



ENERGY & CONSERVATION FOCUS GROUP

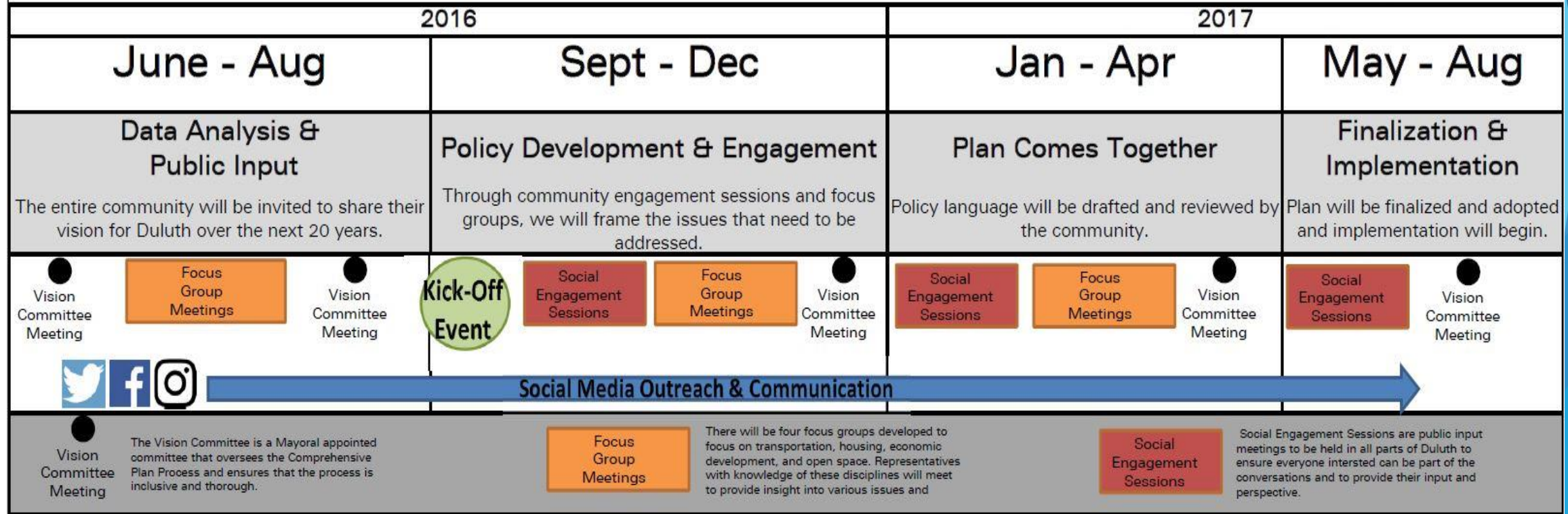
Meeting 2: Data Review and Policy Development

Agenda

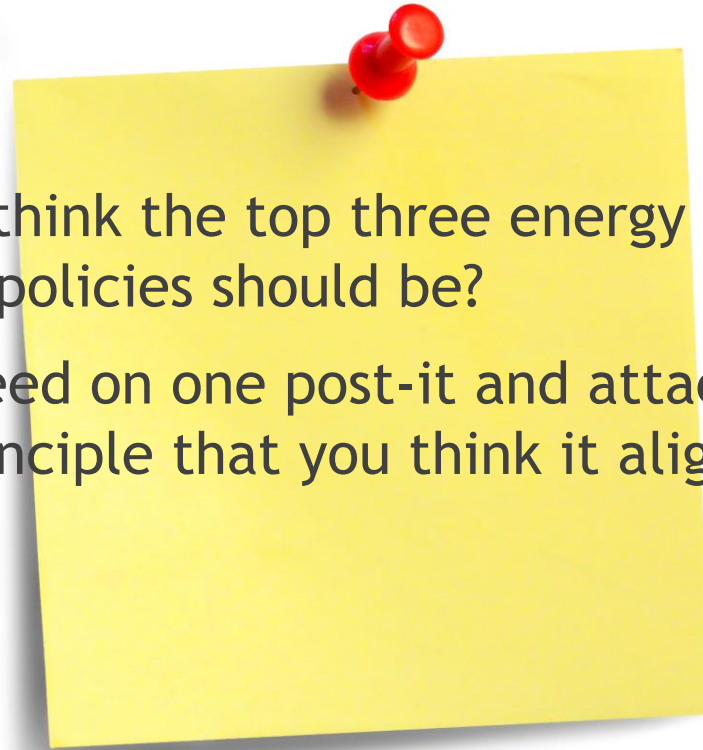
- ▶ Welcome & Introductions
- ▶ Brief Overview - Timeline & Process
- ▶ All on the Wall Activity
- ▶ Review research questions - data and analysis
- ▶ Revisit group exercise
- ▶ Discuss other emerging issues
- ▶ Wrap-up & Next Steps

Timeline & Process

Comprehensive Plan 2035 Timeline



All on the Wall Activity



- ▶ What do you think the top three energy and/or conservation policies should be?
- ▶ Write each need on one post-it and attach it to one the Governing Principle that you think it aligns with.

Revised Research Questions

Energy Production and Economy

- ▶ What are the sources used for energy production in the City? What percentage of these sources are renewable?
- ▶ Are there opportunities for cogeneration in Duluth? What are they?
- ▶ How much and which types of energy are willing/sending to other locations? How much are we getting/paying for from other locations?
- ▶ What are operational and technical best practices used by other cities for energy production, including gas, electricity, and district heating and cooling?
- ▶ What are examples of renewables energy production and energy storage systems that would be viable in Duluth? What would be the costs and benefits?
- ▶ What are some examples of distributive energy? Are there existing models that could successfully be implemented with the City of Duluth?
- ▶ What is the economic output per unit of energy produced?
- ▶ Can we create new jobs vis energy and renewable energy?

Revised Research Questions Continued

Emissions & Efficiency

- ▶ What are the emissions associated with various uses in the city as a whole, and what are the energy sources of the emissions?
- ▶ What are GHG and carbon emissions of commercial, residential, industrial, and transportation uses in the corporate City? What are the energy sources of the emissions (electricity, water, gas, etc.)?
- ▶ What are the specific sources of pollution (in addition to GHG and carbon emissions) resulting from our energy use?
- ▶ How could we reduce the emissions from the steam plant? What is the most efficient and least polluting way to heat and cool downtown?
- ▶ How much residential and commercial energy could be saved through economical conservation measures and what are best practices for implementation?
- ▶ How much waste heat is emitted from in the city, and where? What percentage is being captured and reused?
- ▶ What are the best practices for efficiency and emissions reductions for residential, commercial, transportation, and industrial users/uses? And which of those best practices are most efficient in Duluth to implement? How can the City incentive energy efficiency and reduced emissions by businesses?

Revised Research Questions Continued

Energy Use

- ▶ What is the total usage - electrical, gas, steam plant, and others- by all users (industrial, commercial, residential, utility) in the city? Where and what are the largest energy consumers? How does this compare to peer cities and peer industries?
- ▶ What is the geographic extent of the district and cooling system, and what structures does it include? Could this be expanded or could there be sub-districts, and what would be the advantage of this? What possibilities are there for making this system more energy efficient and more sustainable?

Resiliency

- ▶ What climate change factors could impact energy demand and use in our region?
- ▶ What can Duluth implement that would improve its energy resiliency for unforeseen changes and emergency situations such as floods?
- ▶ What potential agencies and institutions could partner and collaborate with Duluth on identifying energy solutions and policies, and how could this collective group shift the overall picture of regional energy resiliency?

What are the current sources for energy production in Duluth?



DULUTH ENERGY
SYSTEMS

Steam is 0% Renewable



Electricity- 20% renewable

- 17% wind
- 4% hydroelectric

*MN Power



Serving the City of Duluth

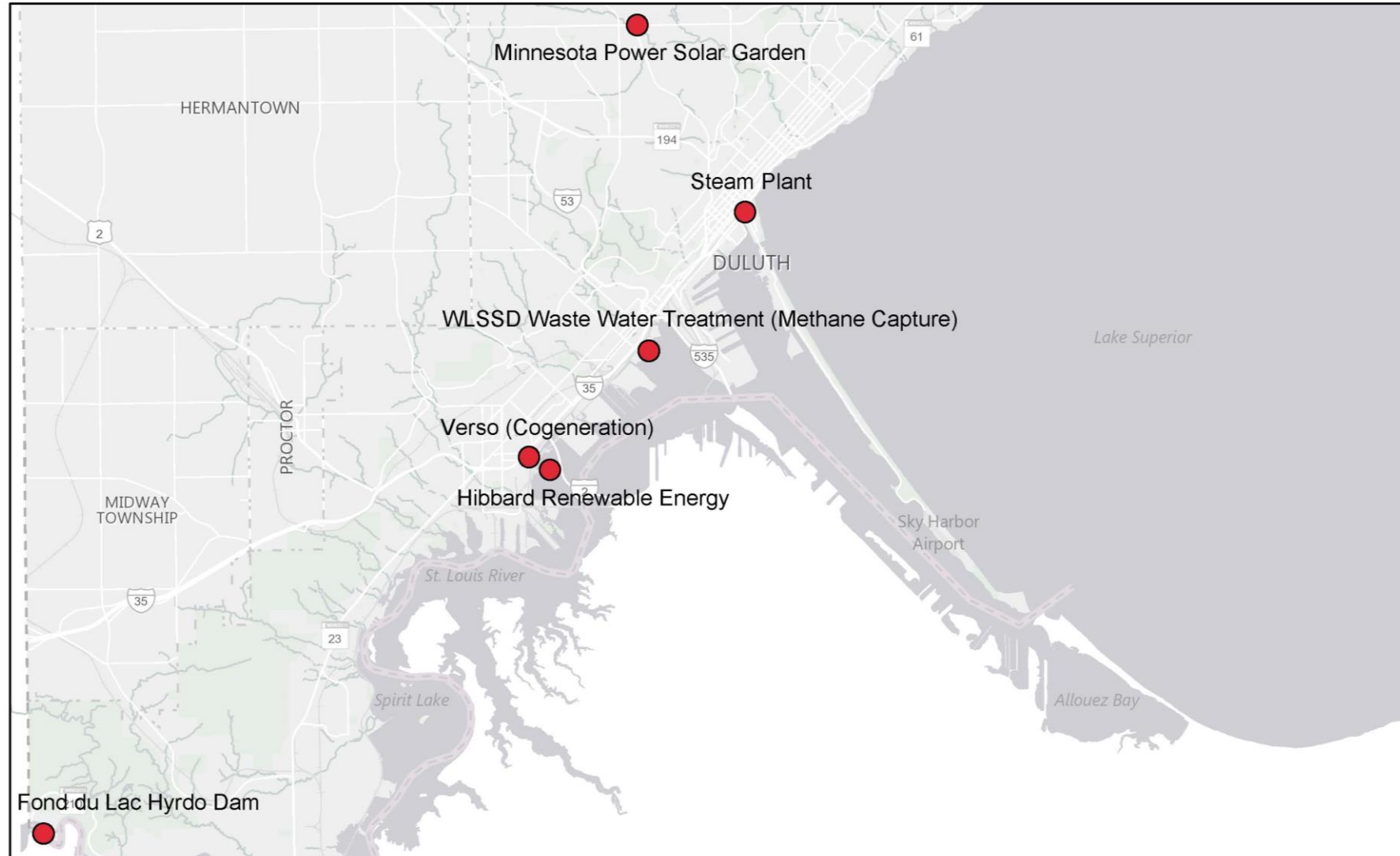
Natural Gas - 0% renewable
Sold 43,415,039 CCF in 2012



- Solar garden installed on Rice Lake Road
- Solar car charging station in Canal Park
- Solar located in Hartley Park

Where is energy produced in Duluth?

Local Energy Generation



Are there opportunities for cogeneration in Duluth?

What is Cogeneration? - the use of a heat engine or power station to generate electricity and useful heat at the same time.

Examples include: data centers, manufacturing facilities, universities, hospitals, military complexes and schools.

Potential cogeneration includes: steam plant, Minnesota Power Coal Plants, distributed cogeneration

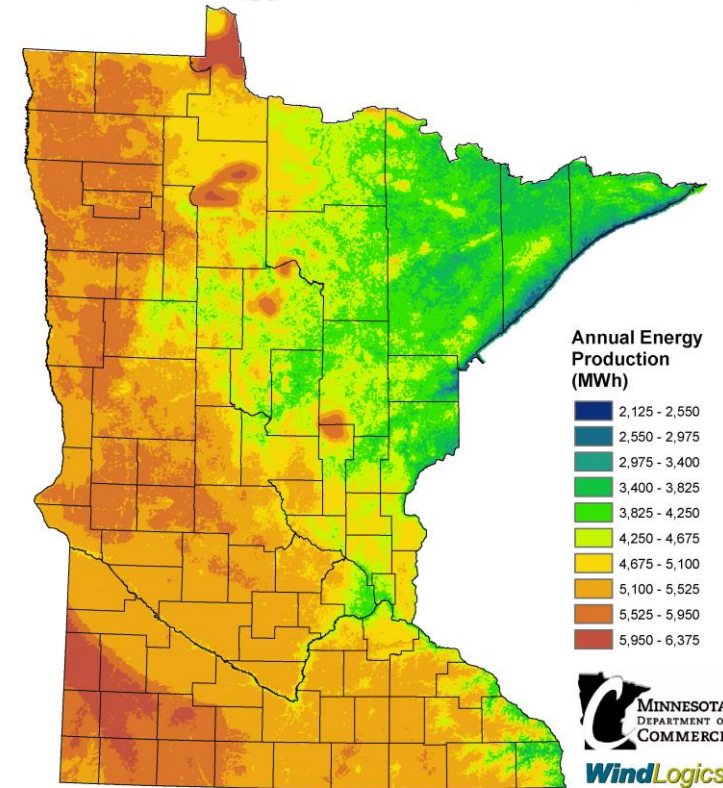


What are examples of renewable energy production and energy storage systems that would be viable in Duluth?

What would be the costs and benefits?

