Natural Heritage: Birds

- NextEra Energy Canada has utilized an avian (bird) monitoring protocol that meets the requirements of the MNR natural heritage assessment guidelines for turbines and birds
- Bird surveys for the Adelaide Wind Energy Centre have included a wide variety of avian surveys, such as breeding bird and wintering raptor surveys. These surveys have been completed over several years of monitoring, including 2007, 2011, and 2012
- Bird surveys were conducted over several seasons to profile species and look at the following factors:
    - Breeding Activity
    - Behaviour Patterns
    - Significant or Critical Habitats
- The breeding bird surveys were conducted by establishing point count locations and conducting habitat searches in the study area, while recording visual and sound observations
- The last of the bird studies was completed in early July 2012 and data from the studies is currently being analyzed and compiled
- The survey methods, habitat assessment, and proposed mitigation measures for any significant habitat identified by these surveys has been approved by the MNR.
- The completed Natural Hertiage Assessment details the mitigation measures that will be implemented for any significant avian habitat that is identified within 120 m of the Project Location.

Natural Heritage: Bats – Adelaide Project

- NextEra Energy Canada has implemented a bat monitoring program that is consistent with MNR expectations for proposed wind energy generating facilities
- Properties that contained wooded areas within 120 m (394 feet) of proposed wind turbines, measured from blade tip were examined by biologists to search for suitable bat habitat
- After identifying suitable bat habitats, certain features were chosen for more extensive monitoring which involved installing bat monitoring equipment within (or adjacent to) the wooded habitats for 10 days in June/July to record the number of bat passes
- These properties also required 10 nights of visual surveys that involved examining woodlands with spotlights and microphones to assess bat activity and species composition
- Bat monitoring was completed in accordance with the Ontario Ministry of Natural Resources "Bats and Bat Habitats: Draft Guidelines for Wind Power Projects (March 2010)" and has been reviewed and approved by the MNR as part of the REA's Natural Heritage Assessment requirements
- In July 2011, after the completion of the 2011 monitoring program, the Ontario Ministry of Natural Resources has issued new guidelines "Bats and Bat Habitats : Guidelines for Wind Power Projects" with more specific criteria for evaluation bat habitat. Woodlands not studied under the 2010 bat guidelines were re-examined under these new 2011 bat monitoring guidelines, and assessed to determine if more detailed surveys would be required to determine significance.
- If any of the woodlands surveyed in 2012 are determined to be significant according to provincial standards, mitigation measures outlined in the Environmental Impact Statement will be implemented.

NEXTera™ ENERGY CANADA

www.NextEraEnergyCanada.com

Noise Study

Noise studies were conducted to help determine the final turbine layout. The noise studies comprise the following steps:

- **Step 1:** Identify points of reception – dwellings (typically houses) that are within 2km of the wind turbines

  The MOE Noise Guideilnes generally define a Point of Reception (POR) as a house, campground, church, school or other sensitive building that is not located on the same premises as the wind farm, including its turbines and ancillary structures. POR's can also include locations on vacant lots that have residences as a permitted use; in this case a Vacant Lot Receptor (VLR) is required.

- **Step 2:** Obtain wind turbine specifications and noise emission ratings from the manufacturer

- **Step 3:** Using an initial wind turbine layout, predict the noise levels generated at points of reception using a noise prediction model to ensure allowable limits are not exceeded. The noise model is designed in accordance with standards set by the Ministry of the Environment (MOE)

- **Step 4:** Using the noise model results, revise the turbine layout as necessary to ensure that the final turbine layout meets all applicable noise guidelines

Noise requirements under Renewable Energy Approval Regulation (O.Reg. 359/09)

- Wind turbines will be set back from dwelling units that are not part of the project by at least 550m (1804ft) and must be at or below 40dBA.

