# Project Owners

## North Kent Wind is a joint venture limited partnership owned by affiliates of Pattern Development, Samsung Renewable Energy, Bkejwanong First Nation and Entegrus.

### Pattern Development (35%)

Pattern Development is a leading developer of renewable energy and transmission assets. With a global footprint spanning Canada, the United States, Mexico, Chile, and Japan, Pattern Development's highly-experienced team has brought more than 5,000 MW of renewable power projects to market. Our mission is to transition the world to renewable energy by developing high-quality facilities in an environmentally responsible manner and with respect for the communities where we operate. Our affiliate, Pattern Energy, is a publicly listed independent power company that owns and operates renewable energy in Canada, the United States, Puerto Rico, and Chile and uses proven, best-in-class technology. Combined, we have expertise in all project stages: resource analysis, site development, power marketing, finance, construction, facility operations, and asset management.

### Samsung Renewable Energy (35%)

Samsung Renewable Energy is creating clean, renewable energy for generations to come. Together with our partners, Samsung made a $5-billion investment in Ontario to create the world's largest cluster of wind and solar power. Our investments have created 900 direct renewable energy manufacturing jobs and 9,000 high-skilled jobs in Ontario. Samsung and its partners provided much-needed jobs in communities throughout Ontario, including manufacturing facilities in Windsor, Tillsonburg, Toronto and London. Built on Samsung C&T's commercial and technical expertise and the success of its renewable energy projects in several countries – including the United States and Europe –Samsung is creating real jobs, through real investment, benefitting real people.

### Bkejwanong First Nation (15%)

Bkejwanong First Nation, also known as Walpole Island, is located near Wallaceburg, Ontario at the mouth of the St. Clair River. It encompasses six islands that have been occupied by the Ojibwe, Potawatomi and Odawa peoples for thousands of years. Walpole Island has never been set apart as a reserve, giving it the distinction of being unceded territory. The First Nation is committed to a sustainable future within its Traditional Territory, which includes being heavily involved in the renewable energy sector over the past decade. This has culminated in equity participation in four wind energy projects totaling 350 MW.

### Entegrus Renewable Energy Inc. (15%)

Entegrus Renewable Energy Inc. ("EREI") is a wholly owned subsidiary of Entegrus Inc. that was incorporated to make investments in wind developments in the Municipality of Chatham-Kent on behalf of its shareholders. The Entegrus group of companies directly operates and maintains electricity distribution systems for over 40,000 customers in Southwestern Ontario, provides general administrative services, namely in the areas of customer care, billing, call center operations and collection services for companies focused on electricity supply, transmission and distribution, and water supply. Entegrus is committed to maintaining safe, reliable operations while providing high levels of service to its customers, partners and the communities it serves.

# Project Overview

## North Kent Wind supports the community, contributes to the tax base, and creates job opportunities.

- 100 MW wind power project
- 20-year power purchase agreement from the IESO
- Energy equivalent to the annual electricity needs of 35,000 Ontario homes
- Estimated **$5 million over 20 years in taxes, with $3 million directly to Chatham-Kent**
- Estimated $500,000 in local building permit fees
- 12-month construction period with average of 200 workers on-site
- **Currently 50% of workers on-site are from Chatham-Kent and 100% are from Ontario**
- Approximately 10 on-site, full-time operations jobs, in addition to continued use of local contractors
- **Chatham-Kent community benefit contribution of $4 million**

### Wind Turbines

- Number of Turbines: 34
- Turbine model: Siemens SWT-3.2-113
- Hub height: 99.5 metres
- Blade length: 55 metres
- Tower base diameter: 4.6 metres
- Cut-in wind speed: 3 - 5 metres per second
- Cut-out wind speed: 12 - 13 metres per second
- Turbine blades manufactured in Tillsonburg by Siemens
- Turbine towers manufactured in Windsor by CS Wind

### Wind Energy

- Is an inexhaustible resource
- Diversifies Ontario's energy mix
- Improves air quality in Ontario and helps fight climate change
- Is compatible with mixed land use: grazing and agriculture
- Creates local job opportunities
- Provides a steady, long-term income to farmers and property-owners
- Strengthens the local tax base, helping to improve services in Chatham-Kent, including schools, police and fire departments
- Produces energy with stable production costs, offering a hedge against other energy sources with volatile fuel markets