- ▶ Solar is available wherever there is an unshaded south-facing roof or any unshaded flat area. Costs include \$2,000 per KW for panels plus installation and maintenance.
- ▶ Wind energy is an example. Duluth has some of the lowest wind resources in the state.
- ▶ Biomass as a cheaper option than natural gas. - Steam Plant Master Plan
- ▶ Woodchips if used for co-firing could bring coal to being less than 10% of total fuel used

Minnesota's Wind Resource by Estimated Annual Energy Production at 80 Meters

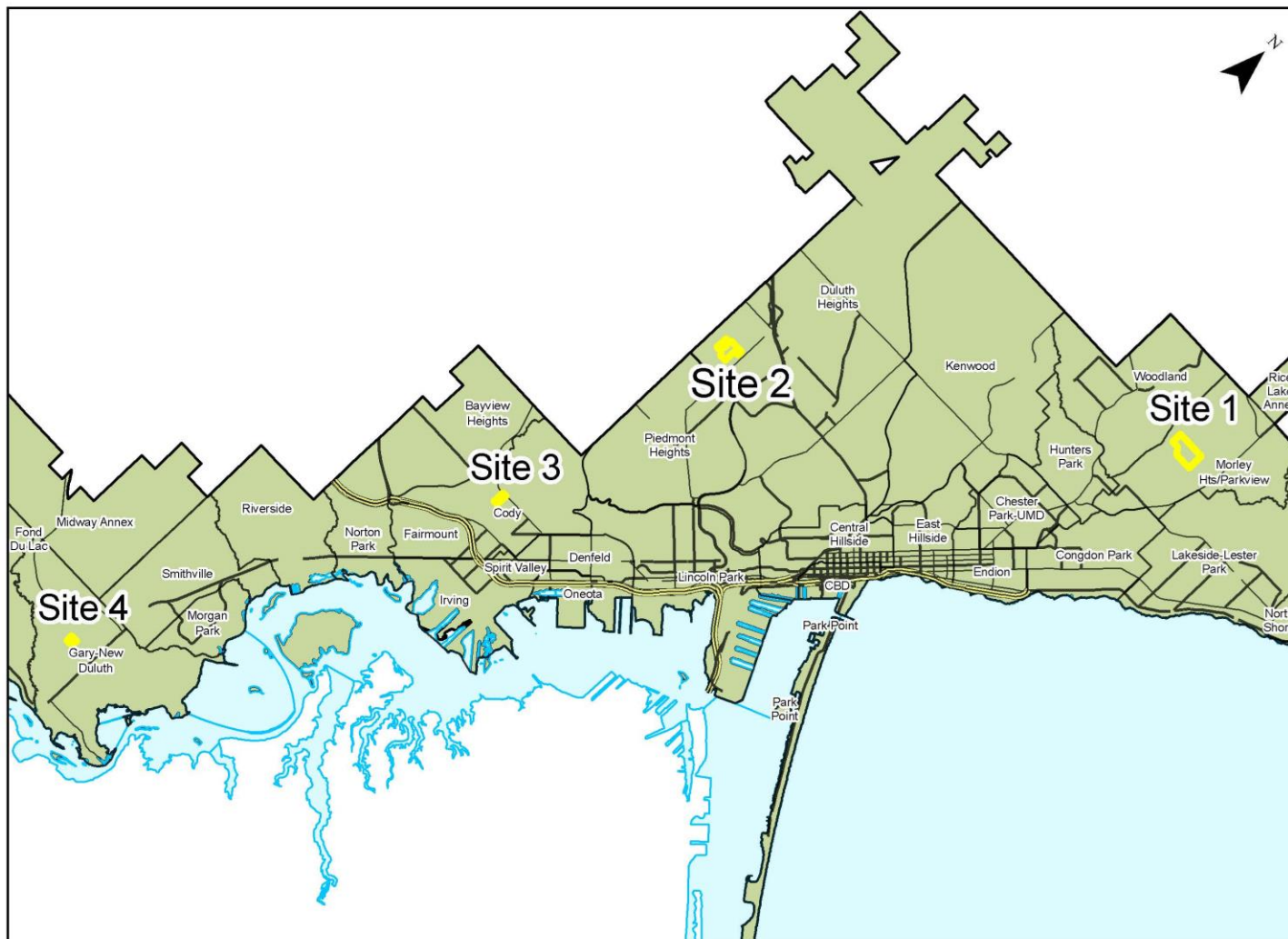


This map has been prepared under contract by WindLogics for the Department of Commerce using the best available weather data sources and the latest physics-based weather modeling technology and statistical techniques. The data that were used to develop the map have been statistically adjusted to accurately represent long-term (40 year) wind speeds over the state. Energy production is based on a 1.65 MW turbine. Production has been discounted 15% to represent real world conditions. Data has been averaged over a cell area 500 meters square, and within any one cell there could be features that increase or decrease the values shown on this map. This map shows the general variation of Minnesota's wind resource and should not be used to determine the performance of specific projects.