- Noise from turbines must meet provincial noise limits as outlined in MOE publication 4709e "Noise Guidelines for Wind Farms"

Noise Assessment results

- Modelling of predicted noise levels from the proposed turbines, transformer station and proposed/existing wind farms within 5 km of the Project Location was undertaken. The results were as follows:

  - All non-participating residences (vacant or occupied) comply with MOE guidelines for wind turbines – they are below the 40 dBA noise threshold and are greater than 550m from the nearest wind turbine;

Acoustic Barrier (Height: 6 m)

Transformer

10 m

Legend

Project Components

- Wind Turbine (38)
- Napier Turbine
- Substation
- Participating Receptor
- Project Area
- Investigation Area (1.5 km from the noise source)

Predicted Sound Level at Wind Speed of 6 m/s

- 40 dB(A) at 1.5 m agl*
- 40 dB(A) at 4.5 m agl*
- 40 dB(A) at 7.5 m agl*

*agl: Above Ground Level

Other Components

- 1-Storey Receptor
- 2-Storeys Receptor
- 3-Storeys Receptor
- Vacant Lot Receptor
- Other Building
- Railway
- Freeway
- Arterial / Collector
- Local Road / Street
- Permanent Watercourse
- Intermittent Watercourse
- Runway
- Residential Area
- Park / Sports Field
- Campground
- Cemetery
- Pit or Quarry
- Waterbody
- Wetland
- Wooded Area
- Lot Line
- Municipal Boundary
- County Boundary

0 0.5 1 2 km

NEXTera ENERGY

Adelaide Wind Energy Centre

38 TURBINE LAYOUT WITH SIMULATED NOISE ISOCONTOURS (WIND SPEED OF 6 m/s) GE 1.6-100

GL Garrad Hassan

1009-015-120814-001-RG

August 14, 2012

Projection: UTM Zone 17, NAD83

Sources: Ontario Base Mapping, Ontario Road Network, Land Information Ontario, Geobase, CanVec, Industry Canada.

Shadow Flicker - Adelaide Wind Energy Centre

Shadow flicker may occur under certain combinations of circumstances with regards to the sun's position and wind direction; when the sun passes behind the rotating blades of a wind turbine, a moving shadow is cast in front of or behind the turbine. When viewed from a stationary position, the moving shadows cause periodic flickering of the sunlight, otherwise known as "shadow flicker".

The effect is most noticeable inside buildings, where the flicker appears through a window opening. The likelihood and duration of the effect depends on a number of variables, namely:

- Orientation of the building relative to the turbine;
- Wind direction: the shape and intensity of the shadow are determined by the position of the sun relative to the blades (the turbine rotor continuously yaws to face the wind so the rotor plane will always be perpendicular to the wind direction;
- Distance from turbine: the farther the observer from the turbine, the less pronounced the effect;
- Turbine height and rotor diameter: a larger turbine rotor diameter will cast a larger shadow, meaning a larger area will be prone to incidences of shadow flicker;
- Time of year and day: position of sun relative to the horizon;
- Weather conditions: cloud cover reduces the occurrence of shadow flicker;
- Vegetation and other obstacles that help to mask shadows; and
- Whether or not the turbines are operating

