Illinois Department of
Natural Resources
One Natural Resources Way Springfield, Illinois 62702-1271
http://dnr.state.il.us

Pat Quinn, Governor
Marc Miller, Director

April 4, 2012

Mr. Stuart Richter, Zoning Officer
Whiteside County Development
200 E. Knox St.
Morrison, IL 61270

RE: **Green River Wind LLC, Whiteside County**
Endangered Species Consultation Program
EcoCAT Database Review #1111192

Dear Mr. Richter:

The Department has received this project for consultation, pursuant to the *Illinois Endangered Species Protection Act* [520 ILCS 10/11], the *Illinois Natural Areas Preservation Act* [525 ILCS 30/17], and Title 17 *Illinois Administrative Code* Part 1075.

Mainstream Power USA/Green River Wind proposes a commercial wind energy generation project in southeastern Whiteside County, comprising approximately 9 wind turbines and a substation. Collection power lines will be located underground, and each turbine will be served by an access road. Soils in the project area consist largely of sandy and friable loamy soils, most of which are tilled. Some remain in pasture or open woodlands, while a few acres have been restored to native prairie vegetation. The project area is drained by the Green River and its tributaries.

It is the biological opinion of the Department the proposed action is likely to adversely modify the essential habitat of the state-listed **Ornate Box Turtle**, **Plains Hognose Snake**, and **Regal Fritillary Butterfly**, and may adversely modify habitat for the state-listed **Blanding's Turtle**, **Yellow Mud Turtle**, **Loggerhead Shrike**, **Short-eared Owl**, and **Northern Harrier**. The project may also adversely modify habitats within the **Sand Prairie State Habitat Area**, an IDNR-owned and managed site in Lee County listed on the Illinois Natural Areas Inventory (INAI) and may adversely modify the **Foley Sand Prairie Nature Preserve** in Lee County.

The Department recommends the applicant seek an Incidental Take Authorization from the Department for the Ornate Box Turtle, the Plains Hognose Snake, and the Regal Fritillary. The Department's opinions are further explained below, with more detailed recommendations to the County where applicable.

Ornate Box Turtle, *Terrapene ornata ornata*. The Ornate Box Turtle was listed by Illinois as threatened in October 2009. Many populations have been adversely affected by habitat conversion for agriculture and over-collection for the pet trade. Because of their commercial value, poaching may be a serious problem in some areas.

This species has been reported within the last decade from sites within the evaluated footprint in Whiteside County. Extant populations remain in adjacent Lee County. Being a small (<six inches) terrestrial turtle which spends significant time underground, this animal can easily escape notice.

People may be more familiar with the closely-related Eastern Box Turtle, *Terrapene carolina*. The Eastern Box Turtle prefers more wooded habitats and its shell markings are quite different; reference to photographs makes identification easy.

Recent experiments with radio-tagged Ornate Box Turtles in Illinois have shown that, even where the species is abundant and active on the surface, the probability of human searchers finding even one specimen during a survey is less than 3%; numerous unsuccessful surveys would be needed to confidently and reliably conclude suitable habitat is unoccupied by this species. (Using specially-trained "turtle dogs" increases detection success by more than 300%, but many turtles remain undetected.)

Significant acreages of suitable soils and fragmented habitat exist within the Whiteside County footprint of this project. Although Mainstream has carefully analyzed the locations of available primary habitat, no on-the-ground surveys for this species were attempted. The Ornate Box turtle has been reported from near the proposed substation location in Section 24.

A number of life history characteristics increase the vulnerability of this species to disturbances during both construction and operation of a wind farm.

From late September through mid-April, the Ornate Box Turtle hibernates (more properly, as a reptile, it brumates) in burrows as deep as three feet underground. Such burrows are far from obvious to humans, so that for more than six months of the year this species is not subject to observation. Construction activities in occupied habitat during this period run the risk of killing or injuring turtles during excavation of power line routes and turbine foundations, or of sealing such burrows when constructing access roads. The only practical means of avoiding such outcomes is to perform such activities during the turtle's active periods.

However, this species continues to spend significant portions of each day underground, either in burrows or shallow excavations near the surface called "forms." (During their first two or three years, hatchlings spend virtually all of their time underground.) Thus, even during the "active" portion of the Turtle's annual cycle, excavation activities in occupied habitat run a high risk of injuring or killing unobserved animals.