# Pile-Driving is Routine in Chatham-Kent

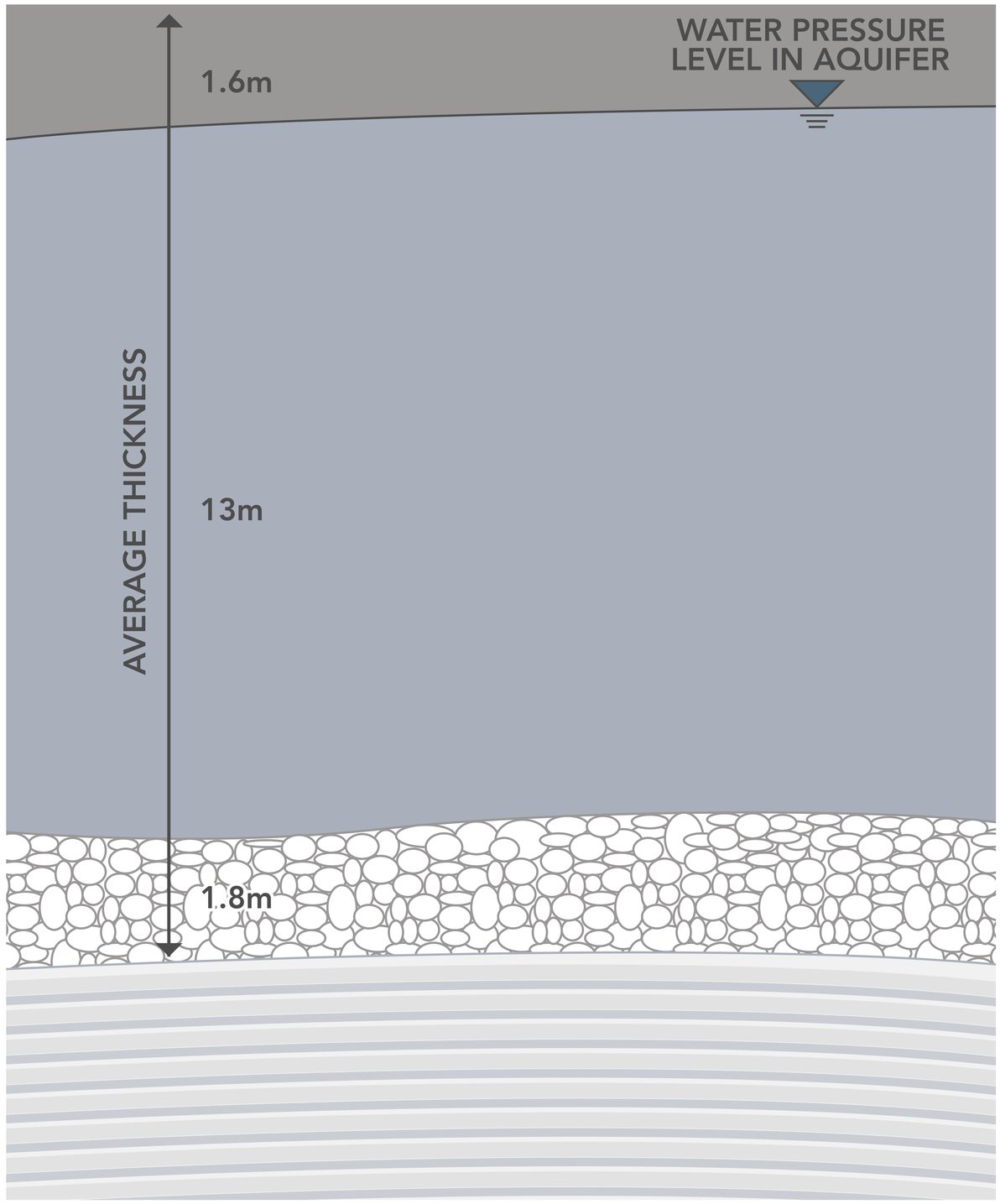
**Pile-driving is a routine form of construction used throughout Chatham-Kent, supporting culverts, bridges, and buildings. Pile-driving is the act of installing steel pipes or beams, called piles, into the ground to provide a foundation for structures.**