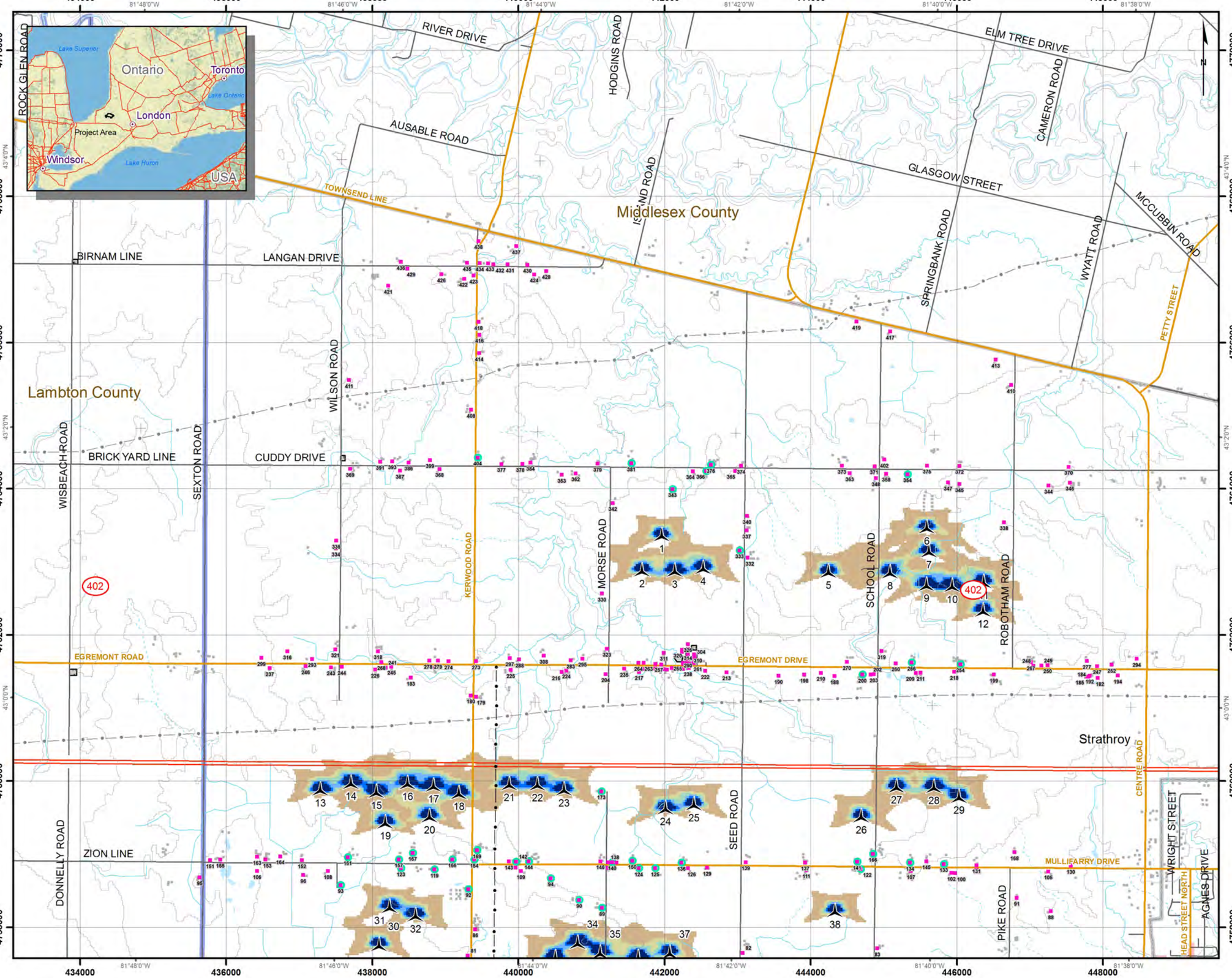
Shadow Flicker Assessment and Results

- To assess the effect of shadow flicker, receptor location, hourly meteorological data, topography of the wind farm site, and turbine specifications such as rotor diameter and hub height were considered.

- The worst case maximum shadow flicker per day was calculated to be 57 min/day and 18 hr/year.

- This is a conservative analysis as it does not account for

    - Operational downtime due to low winds, high winds or maintenance
    - The amount of time the turbine is not directly facing the sun which will reduce the area of the projected shadow thus the shadow flicker incidence
    - The presence of vegetation and other physical barriers
    - The amount of aerosols (moisture, dust, smoke, etc.) in the atmosphere



Legend

Project Components

- Wind Turbines (38)
- Participating Dwelling

Other Components

- Dwelling
- Transmission Line
- Railway
- Freeway
- Arterial / Collector
- Local Road / Street
- Pipeline
- Permanent Watercourse
- Intermittent Watercourse
- Contour (Interval: 10m)
- Residential Area
- Waterbody
- Lower/Single Tier Municipality
- Upper Tier Municipality

Shadow Flicker [hour/year]

- 30 - 59
- 60 - 89
- 90 - 119
- 120 - 149
- 150 - 179
- 180 and over

kilometres

0 0.75 1.5 3

NEXTera ENERGY

Adelaide Wind Energy Centre

SHADOW FLICKER ANALYSIS

GL Garrad Hassan

1009-002-121211--001-JM

Februrary 22, 2011

Projection: UTM Zone 17, NAD83
Sources: Ontario Base Mapping, Ontario Road Network, Land Information Ontario, Geobase, CanVec, Industry Canada.