January 2006

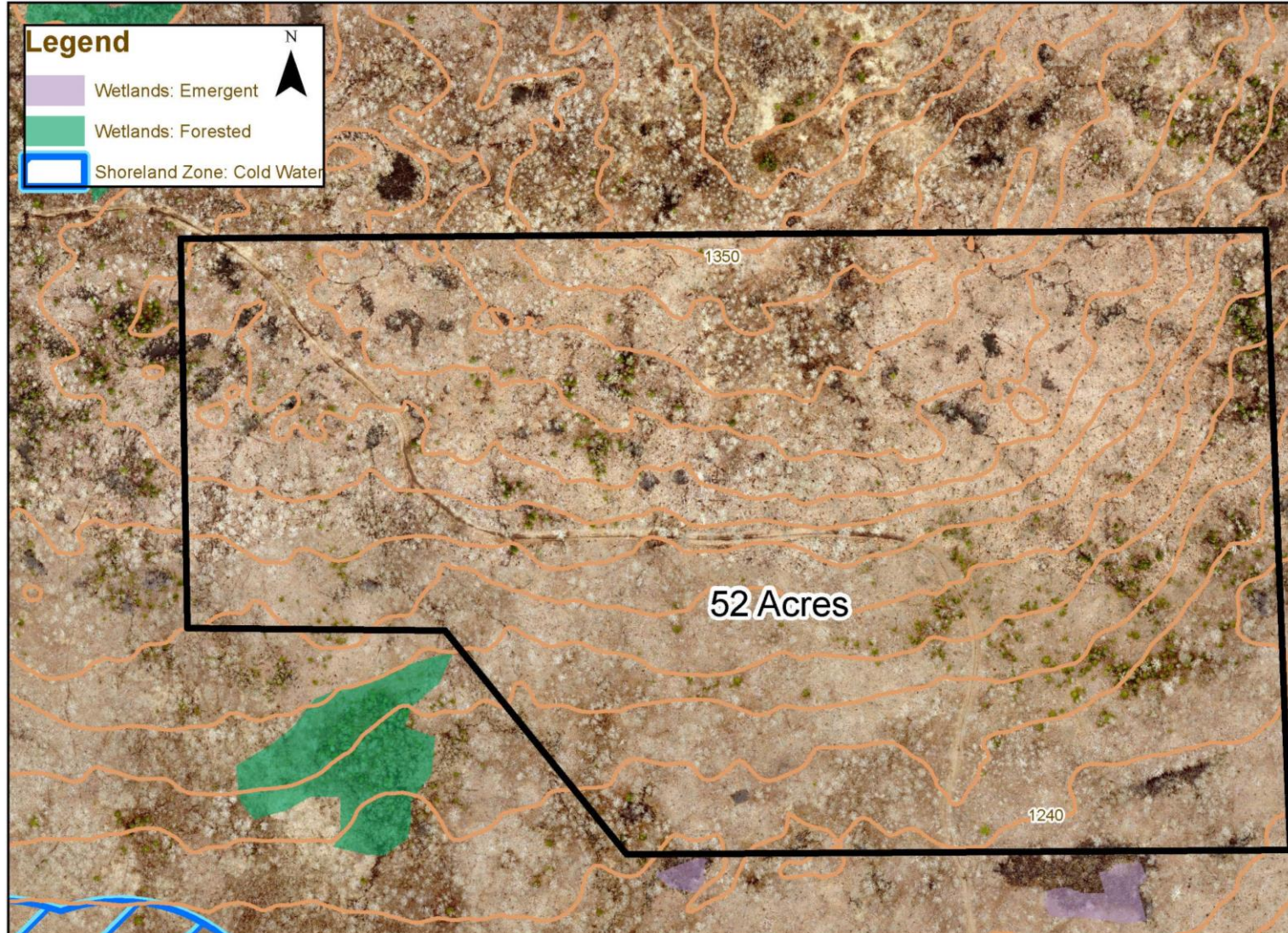
Solar Potential in Duluth

Tax Forfeit Land: Potential Sites for Solar Gardens



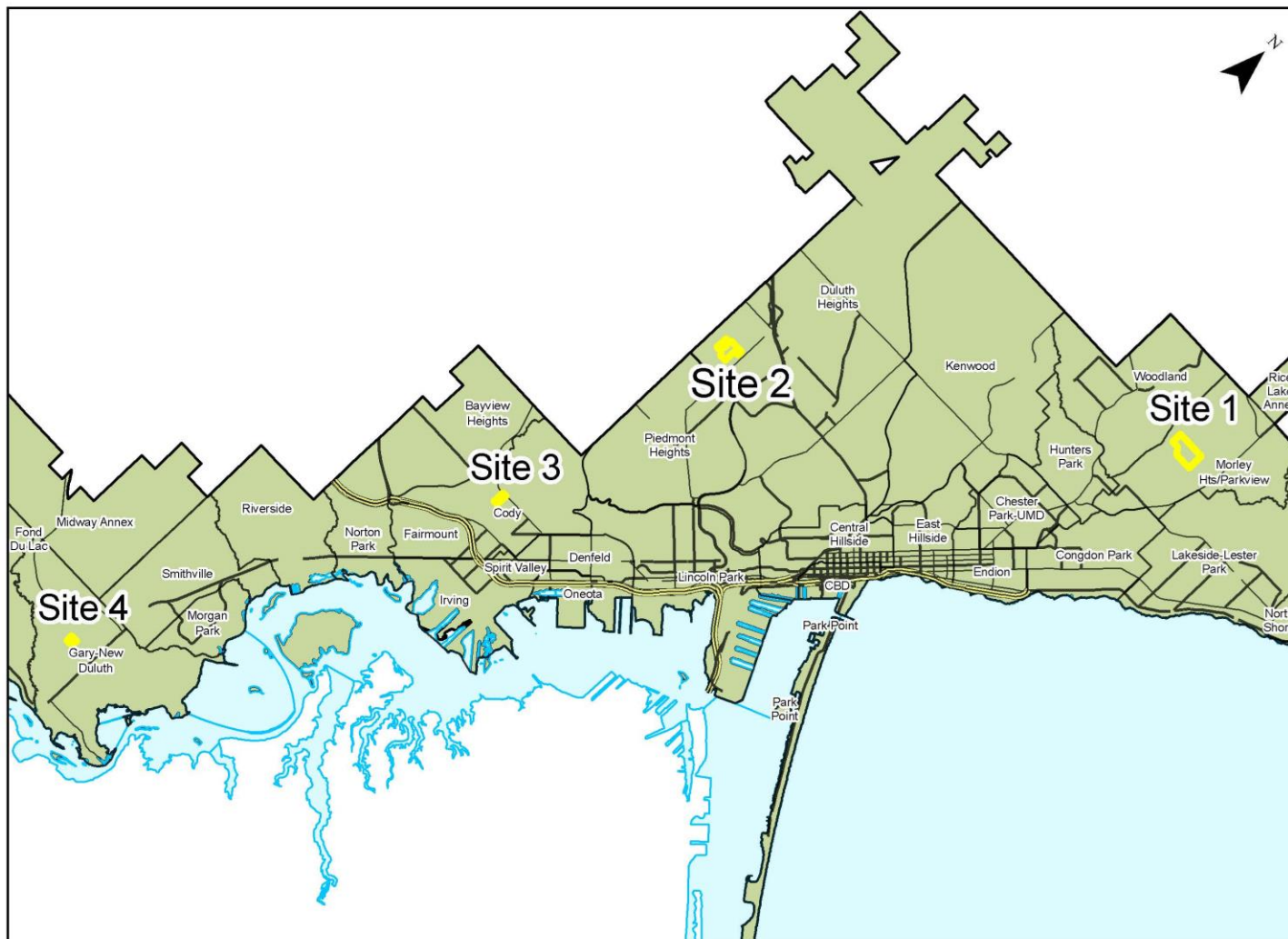
Solar Potential in Duluth- Site 1

Tax Forfeit Land: Potential for Solar Gardens



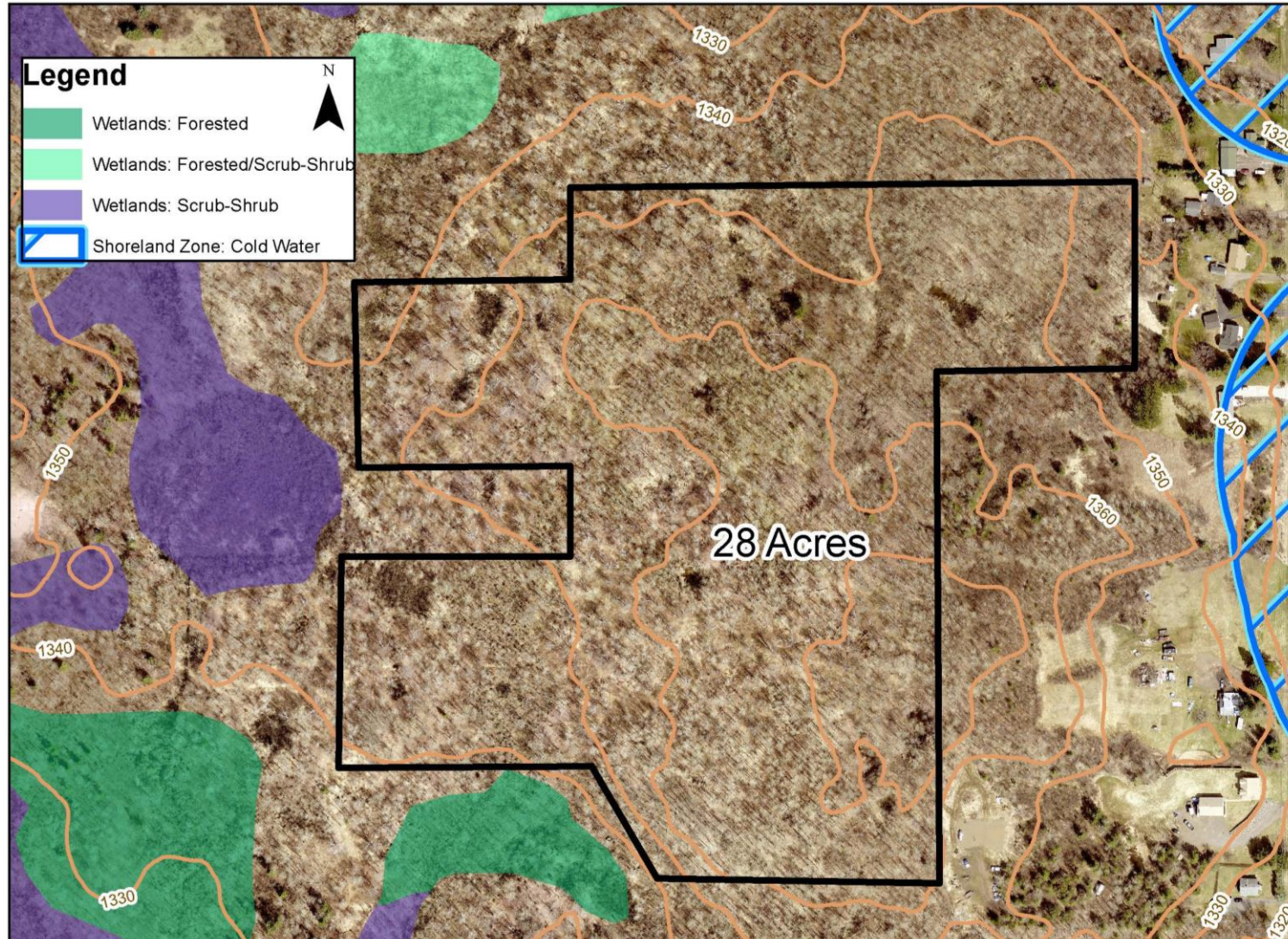
Solar Potential in Duluth

Tax Forfeit Land: Potential Sites for Solar Gardens



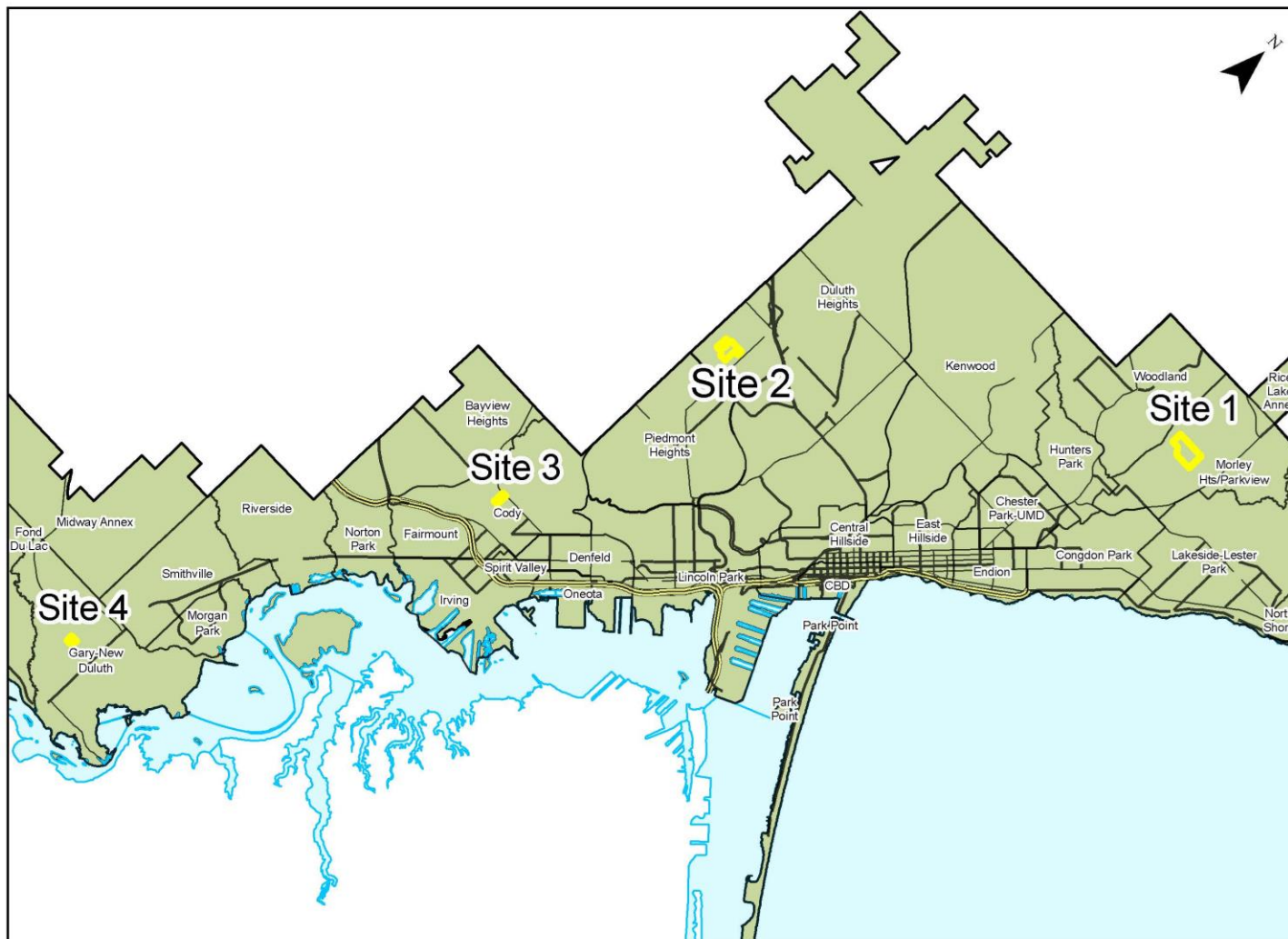
Solar Potential in Duluth- Site 2

Tax Forfeit Land: Potential for Solar Gardens



Solar Potential in Duluth

Tax Forfeit Land: Potential Sites for Solar Gardens



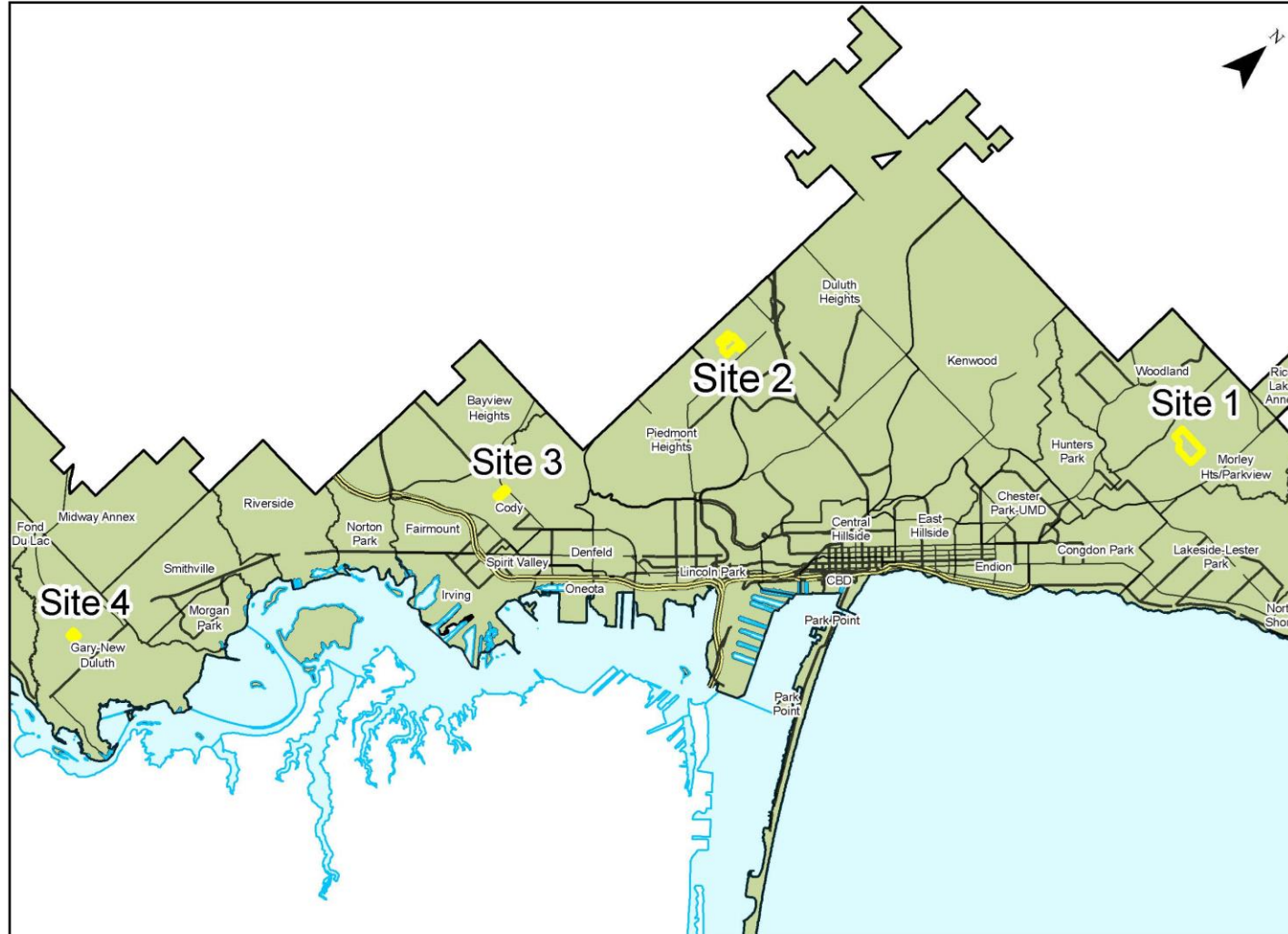
Solar Potential in Duluth - Site 3