## About Pile-Driving

- Pile-driving has been used for more than 400 years
- "Pipe" piles for North Kent Wind are driven with end plugged by grout
- Plug inhibits the piles from being driven into sound rock
- Piles sometimes penetrate many metres under their own weight
- Anchors are drilled and cemented a few metres below piles using equipment similar to residential water well installations

## Local Geological Ground Conditions

1. **Sand and silt:** 1-2 metres thick
2. **Soft clay:** 10-15 metres thick
3. **Glacial till:** 1-3 metres thick, comprised of broken bedrock, gravel, sand, silt, and clay
4. **Black shale bedrock:** Kettle Point Formation bedrock

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# Evaluation of Potential Water Well Impacts

## The review of published research, experience in other jurisdictions, and engineering, hydrogeologic and radiological evaluations completed prior to construction led to the following conclusions:

- Influence of ground vibrations from pile-driving on well water conditions, if any, is likely to be insignificant.
- There is no plausible mechanism for sediment to be transported tens or hundreds of metres underground from turbine foundation pile locations to water supply wells.
- Water quality in the vicinity of the wind energy project is unlikely to be affected.
- Water well quality is most influenced by regional natural water quality and near-well conditions (within a few metres), well construction details, well and pump conditions, and pump operations.

*"We can conclude to a reasonable degree of scientific certainty that the construction and operation of the turbines at the planned setback distances will not cause harm to groundwater quality either at the wells or in the broader subsurface groundwater environment."*