438000 440000 442000 444000 446000

4764000 4762000 4760000 4758000

KERWOOD ROAD

EGREMONT DRIVE

MULLIFARRY DRIVE

1 2 3 4 5 6 7 8 9 10 11 12 13

Air1

Kitchener
Sarnia
London
St. Clair
Lake St Clair
Chatham

Legend

Infrastructure Changes

Service Road
- Added
- Removed
- No Change

Collection System
- Added
- Removed
- No Change

Transmission Line
- **Added**
- **Removed**
- **No Change**

Disturbance Area
- Added
- Removed
- No Change

Project Components
- Wind Turbine (48) (November 16, 2011)
- Meteorological Tower
- Project Area
- Laydown Area
- Substation

Other Components
- Receptor
- Other Building
- Railway
- Freeway
- Arterial Road
- Local Road / Street
- Permanent Watercourse
- Intermittent Watercourse
- Residential Area
- Waterbody
- Wetland
- Wooded Area
- Lot Line

0 0.5 1 2 km

NEXTera ENERGY

Adelaide Wind Energy Centre

INFRASTRUCTURE CHANGE MAP
Page 1 of 4

GL Garrad Hassan

1008-038-160412-001-RG
CAN_Bornish_Optimized_72_8MW_Hybrid_GExle1_8_100RD_80HH_447_2Alts_GExle1_5_102RD_80HH_1T_20111116

July 04, 2012

Projection: UTM Zone 17, NAD83

Sources: Ontario Base Mapping, Ontario Road Network, Land Information Ontario, Geobase, CanVec, Industry Canada.

Legend

Infrastructure Changes

Service Road
- Added
- Removed
- No Change

Collection System
- Added
- Removed
- No Change

Transmission Line
- **Added**
- **Removed**
- **No Change**

Disturbance Area
- Added
- Removed
- No Change

Project Components
- Wind Turbine (48) (November 16, 2011)
- Meteorological Tower
- Project Area
- Laydown Area
- Substation

Other Components
- Receptor
- Other Building
- Railway
- Freeway
- Arterial Road
- Local Road / Street
- Permanent Watercourse
- Intermittent Watercourse
- Residential Area
- Waterbody
- Wetland
- Wooded Area
- Lot Line

0 0.5 1 2 km

NEXTera ENERGY

Adelaide Wind Energy Centre

INFRASTRUCTURE CHANGE MAP
Page 2 of 4

GL Garrad Hassan

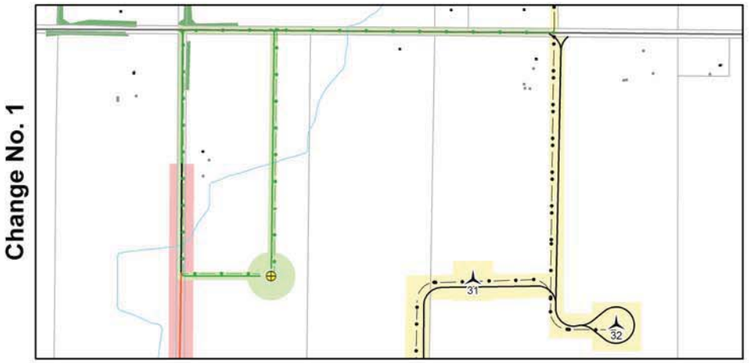
1008-038-160412-001-RG
CAN_Bornish_Optimized_72_5MW_Hybrid_GEver1_6_100RD_80HH_44T_2ARs_GEvar1_5_100RD_80PH_1T_20111116

July 04, 2012

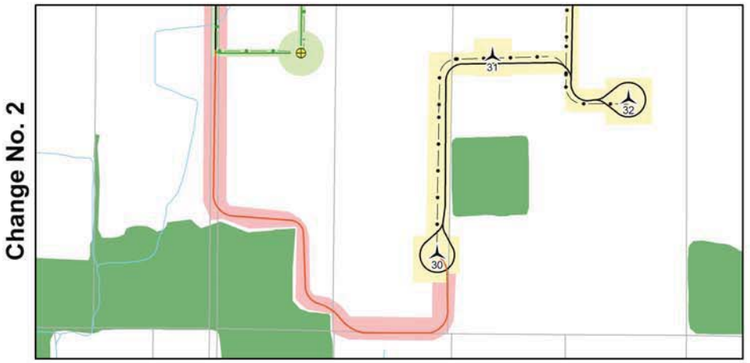
Projection: UTM Zone 17, NAD83

Sources: Ontario Base Mapping, Ontario Road Network, Land Information Ontario, Geobase, CanVec, Industry Canada.