Tax Forfeit Land: Potential for Solar Gardens



Solar Potential in Duluth

Tax Forfeit Land: Potential Sites for Solar Gardens



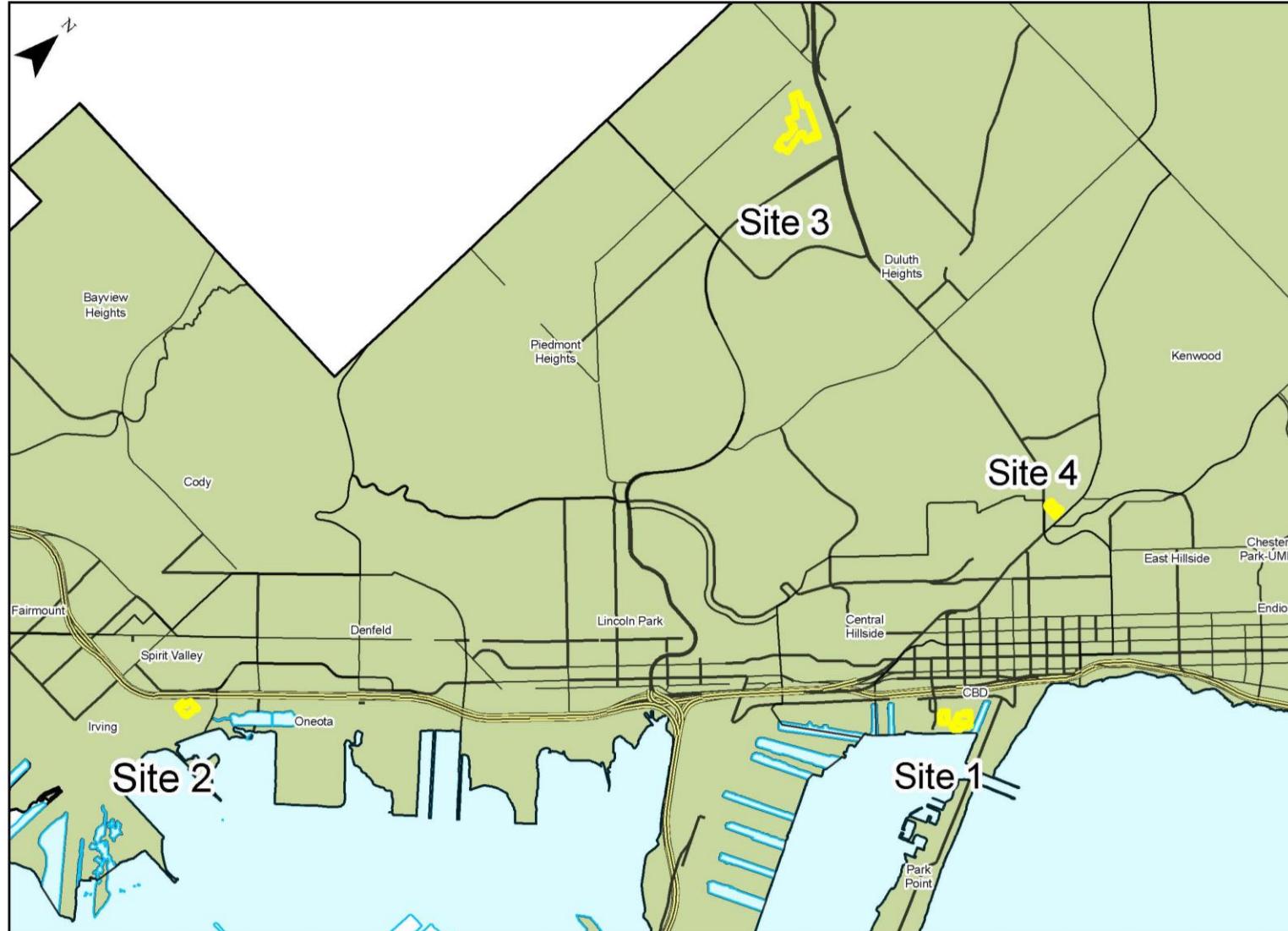
Solar Potential in Duluth- Site 4

Tax Forfeit Land: Potential for Solar Gardens



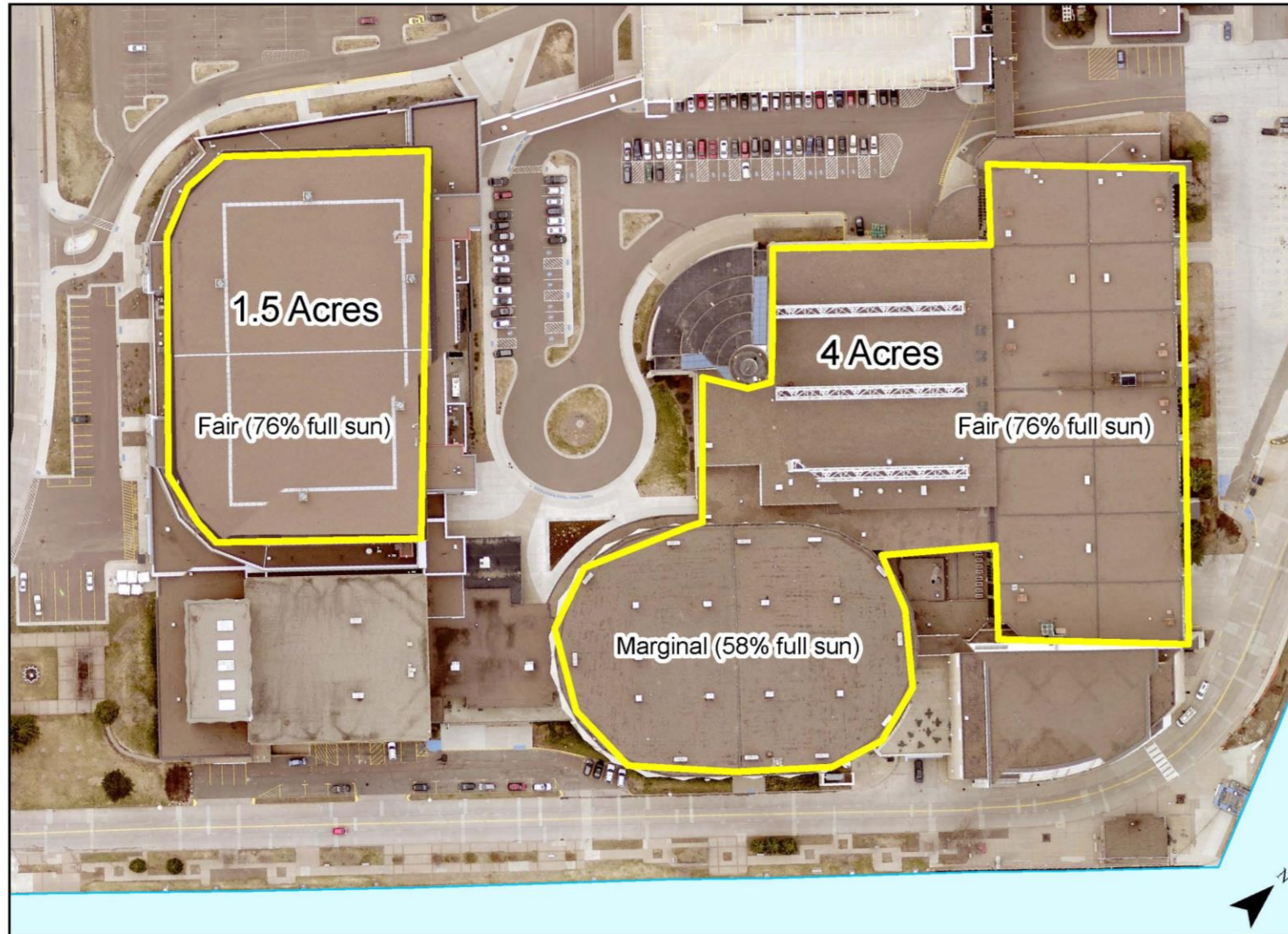
Solar Roof Garden Potential Sites

Rooftops: Potential Sites for Solar Gardens



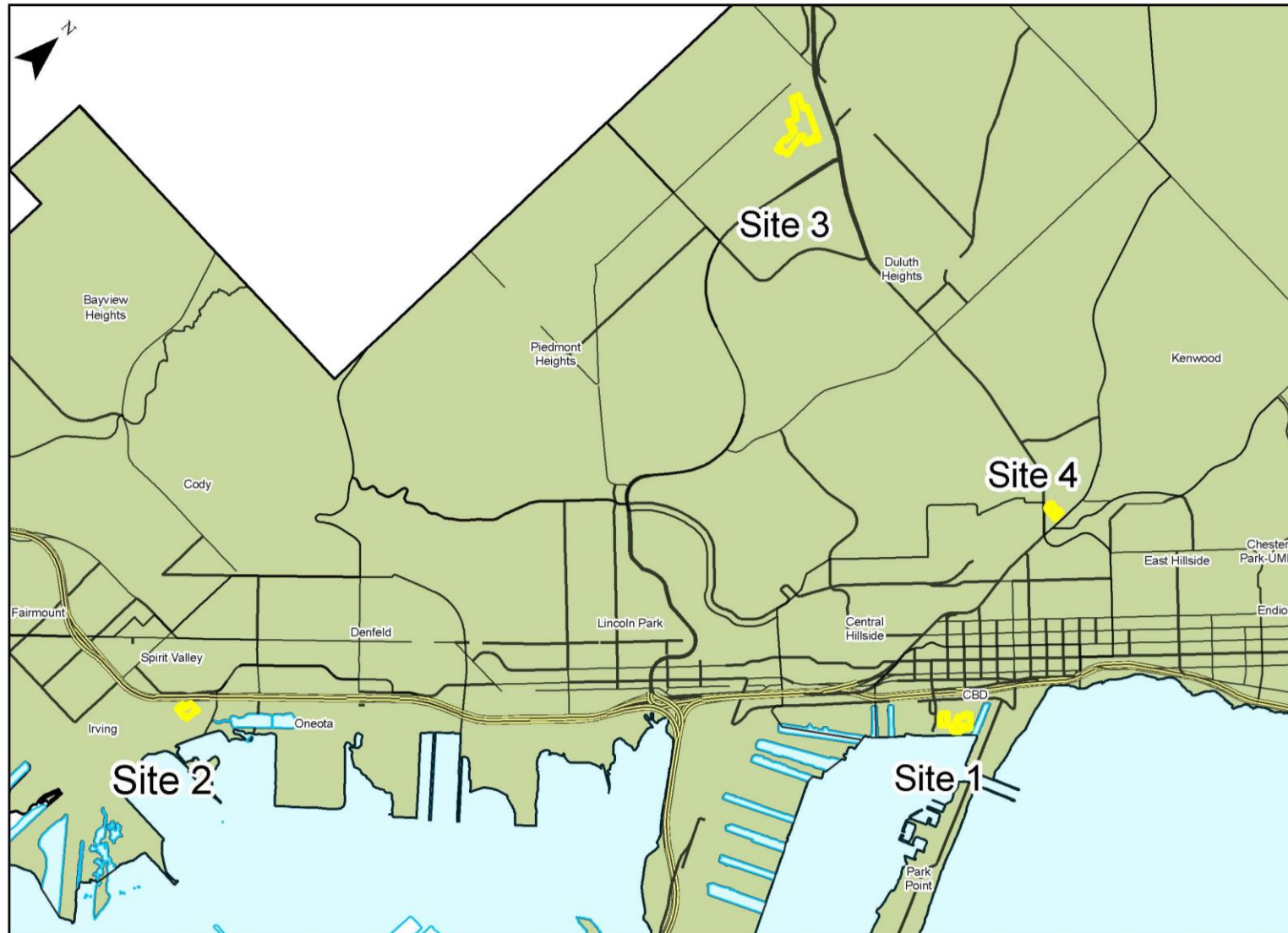
Solar Roof Garden - Site #1

Rooftops: Potential Sites for Solar Gardens



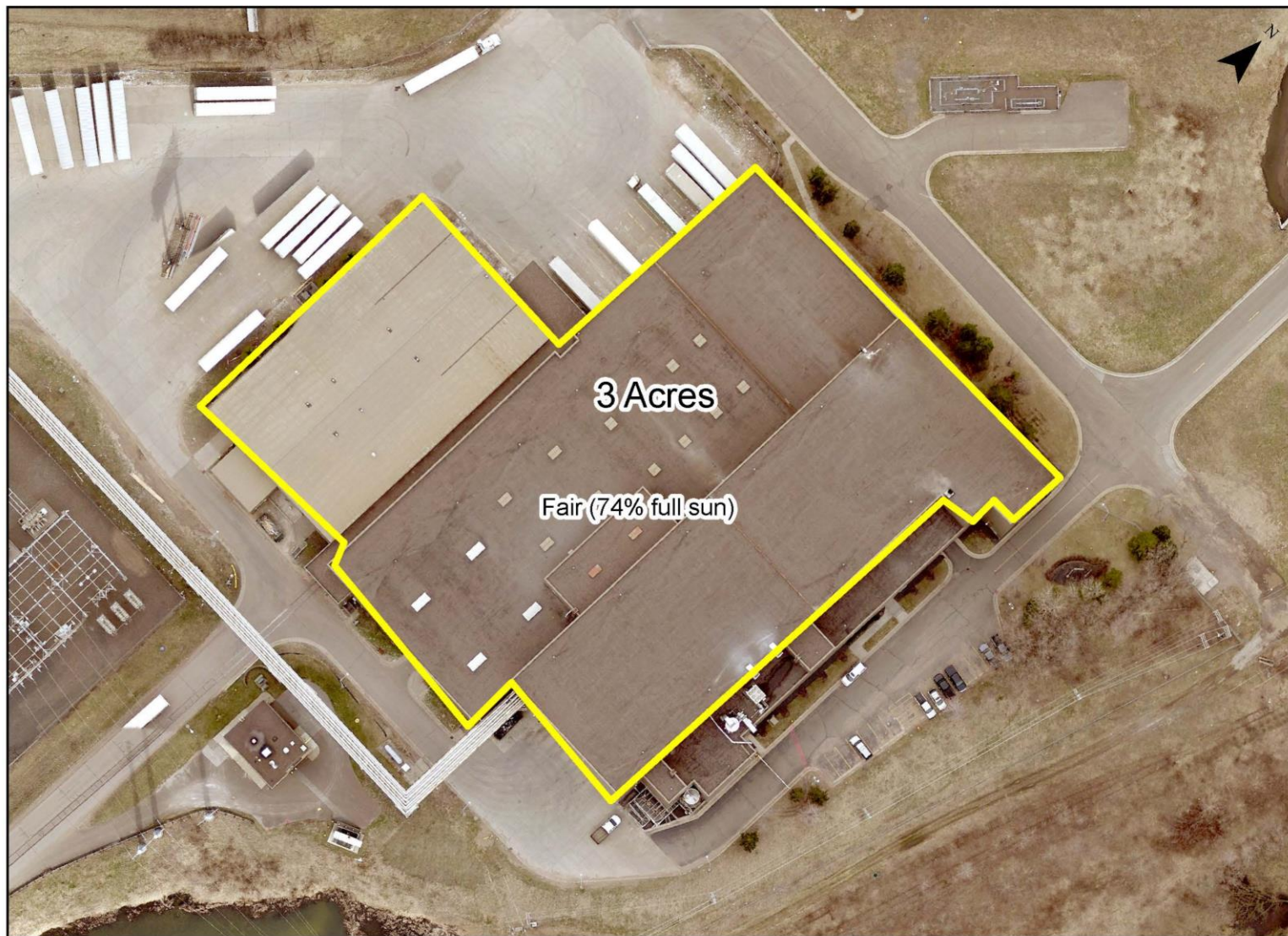
Solar Roof Garden Potential Sites

Rooftops: Potential Sites for Solar Gardens



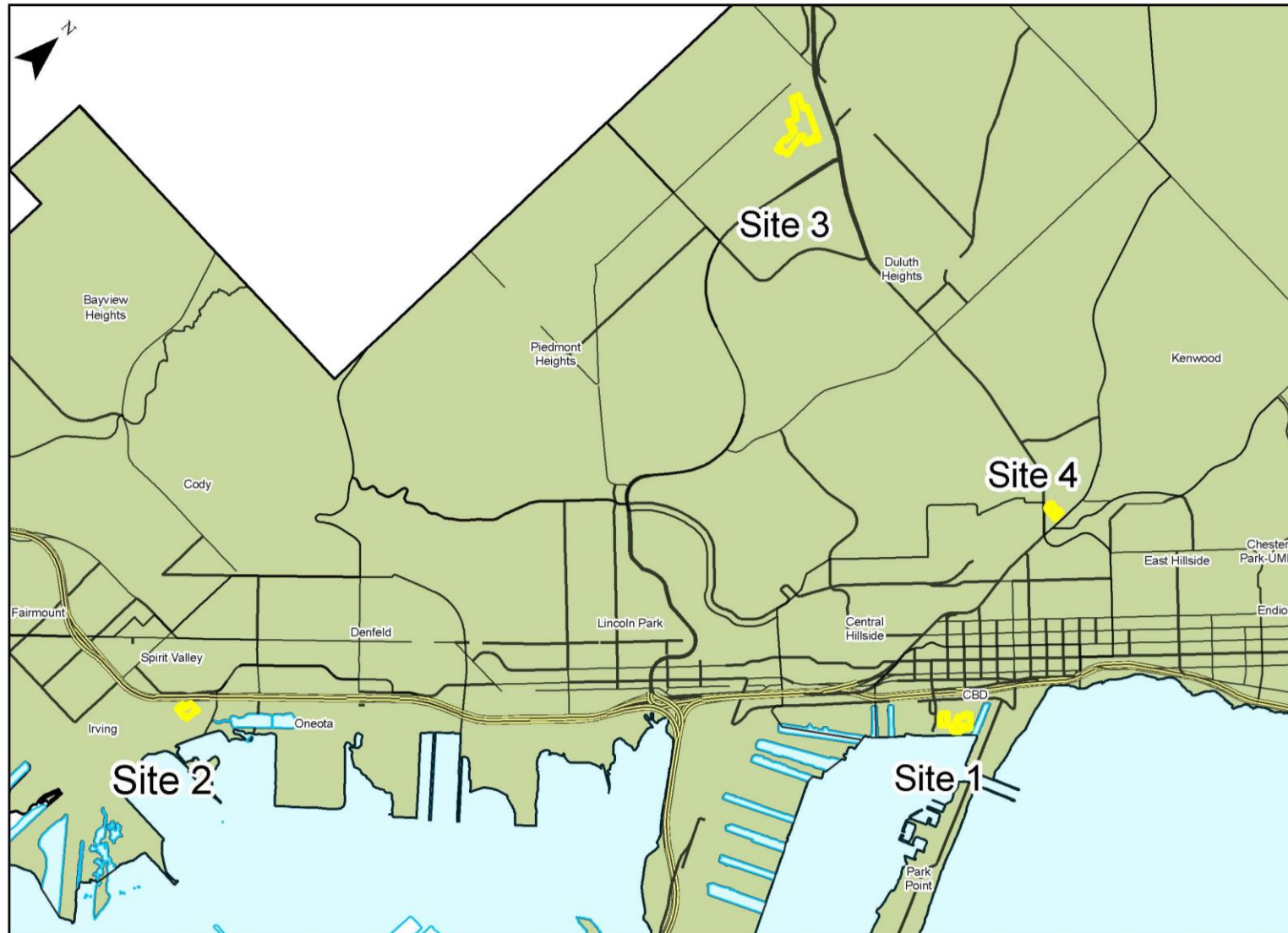
Solar Roof Garden - Site 2