Moreover, this species demonstrates extremely high fidelity to brumation sites, often returning to within a yard of where it spent the winter the prior year. If a brumation site is located where a

turbine foundation or access road is installed, it is unclear how a turtle will respond. There is always the chance that an alternate brumation site will not assure survival through the winter.

It has been suggested that Turtles can simply be moved out of the way. In the first place, such handling constitutes a "take" which requires a permit from the Department. But two other factors work against such a method. (1) Home ranges for this species are very small, consisting of only a few acres, though home ranges often overlap, and (2) this species is highly philopatric, meaning it has an extremely strong attachment to its home range, and will return to it if removed, or die trying. Thus, moving a Turtle "out of harm's way" may result in removing the animal from its home range, exposing it to various threats during its efforts to return. If its return is successful, it will be in harm's way again, perhaps repeatedly.

Because this species finds movement through dense vegetation difficult, it prefers areas where vegetation is sparse or absent. Roads satisfy this desire for easy movement (as do tilled fields), and also provide basking areas where temperatures may rise more quickly in the morning or during cooler weather. Most of the Department's observation records for this species are adjacent to roads or are recorded as road-kills. Further, a study of nesting radio-tagged females on an Illinois federal Wildlife Refuge found that 50% of selected nest sites were directly adjacent to the single road which crossed the study area; this is clearly not a random result. Therefore, increased levels of traffic associated with construction and the construction of thousands of feet of new roads pose a significant threat of losses to any existing population. Several of the planned turbines and their access roads appear to be planned for locations within or adjacent to suitable habitat for this species, especially in Sections 24 and 25.

The operation of wind turbines near occupied habitat may constitute an on-going "take" of this species in terms of harassment or interference with normal activities.

Shadow-flicker may pose a serious long-term threat. Theoretically, at dawn or sunset over flat ground, shadows may be cast more than a mile. After accounting for diffusion and diffraction through the atmosphere under varying conditions, meaningful shadows may extend over half a mile, but the intensity of shadow needed to produce an effect on wildlife is unknown. But, it can be seen that shadows will impact a very large fraction of the ground in the vicinity of turbines for much of any given day. Shadows at the extremes may last for mere minutes, while other areas closer to the machines are affected for hours at a time. If turbines are spaced together closely enough along roughly the same latitude, the same ground may be affected in both the morning and the evening by shadows cast by different turbines. (At this latitude, the area affected by shadows at some time of the year is shaped something like a bow-tie; there is never a shadow on a significant area centered due-south of a turbine.)

The Ornate Box Turtle's daily pattern consists of an early morning emergence, followed by basking to raise its body temperature. When a body temperature suitable for activity is achieved, it forages across its range for several hours, feeding on worms, insects, and small mammals, until temperatures become too high, when it seeks shelter beneath vegetation, in a burrow, or in a "form." It remains inactive until late afternoon or early evening, when temperatures allow a second foraging period. The Ornate Box Turtle retreats to a burrow before darkness falls, with the exception of females during nesting periods (late May and June), when eggs are laid at night.

Shadow flicker may seriously interfere with basking and foraging. Among this species' predators are crows and hawks, and it has been established this species is sensitive to movement within its range of vision, which causes it to "freeze" and adopt a surveillance posture called "standing rest." Shadow flicker may mimic the movement of both aerial and terrestrial predators which stimulate the "standing rest" response, though this has not been investigated with respect to wind turbines. If this does occur, it would constitute a prohibited taking (harassment) within the meaning of the law. Coupled with the fact that entire home ranges, being small, may be subject to shadow flicker, Turtles may be stressed and underfed, leading to breeding failures and decreased survival. Most of the turbines proposed for Whiteside County will cast shadows on known or suitable Ornate Box Turtle habitat.

Turbine-generated noise is usually considered in the context of human impacts, but it does have the potential to interfere with animal communication and survival. Sound wave intensity decreases according to an inverse square law, so that at twice the distance it has one-fourth the intensity. Going the other way, at half the distance it is four times louder. A common benchmark for wind turbines is a sound level equivalent to normal conversation at 1,000 feet.