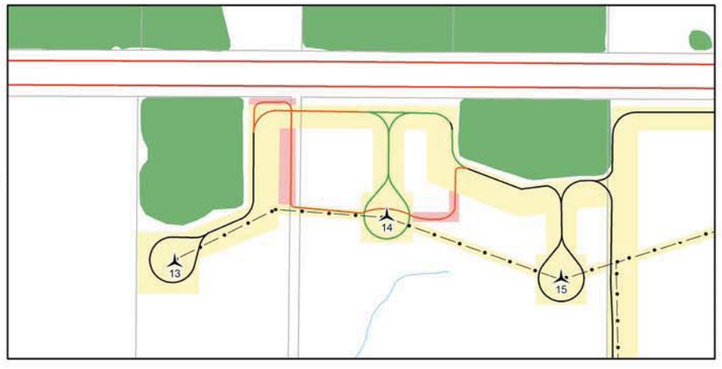
Change No. 1



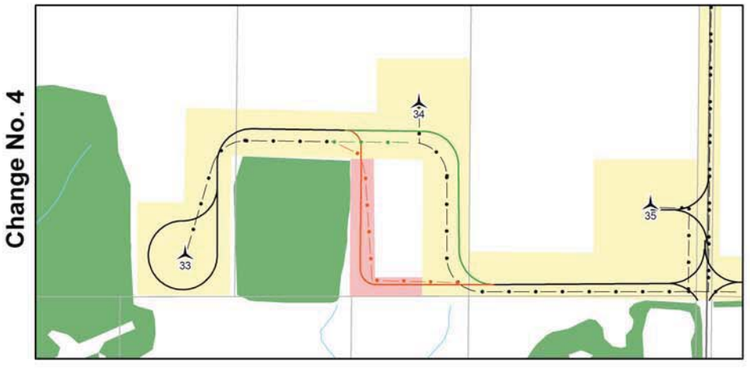
Change No. 2



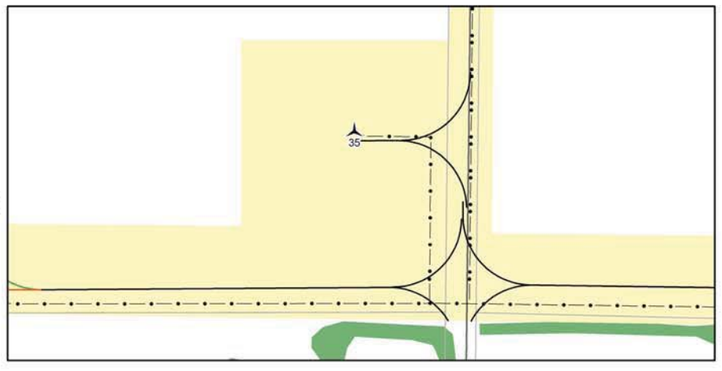
Change No. 3



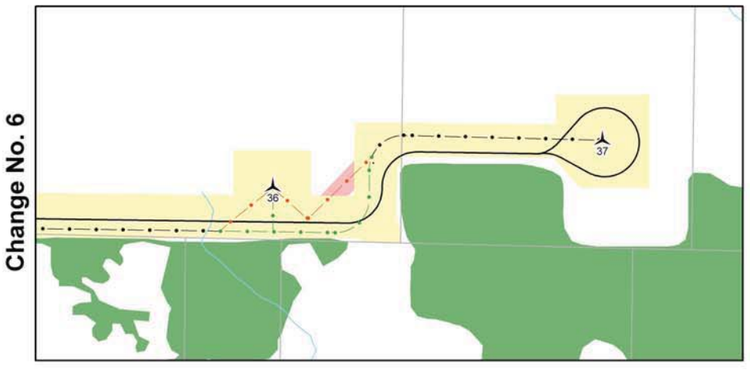
Change No. 4



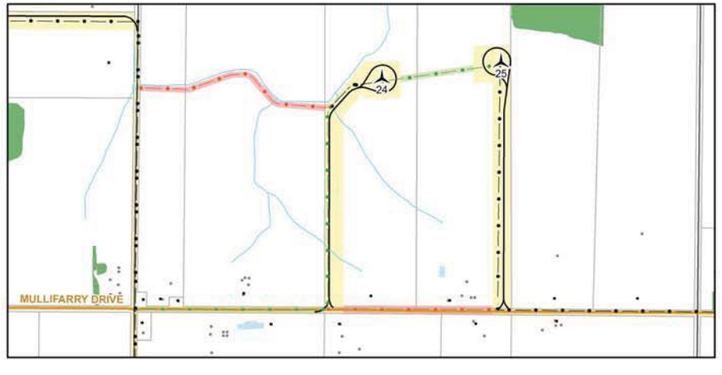
Change No. 5



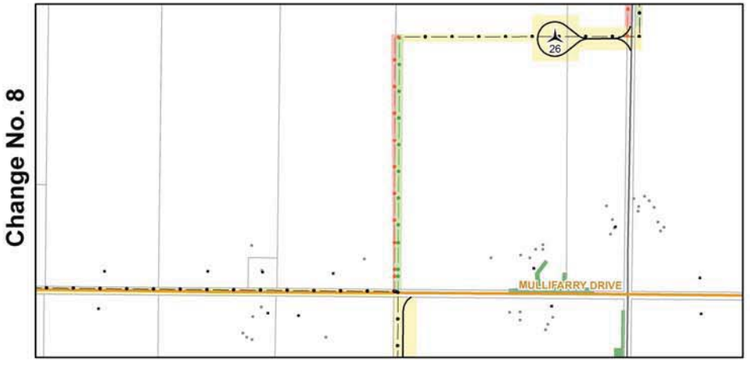
Change No. 6



Change No. 7



Change No. 8



Legend

Infrastructure Changes

Service Road
- Added
- Removed
- No Change

Collection System
- Added
- Removed
- No Change

Transmission Line
- **Added**
- **Removed**
- **No Change**

Disturbance Area
- Added
- Removed
- No Change

Project Components
- Wind Turbine (48) (November 16, 2011)
- Meteorological Tower
- Project Area
- Laydown Area
- Substation

Other Components
- Receptor
- Other Building
- Railway
- Freeway
- Arterial Road
- Local Road / Street
- Permanent Watercourse