Rooftops: Potential Sites for Solar Gardens



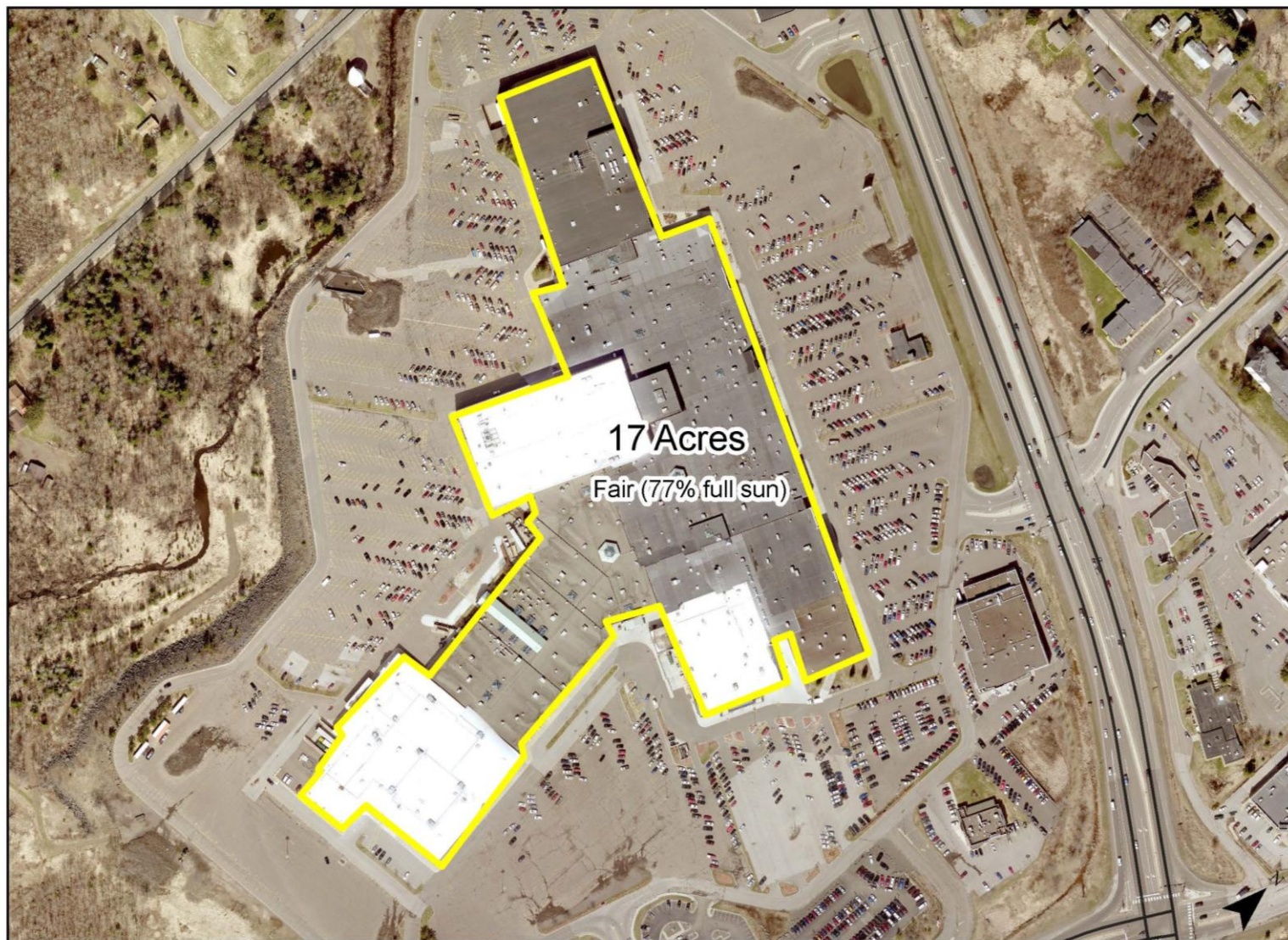
Solar Roof Garden Potential Sites

Rooftops: Potential Sites for Solar Gardens



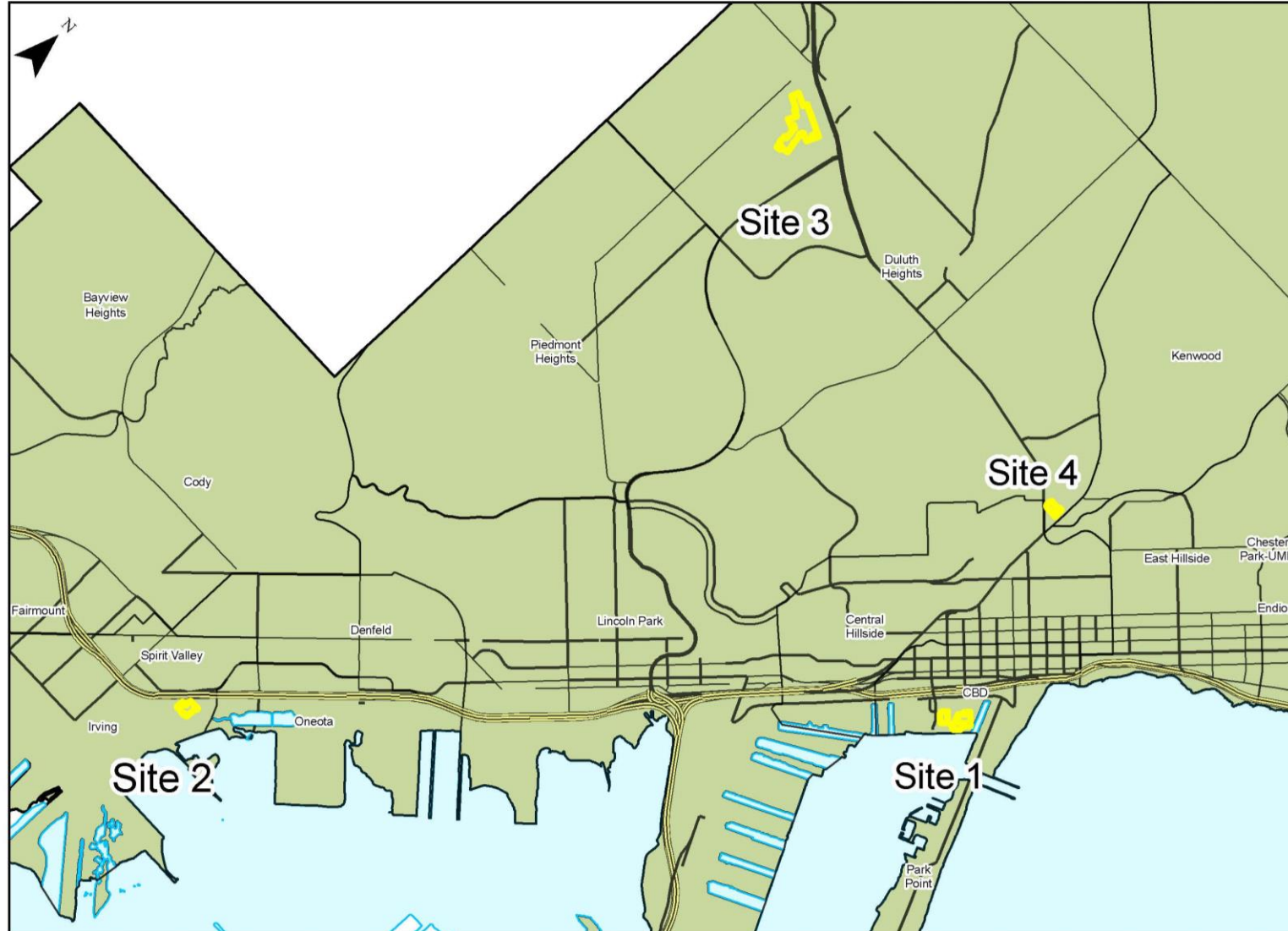
Solar Roof Garden - Site 3

Rooftops: Potential Sites for Solar Gardens



Solar Roof Garden Potential Sites

Rooftops: Potential Sites for Solar Gardens



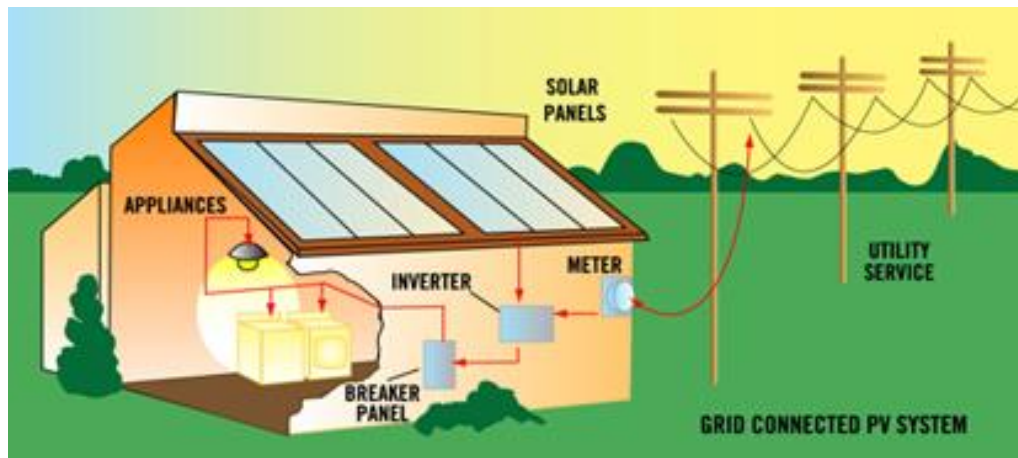
Solar Roof Garden- Site 4

Rooftops: Potential Sites for Solar Gardens

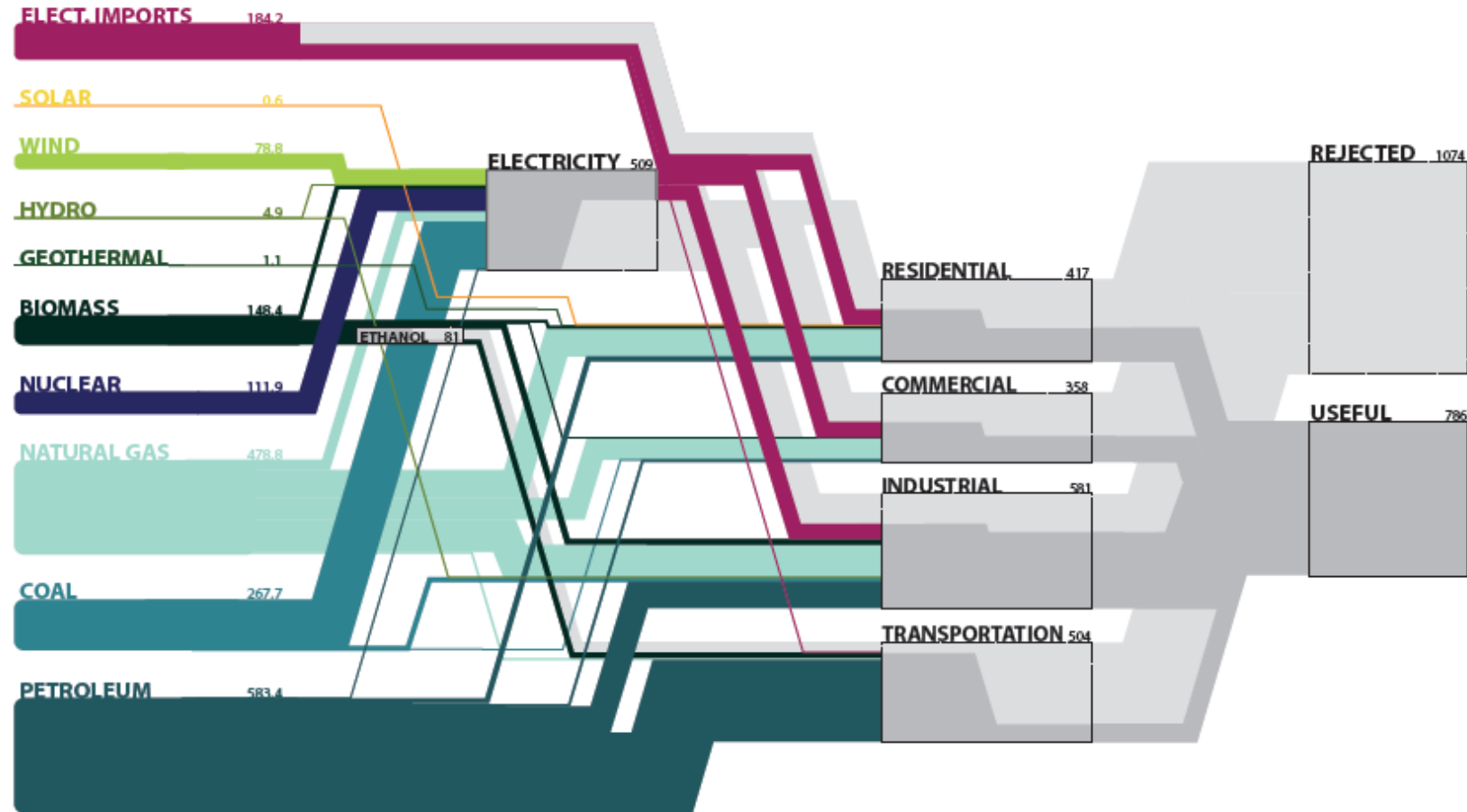


What are some examples of distributive energy? Are there existing models that could successfully be implemented within the City of Duluth?