A circle with a 1,000-foot radius encompasses covers about 72 acres, throughout which turbine noise is likely to equal or exceed normal conversation. The overlapping home ranges of dozens of Ornate Box Turtles could be contained within an area of this size. The Ornate Box Turtle's mating ritual includes exchanges of sounds variously described as "vigorous aspirations" or "sibilant grunts" which may contain infra-sonic or ultra-sonic components not audible to humans. Turbine noise may be sufficient to mask these communications, whose importance to the mating ritual is not well-understood. Thus, turbine noise has the potential to decrease reproductive success. About half of the proposed turbine sites may be within audible range of suitable Ornate Box Turtle habitat.

Turbine noise may also be sufficient to mask the approach of predators, though the range of such an effect is unknown, and may vary among turbine models. Predators include coyotes, badgers, skunks, raccoons, opossums, and other mammals (as well as the also-state-listed Plains Hognose Snake, an egg-predator). The Ornate Box Turtle is most vulnerable when younger: it cannot close its shell completely until about four years old, and the shell does not completely harden until about ten years of age. Losses to predation decrease greatly with advancing age and experience. Turbine noise may render predator detection and evasion more difficult, decreasing survival.

Turbine vibrations may pose another risk factor. Many reptiles are very sensitive to vibrations transmitted through the ground, as are earthworms and other soil organisms on which Turtles feed. Vibrations may affect the supply of prey and impose additional stress, but if animals become habituated to them, they may remain oblivious to threats they would otherwise detect through this means. It might be possible that vibrations (produced by the wind even when turbines are not operating) might interfere with their winter brumation, which could increase the main cause of natural mortality for this species.

Underground collection power lines may affect Ornate Box Turtles through thermal radiation. All electrical conductors provide resistance to current, which in turn produces heat. In the air, heat is easily dissipated but, underground, heat can only be transferred to surrounding soils, which will increase the temperature of those soils above normal, though the number of degrees and the distance from the conductor these effects may extend will vary with soil characteristics.

The gender of Ornate Box Turtle hatchlings is determined by the temperature in the nest. While the exact temperature of sexual differentiation in this species has not been determined, it is known that eggs incubated at 84°F will produce 100% females. Nests are typically placed at depths no greater than 10-14 inches, but the Department has no data on the degree of heating produced in underground collection cables, which are normally placed at depths of about four feet, and so is unable to fully evaluate potential impacts to populations from this cause.

The second way underground power lines may affect this species is during brumation. Turtles must lower their metabolism to levels which will allow them to survive the winter based on their reserves of fat, and their metabolic rate is determined by body temperature. As noted, Turtles return to nearly the exact spot used the prior year for brumation. Power lines through or beneath such locations could prevent Turtles from achieving the body temperature needed for survival.

The potential adverse effects of shadow-flicker, noise, vibration, and thermal radiation on the Ornate Box Turtle have not been reported at this point in time, but the Department is unaware of any effort by biologists or others to investigate the significance of such factors for this species. Such effects are plausible and should be considered by developers and government officials.

The developer has suggested a 100-foot setback from suitable habitat on leased parcels for construction activities in order to protect Ornate Box Turtles which may be present. But the Department is unaware of any biological or ecological basis supporting a 100-foot setback for construction activities. There is no evidence suggesting the Ornate Box Turtle does not make forays extending beyond 100 feet from areas humans may perceive to be "suitable habitat," and, as described above, important adverse effects from shadows, noise, and vibration may extend far beyond areas directly disturbed by construction.

Recommendation #1: The County should consider a requirement for the developer to obtain an Incidental Take Authorization from the Department for the Ornate Box Turtle.

The following recommendations will be most important if an Incidental Take Authorization is not obtained; any requirements imposed should allow pre-emption by an IDNR permit addressing the issue.

Recommendation #2: The County should consider a requirement that all contractors and employees working on the project should be trained to recognize the Ornate Box Turtle, to understand its significance to the project and the public, and be instructed how to respond to an observation or encounter with this species.

Recommendation #3: The County should consider a requirement for a pre-construction survey for the Ornate Box Turtle in suitable habitat within 0.6 miles of proposed turbine locations,

performed using suitably-trained dogs, during May and June when this species is most active on the surface. No disturbance related to the project should be allowed in any habitat demonstrated to be occupied by the Ornate Box Turtle unless an Incidental Take Authorization has been obtained from the IDNR.