- Intermittent Watercourse
- Residential Area
- Waterbody
- Wetland
- Wooded Area
- Lot Line

NOTES:

CHANGE NO. 1
Establishement of new meteorological tower and infrastructure

CHANGE NO. 2
Removed access to previously proposed turbine

CHANGE NO. 3
Road network connecting turbines 13, 14 and 15

CHANGE NO. 4
Direct link between turbines 33 and 34

CHANGE NO. 5
Turbine 35 moved 5 m West

CHANGE NO. 6
Collection re-routed along perimiter of lot

CHANGE NO. 7
Collection re-routed in two locations

CHANGE NO. 8
Collection system moved from public ROW to private property

NEXTera ENERGY

Adelaide Wind Energy Centre

INFRASTRUCTURE CHANGE MAP
Page 3 of 4

GL Garrad Hassan

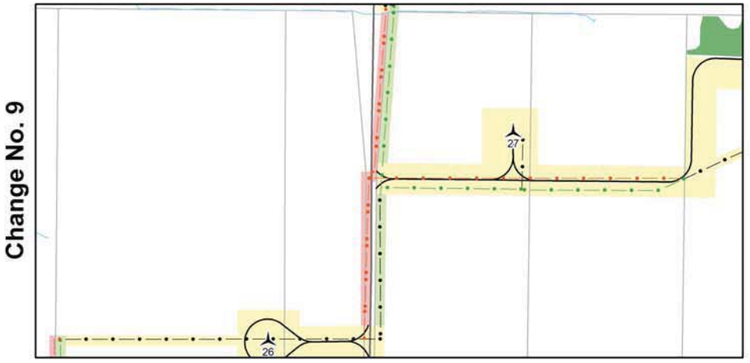
1008-038-160412.001.IRG
CAN_Bornish_Optimized_72_5MW_Hybrid_GEx1.5_100RD_80HH_44T_2Alts_GEx1.5_100RD_80HH_1T_20111116