- ▶ Small grid-connected devices
- ▶ Brooklyn Microgrid: peer-to-peer energy market for locally generated renewable energy that is driven by the community that it serves
- ▶ Resilient Power Project: joint initiative of Clean Energy Group and Meridian Institute that focuses on accelerating market development of resilient, clean energy for affordable housing and critical community facilities in low-income and disadvantaged communities.



Minnesotan Energy Use



Data Source: U.S. Energy Information Administration, State Energy Data System (SEDS); 1960-2013, July 2015. End use efficiency is estimated as 65% for the residential and commercial sectors, 80% for the industrial sector, and 21% for the transportation sector.

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What is the total usage - electrical, gas, steam plant, and others- by all users (industrial, commercial, residential, utility) in the city of Duluth?

- ▶ City of Duluth Usage:

Natural Gas: 361,656 ccf (2016)

Steam: 9,762,000 lbs (2016)

Electricity: 30,970,613 kWh (2015)

*Information from City bill statements

- ▶ Total Usage:

- ▶ Steam (Duluth Energy Systems 2016 information):

2,521,962 kWh

43,739 tons of coal

16,930 fuel oil

- ▶ Minnesota Power (2015 fuel mix from MP):

56.8% coal

16.7% wind

16.2 % purchased

5% energy savings

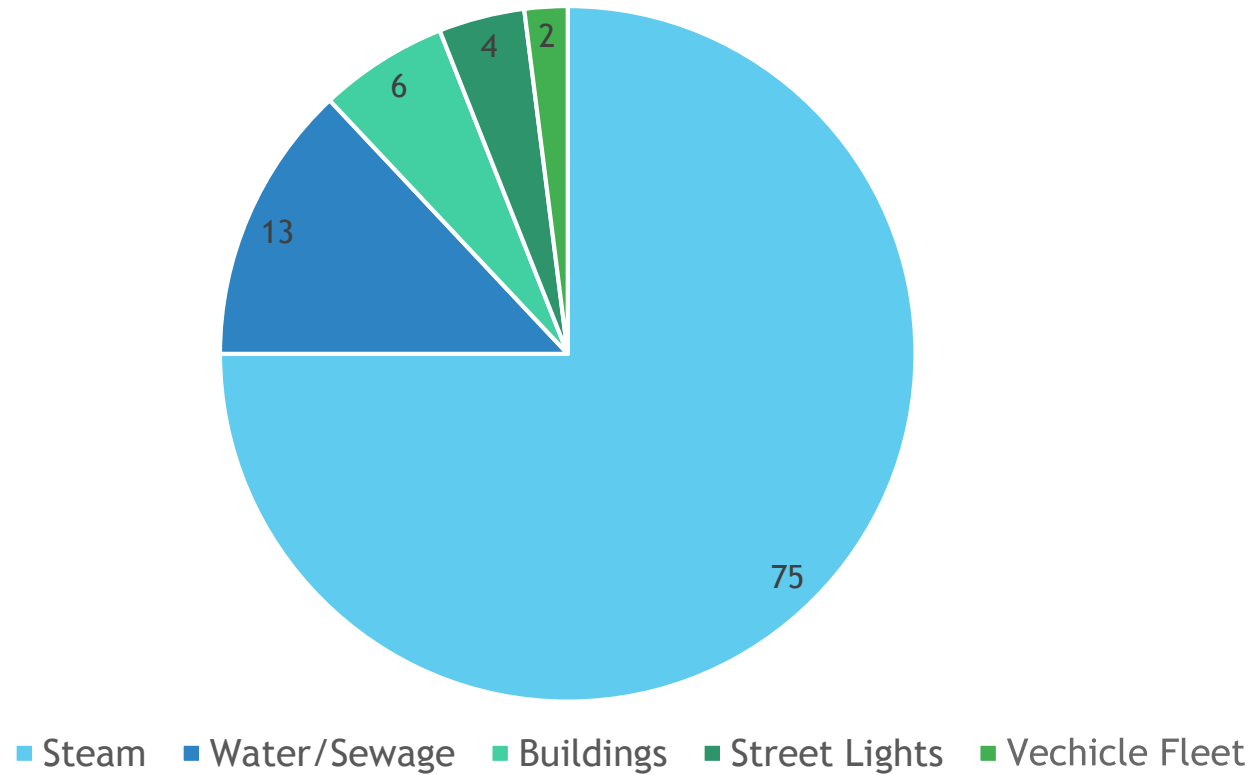
4.4% hydroelectric

0.5% natural gas

0.5% biomass

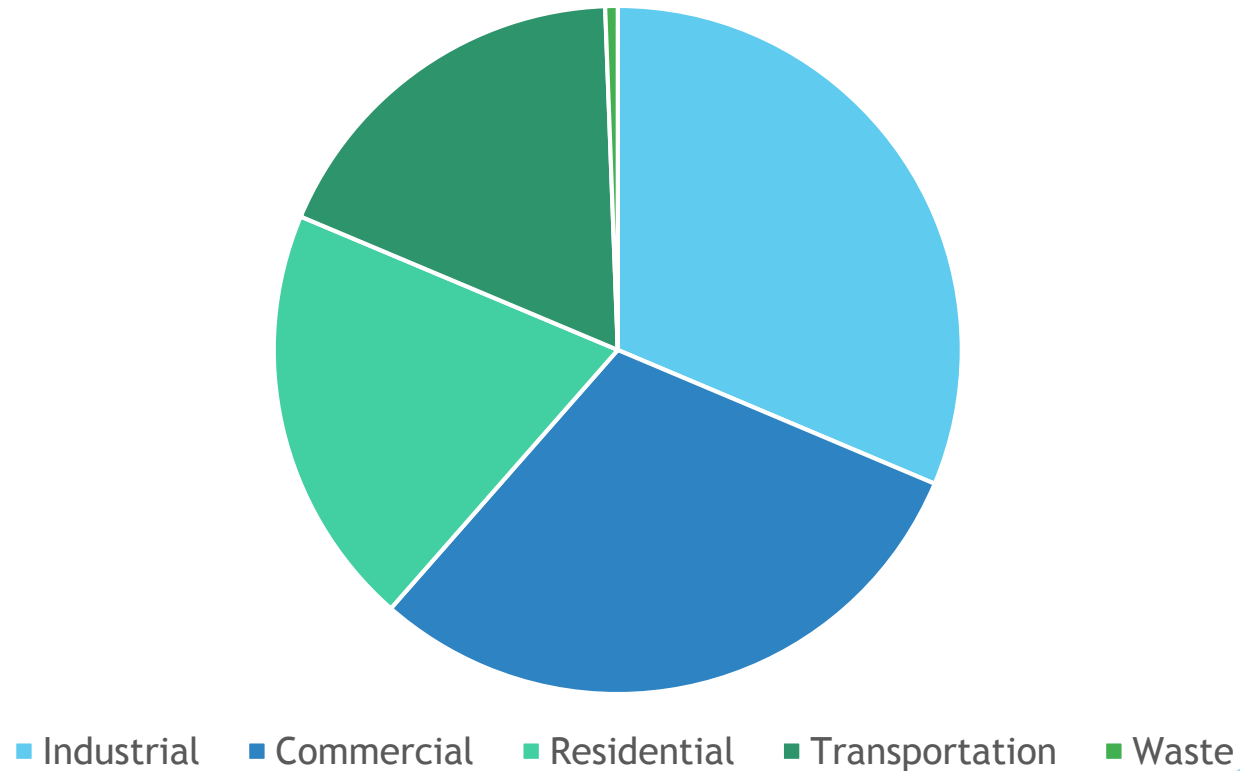
What are emissions associated with various uses in the city as a whole, and what are the energy sources of the emissions?

Municipal Operations 2008 Baseline Report



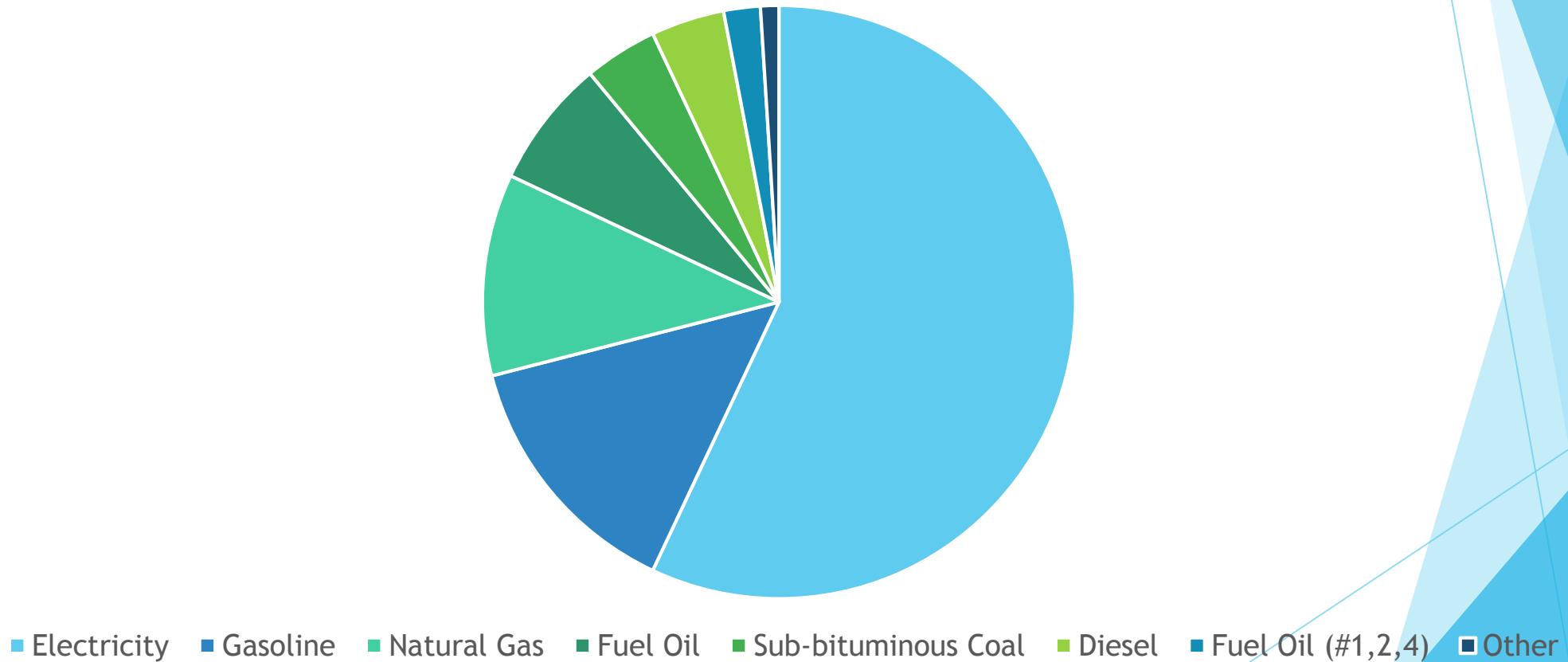
What are the GHG and carbon emissions of commercial, residential, industrial, and transportation uses in the corporate City? What are the energy sources of the emissions (electricity, water, gas, etc.)?

GHG Emissions Breakdown (2008 Inventory)



What are the GHG and carbon emissions of commercial, residential, industrial, and transportation uses in the corporate City? What are the energy sources of the emissions (electricity, water, gas, etc.)?

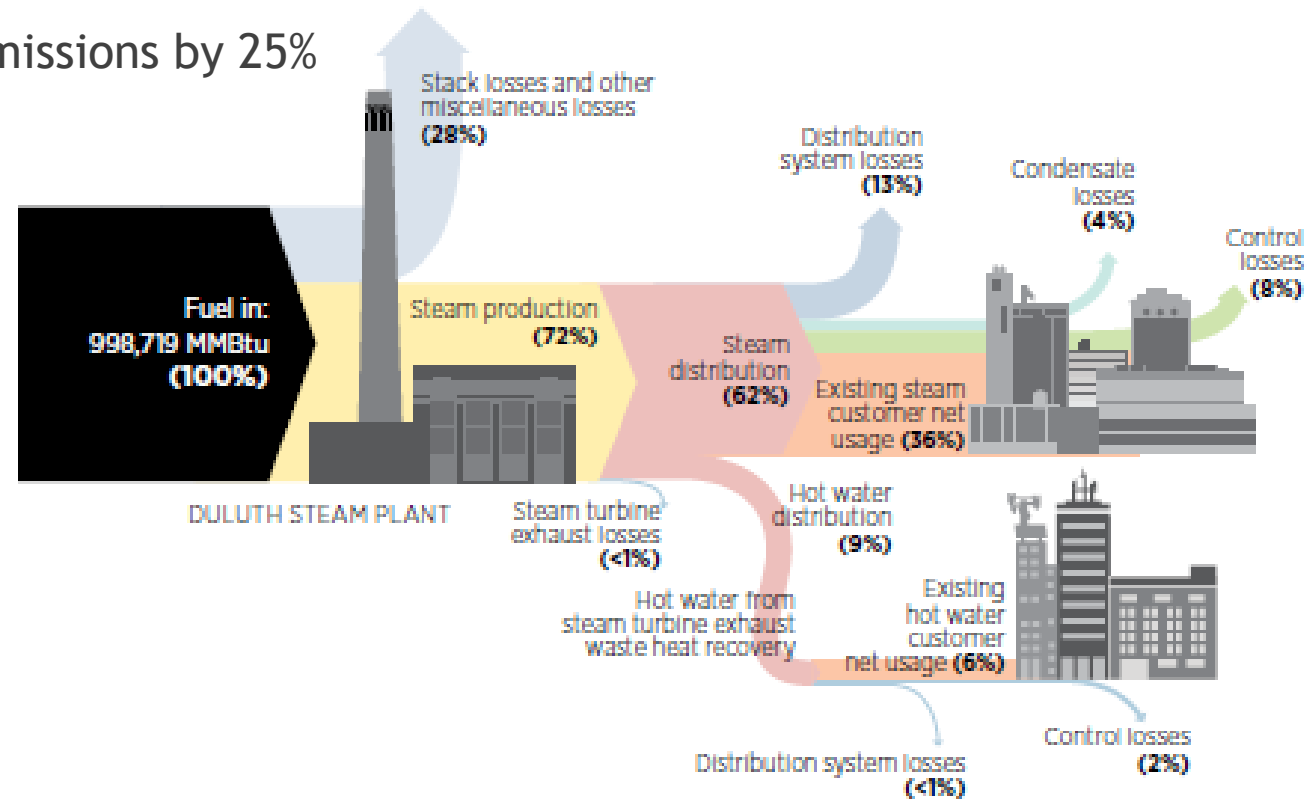
Duluth Community 2008 GHG Emissions by Source



How could we reduce emissions from the steam plant? What is the most efficient and least polluting way to heat and cool downtown?

