland Four Corners, VT: The Sustainability Institute.

Mitchell, A. (2005). *The ESRI guide to GIS analysis volume 2: Spatial measurements and statistics*. Environmental Systems Research Institute, Redlands, CA.

Mitra, A. (2003). *Painting the town green: The use of urban sustainability indicators in the United States of America*. London: RICS Foundation.

Naseef, R. (2009, October 5). *Follow the trash!* Retrieved from Go Green LaGrange web site: http://www.gogreenlagrange.org/html/follow_the_trash_.html

Nicor Gas. (2008, June). *Oak Park Energy Use Analysis*. Unpublished report prepared for Commissioner Robert F. Lieberman. Chicago, IL

Nicor Gas. (2009). *Gas distribution and pipeline system*. Retrieved October 2, 2009, from About Nicor Gas web page: http://www.nicor.com/en_us/residential/about_gas/distribution_pipeline.htm

Oak Park (IL). (1990). *Comprehensive plan 1990, Village of Oak Park, Illinois: adopted September 4, 1990*. Oak Park, IL: Village of Oak Park.

Oak Park (IL). (2006). *Public participatory planning guidelines, Village of Oak Park, Illinois, adopted February, 2006*. Oak Park, IL: Village of Oak Park.

Oak Park (IL) (2008a). *Resolution authorizing the extension of the agreement with Waste Management-Metro for the collection and transportation of refuse and the collection, transportation and processing of recycling and yard-waste from January 1, 2009 to December 31, 2011.* Village board meeting agenda (September 2, 2008): Oak Park, IL.

Oak Park (IL) (2008b). *An ordinance amending section 20-7-2 (E) of the Village Code relating to rates for collection of garbage, refuse and recycling charges*. Village board meeting agenda (December 2, 2008): Oak Park, IL.

Oak Park (IL) (2008c). *2008 Energy use in Oak Park*. Village of Oak Park: Oak Park, IL.

Oak Park (IL) (2009). *2008 Annual review of waste management services*. Department of Public Works, Oak Park, IL: Author.

Oak Park (IL) (2009, September 28). *Garbage collection / Solid Waste Division*. Retrieved from http://www.oak-park.us/Public_Works/Garbage_Collection.html

Oak Park (IL) (2009, September/October). Annual fall leaf collection begins in October. *OP / FYI, 21(5),* 2.

Oak Park (IL) Environment and Energy Advisory Commission. (2009, May). *A sustainable village: 2009 updated report and recommendations from the Village of Oak Park Environment & Energy Citizen's Advisory Commission to the Board of Trustees for an environmental action plan*. Oak Park, IL: Author.

Portney, K. E. (2003). *Taking sustainable cities seriously: Economic development, the environment, and quality of life in American cities.* Cambridge, MA.

Raymond, R. L. (1972). *The challenge to Oak Park: A suburban community faces racial change*. Unpublished thesis, Roosevelt University.

Ritter, D. F., Kochel, R. C., & Miller, J. R. (2006). *Process geomorphology*. Long Grove, Ill: Waveland Press.

Schlossberg, M., Agrawal, A., & Irvin, K. (2007). An assessment of GIS-enabled walkability audits. *URISA Journal.* 19(2):5-12.

Trusty, W. (n.d.). *Renovating vs. building new: The environmental merits* .Merrickville, Ontario: The Athena Institute.

United Nations. (2008). *World urbanization prospects: the 2007 revision.* New York: United Nations.

United States. (2009). *Annual energy outlook 2009: With projections to 2030*. Washington, D.C.: Energy Information Administration.

United States Census Bureau. (2000). *Profile of general characteristics: Oak Park, IL.* Retrieved March 25, 2009, from American FactFinder website: http://factfinder.census.gov/home/saff/main.html?_lang=en.

Wackernagel, M., & Rees, W. E. (1996). *Our ecological footprint: Reducing human impact on the earth*. New catalyst bioregional series, no. 9. Gabriola Island, BC: New Society.