*- Golder Associates*

# Pile-Driving Field Testing Program

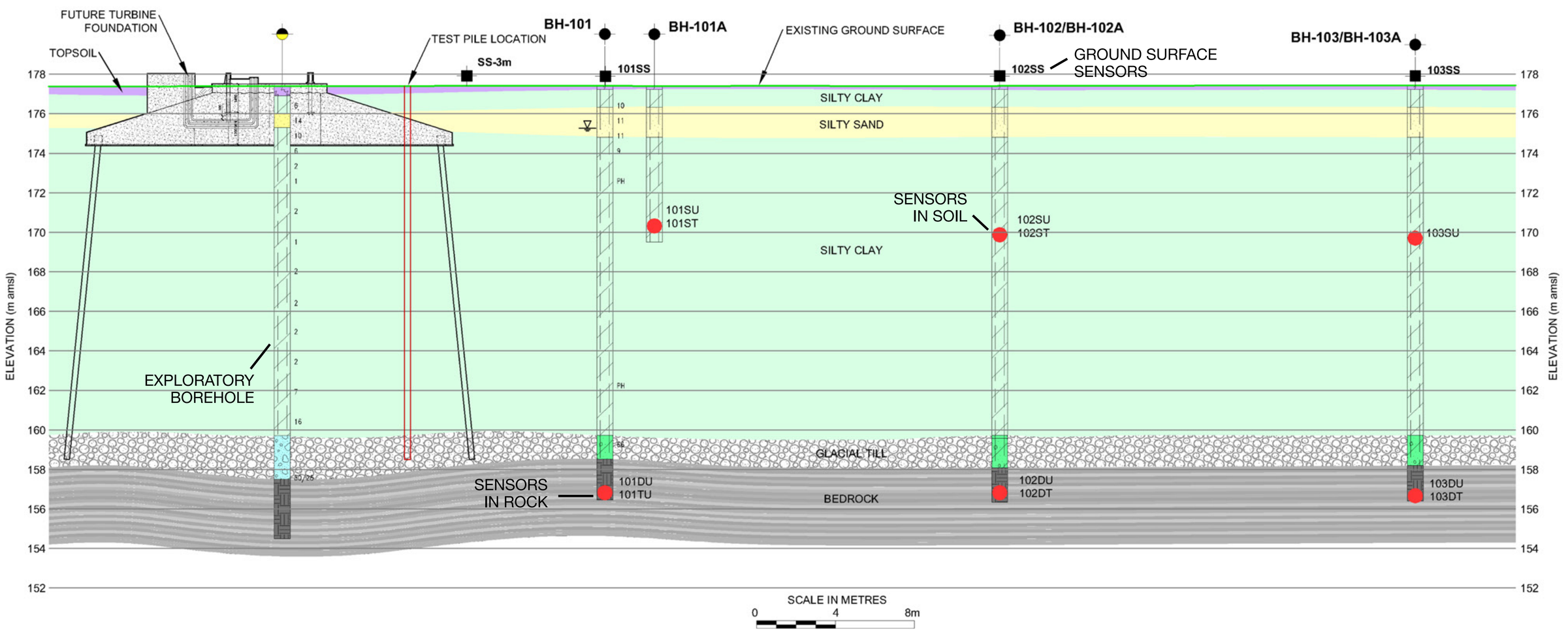
## Phase 1: March – June, 2017

Test pile-driving and monitoring was undertaken to obtain **surface and subsurface vibration measurements** at different distances from the turbine location. Vibration monitoring devices were also installed on residential water well steel casings.

Subsurface vibration monitoring instruments were installed to monitor the test pile program, future construction pile-driving for the same turbine location, and the subsequent operational phase of the same turbine.

### TEST RESULTS

- Pump-induced well casing vibrations exceeded those associated with pile-driving
- Vibrations exclusive of pump operations are typical for background and day-to-day conditions (nearby traffic, nearby road and utility construction)
- Vibrations from pile-driving are inconsequential for wells
- Confirmed routine vibration monitoring from pile-driving is only required at ground surface at the turbine sites, with supplementary data from well casings at various distances



# Pile-Driving Construction Monitoring Program

## Phase 2: June – November, 2017

Monitoring of vibrations at the turbine construction sites is conducted full-time during pile-driving. Vibrations are also monitored at two domestic water wells within seven geographic turbine clusters.

**For each of the turbine sites within each cluster, the monitoring program consists of:**

- Ground surface construction vibration monitoring systems close to the piles
- Monitoring personnel note when active hammering of the piles takes place and when the hammering starts and stops to relate this activity to measured vibrations

**For the monitored wells, work includes:**

- Sensitive vibration monitoring equipment is also securely mounted to steel water well casings that penetrate deep into the ground
- The equipment captures vibrations that occur, for whatever reason, in the vertical and two horizontal directions simultaneously hundreds of times per second
- Deep water well casings have been monitored at distances of about 580 – 2,000+ metres from the pile-driving
- During monitoring, personnel take notes of other activities in the area that might influence ground vibrations such as nearby road or farm vehicle traffic, near-surface construction (utilities and road work), movements of solar panel systems, well pump operation and any other relevant activities

# Preconstruction Water Well Survey

North Kent Wind conducted a survey of private water wells prior to construction. The preconstruction water well survey included:

- Contacting all owners of active water wells within the Project Study Area and within 1 km of project infrastructure to obtain information about their water well and confirm interest in participating in a groundwater survey.

- Establishing the history of the water well through an interview with the resident(s) of each property.

- Collecting a raw (untreated) groundwater sample from each well and submitting the sample to a laboratory accredited by the Standards Council of Canada and the Canadian Association of Laboratory Accreditation for analysis of a defined set of water quality parameters subject to permission from the landowner.

## Summary of Water Well Survey Results

| Identifier | Number |
|---|---|
| Total Number of Properties | 959 |
| Total Number of Private Property Owners | 581 |
| Total Number of Survey Responses Received: | 393 |
| ➢ Total Number of Known Properties with Active Water Supply Wells | 210 |
| ➢ Total Number of Detailed Well Assessments Completed | 189 |

# Complaint Investigation Process

When a complaint is received, the following actions take place:

**STEP 1:** MOECC is notified within 1 business day of receiving the notice.

**STEP 2:** A qualified expert is retained to conduct an investigation and strives to visit the property owner within 2 business days (pending landowner availability) of receiving the notice.

**STEP 3:** The qualified expert will interview the property owner and collect a raw (untreated) groundwater sample for the laboratory.

**STEP 4:** The water sample is delivered immediately to a laboratory accredited by the Standards Council of Canada and the Canadian Association of Laboratory Accreditation. The laboratory analysis requires 3 business days to complete.

**STEP 5:** The lab results are compared against baseline water quality data (from the same well), where available.

**STEP 6:** Vibration monitoring results are interpreted by scientific and engineering specialists. This analysis takes time due to the large amount of minute vibration data collected, including vibrations from well operations and traffic.

**STEP 7:** Other data assessed includes well construction details, well use information, turbine construction activity, and the local hydrogeological setting.