- ▶ Reduce CO₂ and sulfur dioxide emissions by 25%
- ▶ Looking at a closed-loop systems

Figure 2.2 Energy flow diagram for the present system





THE CITY OF
DULUTH
MINNESOTA

- <all other values>
- Cooler
- Drain

— Steam



Map Powered by DataLink
from WSB & Associates

How could we reduce emissions from the steam plant? What is the most efficient and least polluting way to heat and cool downtown?

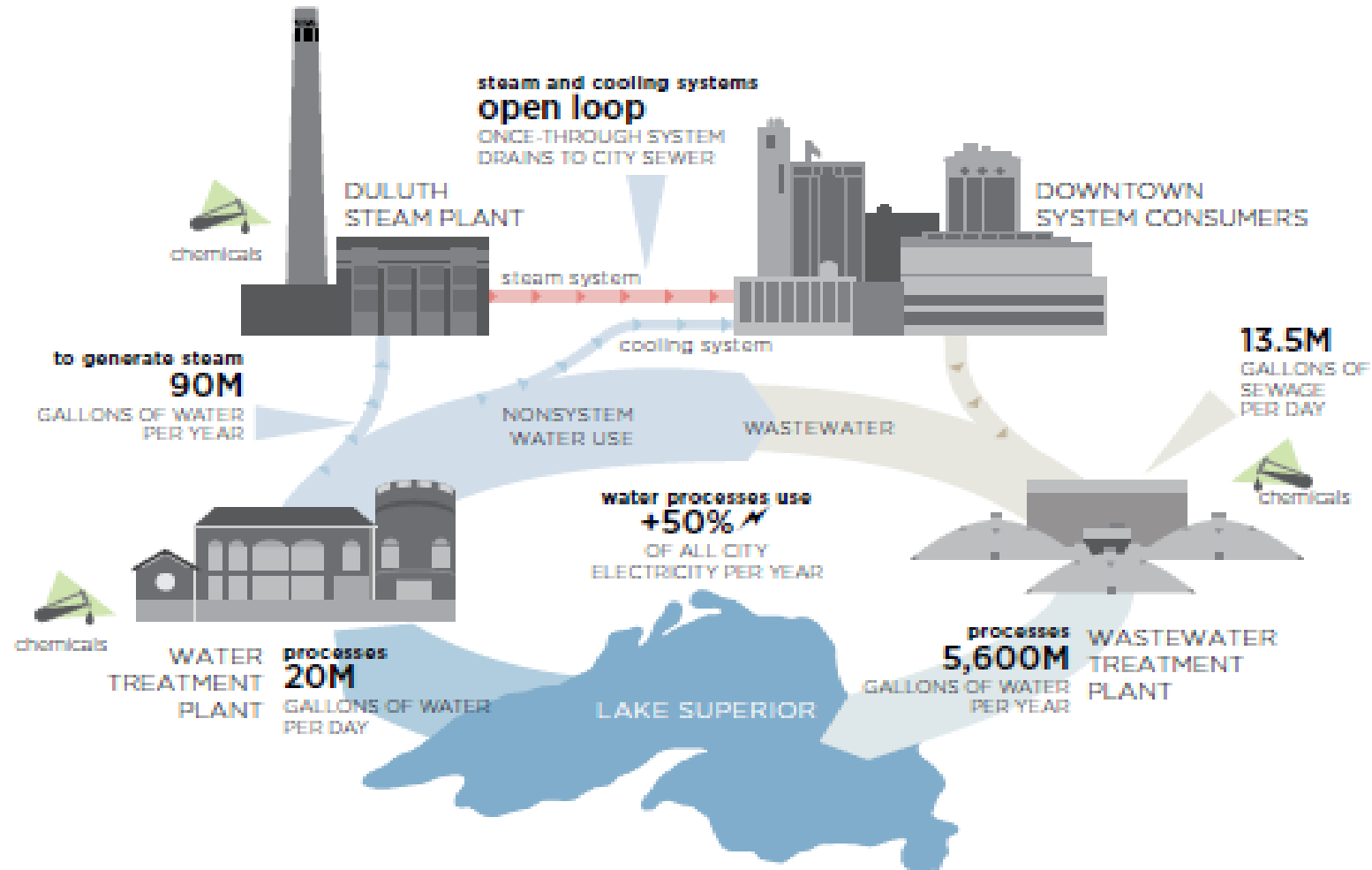


Figure 2.3 Current system for thermal energy transmission in Duluth

What does climate change have to do with energy?

- ▶ Minnesota has had four 1,000-year rainfalls since 2002.
- ▶ Spruce, birch, aspen and fir forests retreat northward
- ▶ Air pollution related to greenhouse gases cost Minnesotan's \$800 million in increased health care costs.
- ▶ 25,000 new jobs
- ▶ \$2 billion in additional wages

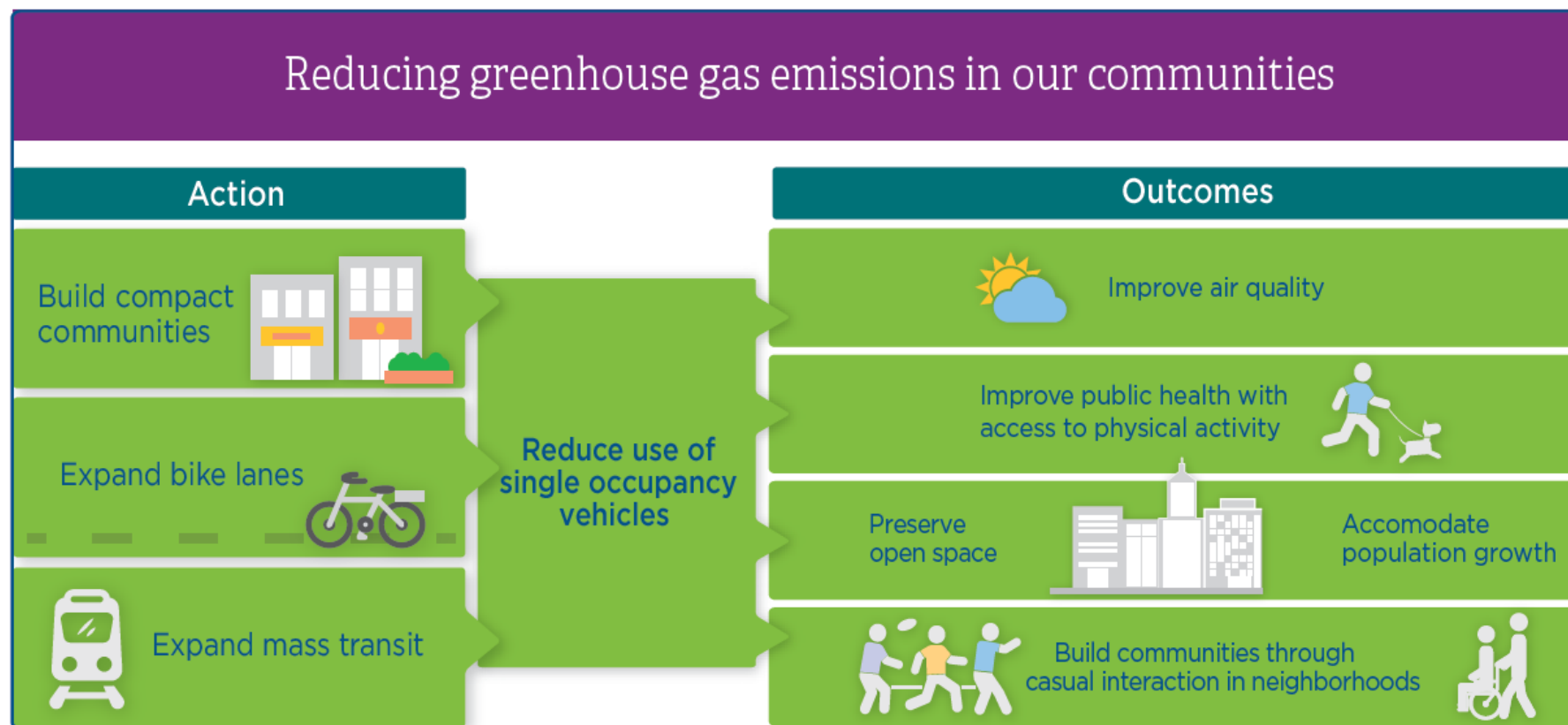
*Minnesota Environmental Quality Board, 2016



Star Tribune, 2012



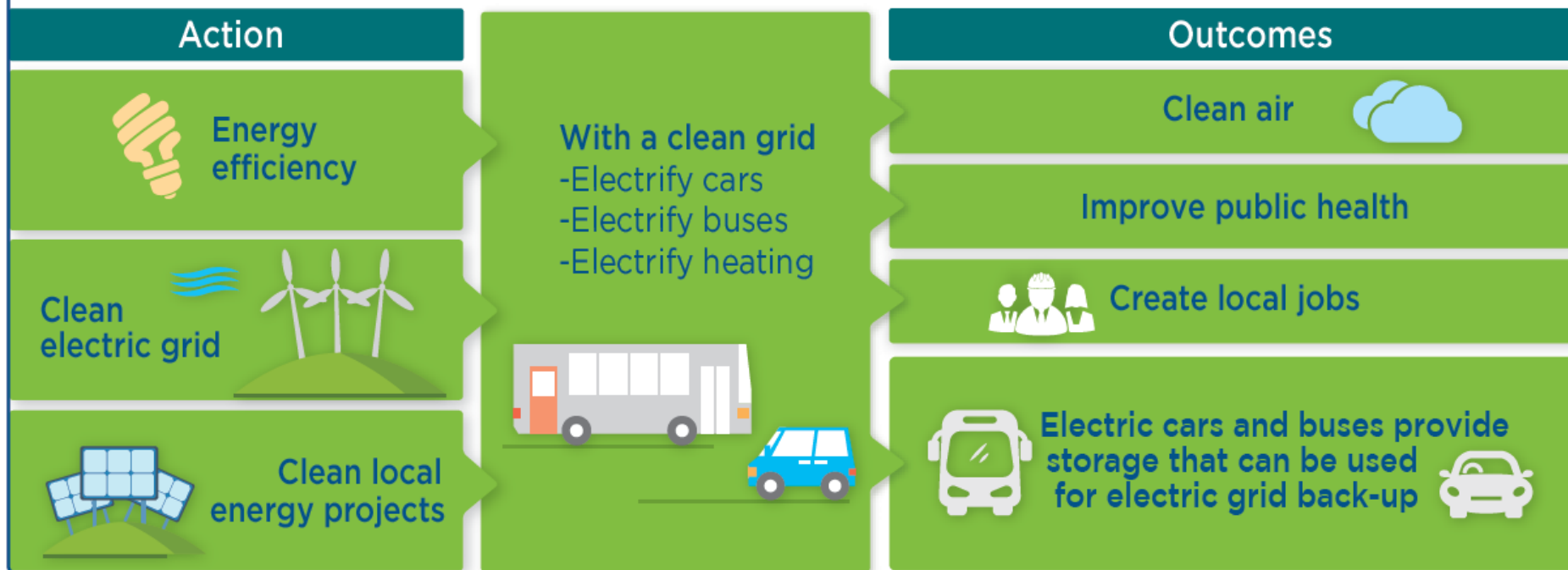
Thinking towards the future - how are we preparing?



*MN Environmental Quality Board, Climate Solutions and Economic Opportunities, 2015

Thinking towards the future

What could 2050 and 80% greenhouse gas reduction look like?