July 04, 2012

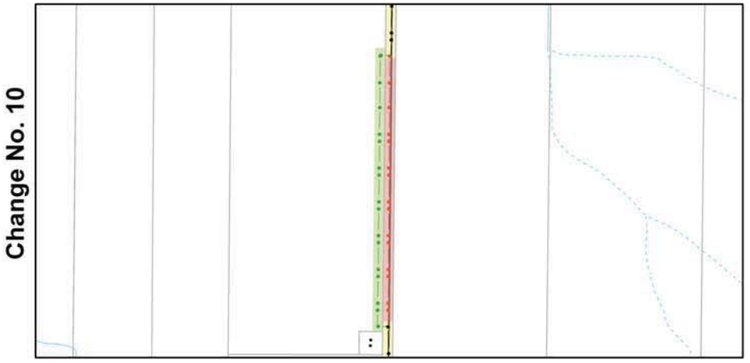
Projection: UTM Zone 17, NAD83

Sources: Ontario Base Mapping, Ontario Road Network, Land Information Ontario, Geobase, CanVec, Industry Canada.

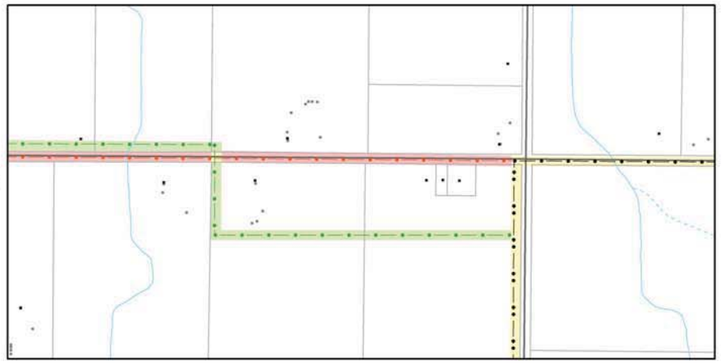
Change No. 9



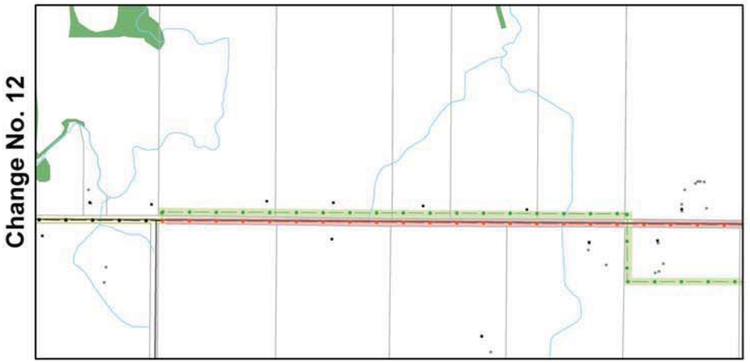
Change No. 10



Change No. 11



Change No. 12



Change No. 13

Change No. 14

Change No. 15

Legend

Infrastructure Changes

Service Road
- Added
- Removed
- No Change

Collection System
- Added
- Removed
- No Change

Transmission Line
- **Added**
- **Removed**
- **No Change**

Disturbance Area
- Added
- Removed
- No Change

Project Components
- Wind Turbine (48) (November 16, 2011)
- Meteorological Tower
- Project Area
- Laydown Area
- Substation

Other Components
- Receptor
- Other Building
- Railway
- Freeway
- Arterial Road
- Local Road / Street
- Permanent Watercourse
- Intermittent Watercourse
- Residential Area
- Waterbody
- Wetland
- Wooded Area
- Lot Line

NOTES:

CHANGE NO. 9
Collection system moved from public ROW to private property

CHANGE NO. 10
Collection system moved from public ROW to private property

CHANGE NO. 11
Collection system moved from public ROW to private property

CHANGE NO. 12
Collection system moved from public ROW to private property

CHANGE NO. 13
Turbine 2 moved 62 m East

CHANGE NO. 14
T-Line moved 50 m onto private easement

CHANGE NO. 15
Relocation of Parkhill Substation

NEXTera ENERGY

Adelaide Wind Energy Centre

INFRASTRUCTURE CHANGE MAP
Page 4 of 4

GL Garrad Hassan

1008-038-160412.001.RG
CAN_Bornish_Optimized_72_5MW_Hybrid_GEx1.5_100RD_80HH_44T_2Alts_GEx1.5_100RD_80HH_1T_20111116

July 04, 2012

Projection: UTM Zone 17, NAD83

Sources: Ontario Base Mapping, Ontario Road Network, Land Information Ontario, Geobase, CanVec, Industry Canada.