# Complaint Investigation Results

## Water well concerns have been investigated by qualified experts who have concluded in all completed investigations to date that pile-driving is not impacting water well quality or function.

Investigations completed by AECOM's licensed hydrogeologist (P.Geo.) and water well contractor in Ontario concluded that:

- **Groundwater quality and quantity issues reported by property owners are not a result of piling or construction activities**
- **Water quality and quantity conditions at the wells were relatively consistent to the baseline data collected prior to construction**
- **In some cases, water quality or quantity concerns appeared related to well construction, the condition of existing well pumping and treatment equipment, or ongoing maintenance**

**Vibration levels from pile-driving have been determined to be inconsequential for the water wells on non-participating properties.** The levels are less than what may be experienced by common day-to-day sources, such as operation of the water well pumps themselves.

### Extensive Monitoring and Analysis:

- More than 800 continuous hours of vibration monitoring of deep well casings so far
- Nearly 700 ten-minute long monitoring events have been analyzed, covering >300% of the time during which more than 250 piles have been driven their hardest
- More than 1 million analyses have been completed to evaluate well casing vibrations

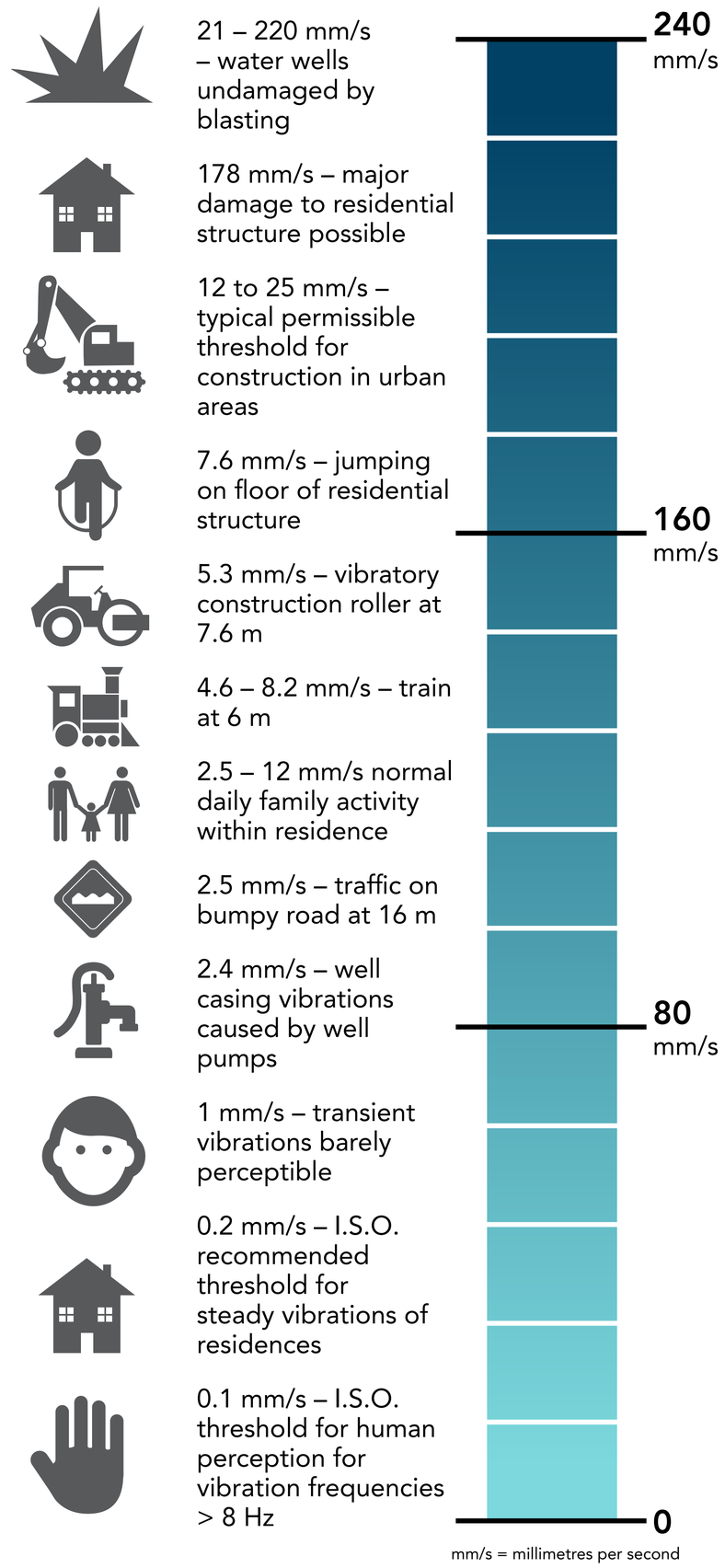
# Pile-Driving Monitoring Results

**Piling occurs 100's of metres away from non-participating properties. The level of vibration at those water wells is so low, it is not plausible that vibrations could cause damage to well infrastructure or re-suspension of particles existing within wells.**

- **84% of well casing vibrations from all sources less than 0.05 mm/s**
- **94% of well casing vibrations from all sources less than 0.1 mm/s**
- **> 99% of measured well casing vibrations from all sources less than 1 mm/s**

- Vibration measurements that were the largest resulted from:
  - Nearby road and utility construction (about 0.2 to 1.5 mm/s)
  - Road and farm equipment traffic (as much as 2.4 mm/s)
  - Well pump operation (to nearly 2.5 mm/s)
  - Well maintenance/ modifications by the well owners (nearly 5 mm/s)

Examples of common particle velocity measurements – the speed at which a particle (of ground in this case) moves up and down or side to side



# Construction Schedule

| Construction Task | Start | Finish |
|---|---|---|
| Site Clearing | Feb, 2017 | May, 2017 |
| Access Roads | May, 2017 | August, 2017 |
| Substation & Switchyard | May, 2017 | October, 2017 |
| Underground Collection System | May, 2017 | November, 2017 |
| Operations & Maintenance Facility | June, 2017 | October, 2017 |