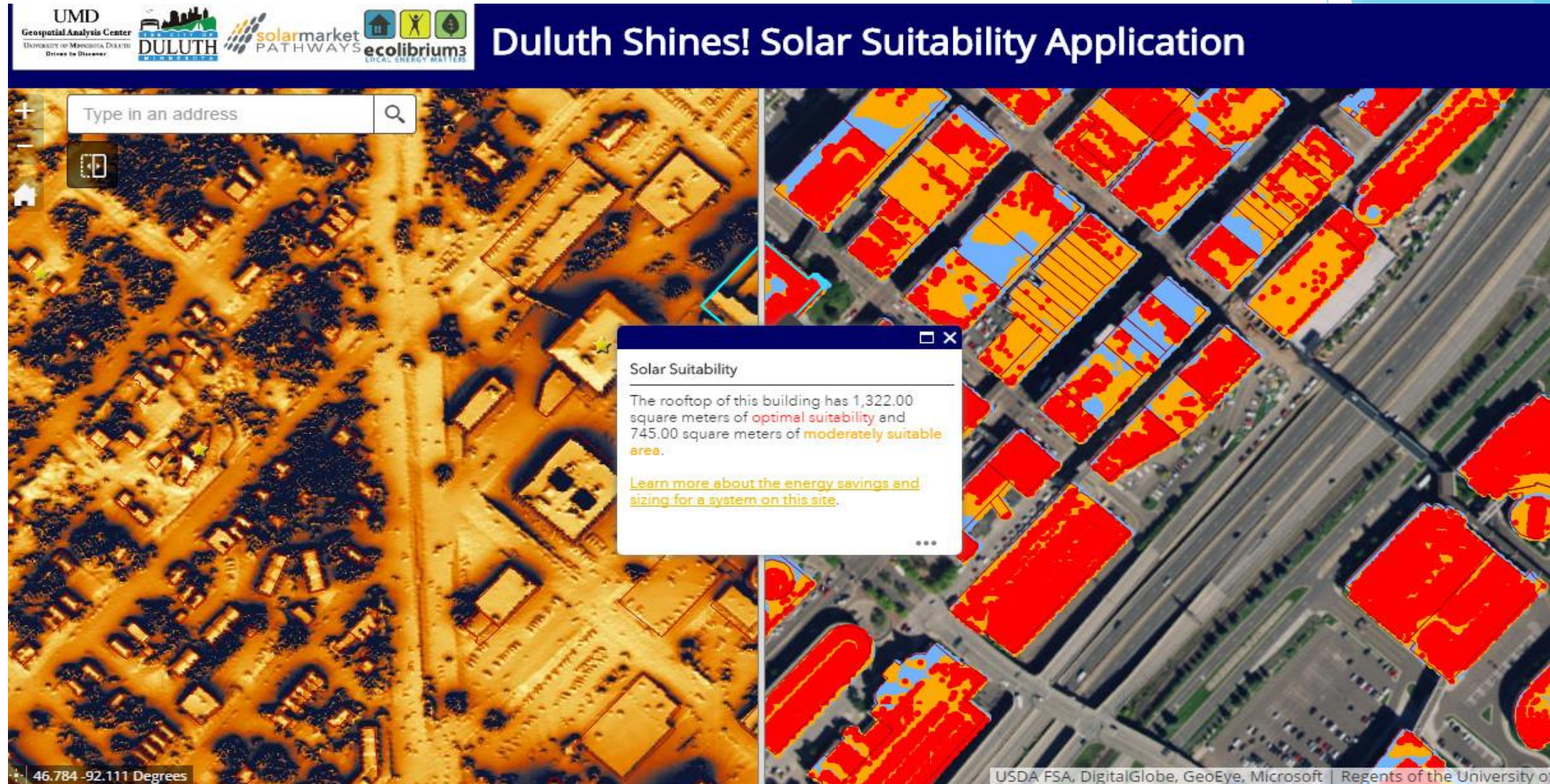
*MN Environmental Quality Board, Climate Solutions and Economic Opportunities, 2015

BIG IDEAS- SOLAR



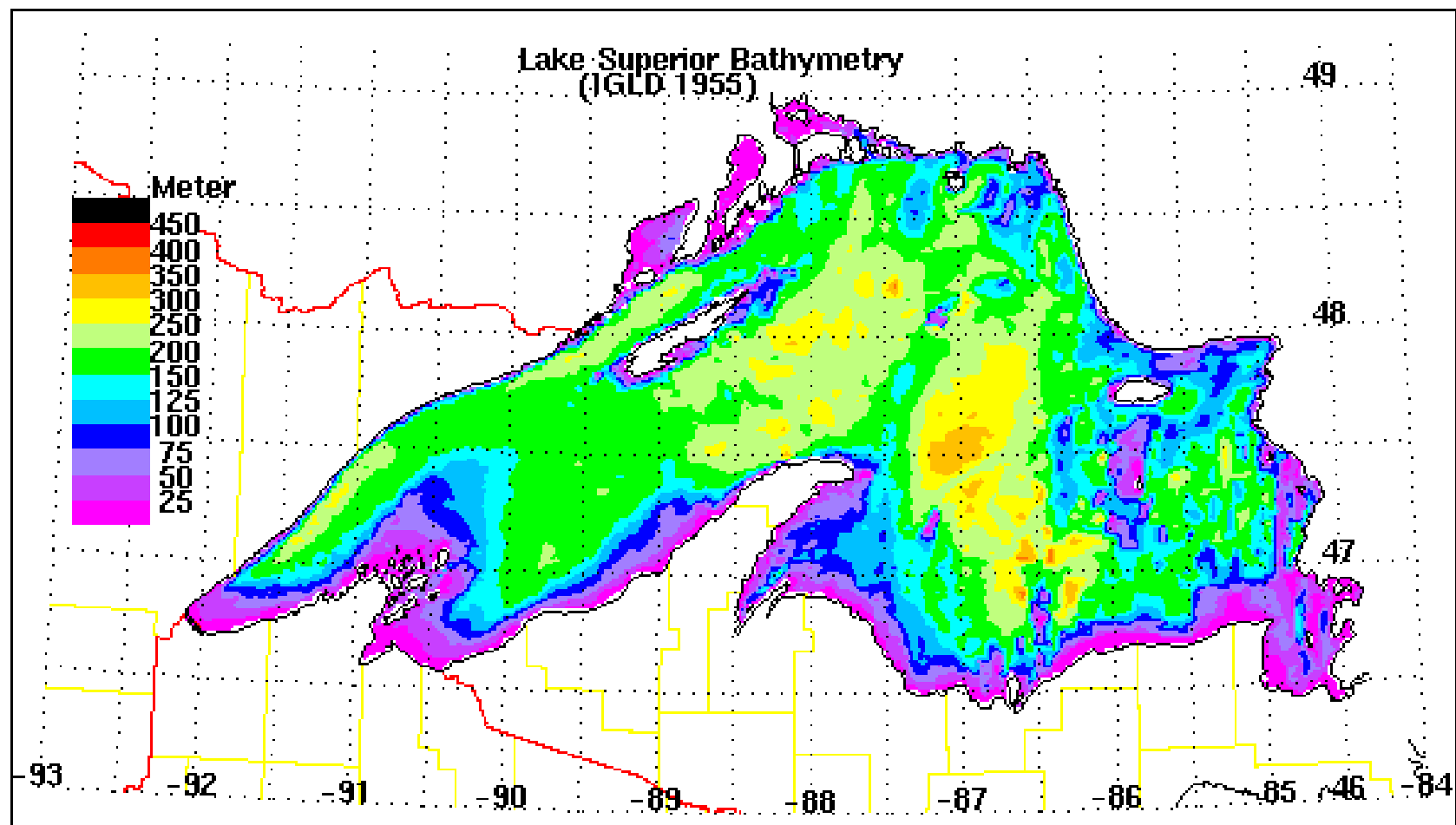
Minnesota Solar Suitability Analysis <https://solarapp.gisdata.mn.gov/solarapp/>

BIG IDEAS- SOLAR

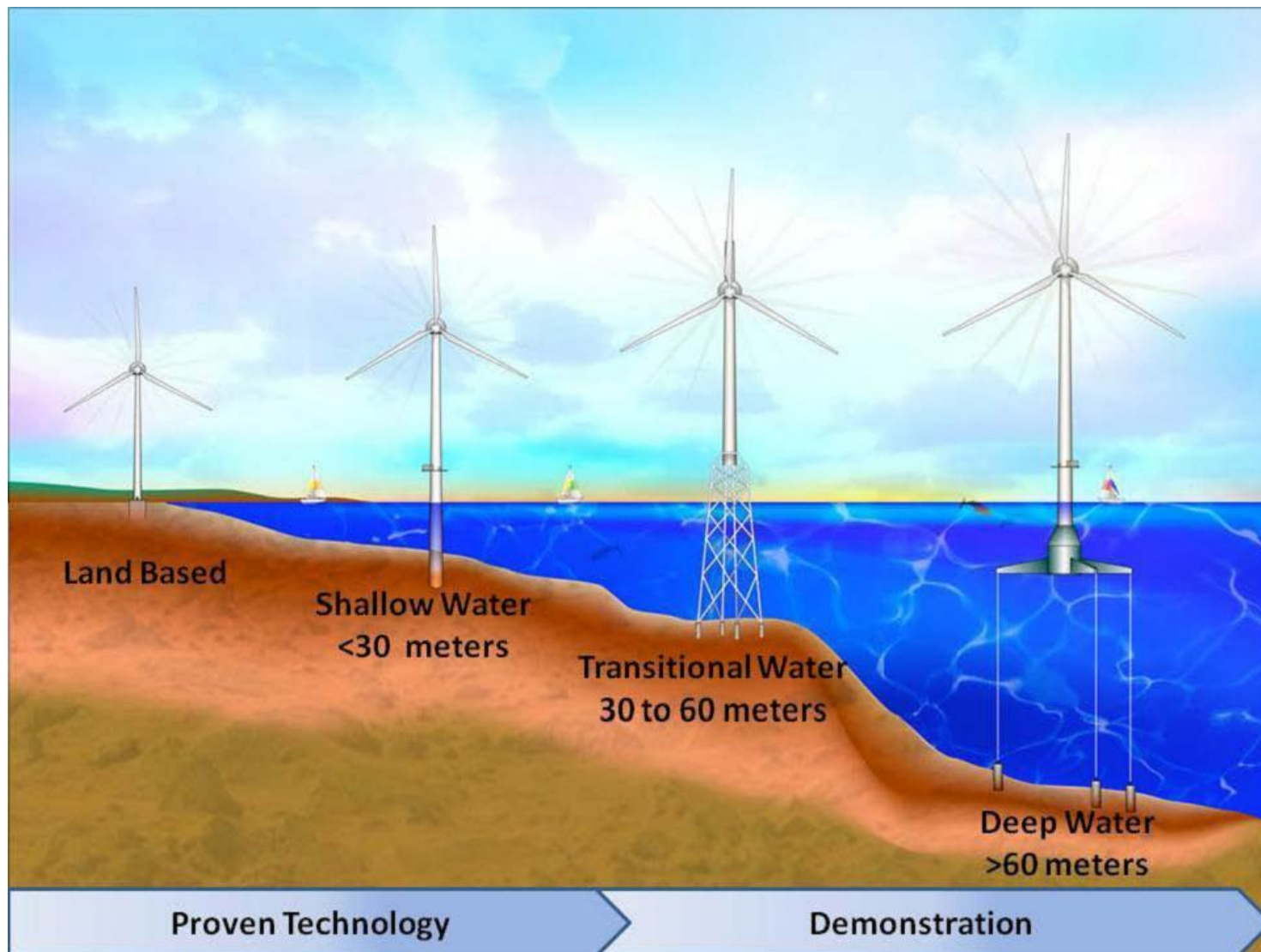


Duluth Shines! <http://umd-cla-gis04.d.umn.edu/duluthshines/>

BIG IDEAS -WIND



BIG IDEAS -WIND



BIG IDEAS -WIND



DRAFT Policies

- ▶ Goal 1: Buildings are designed sustainably to serve current and future generations.
- ▶ 1) Identify and adopt additional energy efficiency standards where appropriate and cost-effective.
- ▶ 2) Incentivize commercial building owners to benchmark and publish building energy use.
- ▶ 3) Prioritize residential energy efficiency retrofit programs and projects with housing rehabilitation funds.
- ▶ 4) Identify and promote existing building energy incentives such as rebates, low interest loans, efficiency certification programs, and affordable energy efficiency retrofit programs.

DRAFT Policies Continued...

- ▶ Goal 2: Increase the use of renewable energy sources.
- ▶ 5) Identify locations and partnerships for cogeneration, including the City's steam plant and large institutions such as hospitals and colleges.
- ▶ 6) Identify locations and partnership opportunities for solar gardens, such as vacant tax forfeit land, brownfields, and building rooftops.
- ▶ 7) Identify and promote opportunities for renters and incentives for landlords to affordably invest in renewable energy.
- ▶ 8) Identify and promote opportunities for homeowners to affordably invest in renewable energy.

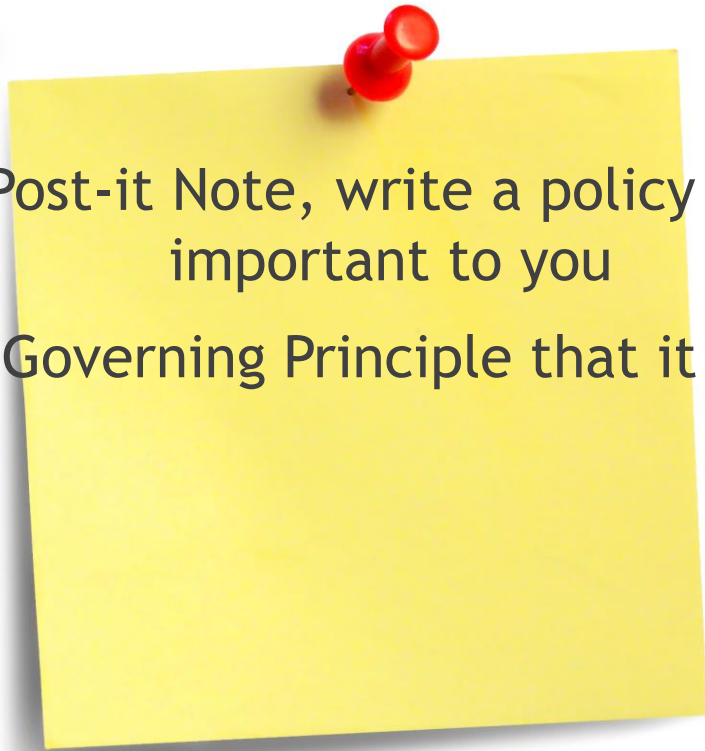
DRAFT Policies Continued....

- ▶ Goal 3: Support development and growth with more efficient public infrastructure.
- ▶ 9) Adopt energy efficiency and energy saving targets for City owned facilities and City operations.
- ▶ 10) Explore the feasibility of converting the steam plant to biomass.
- ▶ 11) Consider the costs and benefits beyond the financial ones when making decisions about energy and infrastructure investments.
- ▶ 12) Encourage energy efficient outdoor lighting, such as LED, on public and private property and streets, while ensuring lighting doesn't negatively impact the aesthetics and quality of life of the city.
- ▶ 13) Mitigate and prepare for extreme weather events and changing climate.

Policy Discussion

- ▶ Split up into groups based on the three goals and sets of policies
- ▶ Discuss the policies that go along with each goal

Final All on the Wall Activity

- 
- ▶ On your last Post-it Note, write a policy that is the most important to you
 - ▶ Post it on the Governing Principle that it best aligns with.

Next Steps

- ▶ Invite community partners, businesses, etc. to review policies and give feedback
- ▶ Gain feedback from the Vision Committee
- ▶ Craft final policy statements before August

Thank You!

- ▶ To Alex Jackson, Eric Enberg and Bret Pence for their contributions to our research

Stay Involved and Keep in Touch!

Stay Involved!

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- ▶ Email: CompPlan@duluthmn.gov
- ▶ Housing Specific Questions:
 - ▶ Kate Van Daele: kvandaele@duluthmn.gov
 - ▶ Kathy Wilson: kwilson@duluthmn.gov

Imagine Duluth: 