| Turbine Foundations | June, 2017 | November, 2017 |
| Turbine Deliveries | October, 2017 | December, 2017 |
| Turbine Installation | October, 2017 | January, 2018 |
| Turbine Commissioning | November, 2017 | March, 2018 |
| Land Restoration | May, 2018 | September, 2018 |

# Benefits to Chatham-Kent Economy

## Over 20 years, North Kent Wind will inject more than $40 million of direct spending into the Chatham-Kent economy.

The wind project will provide many economic benefits to Chatham-Kent, including job creation, business for local contractors, and financial benefits, including from equity ownership, property taxes and a community benefits contribution.

## Job Creation

- Average of 200 workers on-site to construct the project
- Approx. 150 workers are currently on-site with 50% from Chatham-Kent and 100% from Ontario
- Approx. 10 full-time workers will operate and maintain the facility, in addition to the continued use of local contractors
- Subcontractors will be engaged to conduct civil work – grading, excavation, and concreate – electrical work and mechanical assembly
- During operations, the site will use a variety of local vendors to provide maintenance services for communications, the O&M building, roads, substation and truck fleets

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# Provides Clean and Safe Power

In 1998, the Ontario Medical Association declared air pollution a public health crisis in Ontario with coal-fired power plants being major contributors to the smog problem. The Province committed to phasing out coal-fired generation in 2002, and the development of wind energy helped Ontario meet that goal in 2014. Today, wind turbines are harnessing the wind across the Province and generating clean, homegrown energy without producing any harmful emissions and without using water to operate.

## North Kent Wind Compared to Coal-Fired Generation

**Emissions Avoided**

Carbon Dioxide: 300,000 tonnes/year (60,000 car equivalent)
Sulfur Dioxide: 1,500 tonnes/year
Nitrogen Oxides: 450 tonnes/year
Mercury: 5 kg/year

**Water Conserved**

720,000,000 litres/year (enough to supply 9,000 people/year)

*Sources: Emissions offset calculations use estimated electricity production for a 100 MW North Kent Wind project compared to emission rates from the Nanticoke coal plant as indicated in the Ministry of the Environment's 2001 report Coal Fired Electricity Generation in Ontario. Car comparison assumes typical passenger vehicles produce 5.1 metric tons of CO2 per year. Water savings compared to coal-fired generation assumes 2,048 litres/MWh. People supplied figure based on Environment Canada's 2011 Municipal Water Use Report with 225 litres/day Ontario per capita water consumption.*

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