Recommendation #4: The County should consider a requirement, if Ornate Box Turtles are found within the project footprint, for the developer to conduct radio-telemetry studies (after securing the required permits from IDNR) of their movements and responses to turbines, collection power lines, and access roads with the goal of determining and reporting the degree of any adverse effects plausibly caused by construction and operation of the wind farm.

Recommendation #5: Where the Ornate Box Turtle is determined to be present, the County should consider a requirement for the developer to establish and fund a predator control program to reduce predation of nests and turtles, a similar program to combat poaching of the Ornate Box Turtle, and an incentives program for private land owners to promote conservation of this species.

Recommendation #6: If the Ornate Box Turtle is determined to be present, the County should consider posting signs along public roads within the project footprint alerting motorists to the risk of killing or injuring this species. If and when this species is documented crossing a public road, a "Turtle Crossing" sign should be considered 200 hundred feet on either side of the crossing point.

Recommendation #7: The County should consider a requirement for a periodic assessment of Ornate Box Turtle populations, at least once per decade, with a report to County officials and the IDNR of apparent population trends and possible explanations for the results.

Plains Hognose Snake, *Heterodon nasicus nasicus*. Formerly known as the Western Hognose Snake, this stout-bellied snake is also an inhabitant of sand prairies and similar ecosystems, and is often found in the same areas as the Ornate Box Turtle, of which it is a natural enemy (as a predator of turtle eggs), although its primary prey consists of toads, lizards, ground-nesting birds, other snakes, and small mammals.

It can be easily confused with its close relative, the **Eastern Hognose Snake**, *Heterodon platirhinos*, and the ranges of the two species often overlap, though the Eastern Hognose is more often found in wooded areas than the Plains Hognose which, as its name implies, prefers more open habitats. Both species can be found in and near the project footprint. They are most reliably distinguished by the coloration of the underside of the tail: that of the Eastern Hognose is always much lighter than the rest of the belly, while that of the Plains Hognose is the same as the rest of the belly.

The name "Hognose" is descriptive of the upturned scales on the snake's snout. Unlike many snakes these species can burrow in loose soils due to these specialized scales. Though they can actively hunt, they often bury themselves with only their eyes exposed and lie in wait to ambush prey. Like the Ornate Box Turtle, this species spends much of its time underground for purposes

of thermo-regulation and is therefore difficult to observe. Many Department records are road-kills.

The Hognose snakes are also famous for their defensive behavior. A threatened snake will flatten its body, hiss, feign strikes, and defecate. If the aggressor is not deterred, the snake will roll onto its back and pretend to be dead; if placed back on its belly, it will roll over again and repeat the display.

Because of its docile nature, this non-venomous snake is popular in the pet trade, and many populations have suffered from over-collecting. Poaching and persecution continue to be serious problems. These are aggravated by losses of habitat to tilled agriculture.

The Hognose has many natural enemies: other snakes, hawks and owls, and mammals such as coyotes, foxes, raccoons, skunks, and opossums. An egg-layer, its shallow nests are vulnerable to predation; neonates are about six inches long, but adults seldom reach 30 inches. Females cannot reproduce until their second year. Home ranges tend to be small, consisting of just a few acres, but individual territories are not exclusive and a few acres may hold a number of snakes.

The Plains Hognose Snake may be vulnerable to many of the same characteristics of wind farms as the Ornate Box Turtle. Unfortunately, where both wind turbines and Hognose Snakes are common, as in Texas, it appears nobody has investigated interactions between this technology and this animal.

Obviously, construction can destroy and fragment habitat, and risks killing the snake by crushing it with vehicles or through active persecution or collection by construction workers. Shadow-flicker, as discussed previously, may interfere with basking and feeding through stimulating predator-evasion responses. While prey-detection may be primarily by sight or scent, ground vibrations from turbines might interfere with successful detection and feeding. Thermal radiation effects from underground collection power lines may interfere with brumation, but are less likely to affect reproduction, since the nests of the Hognose are much closer to the surface than those of the Ornate Box Turtle.

The Plains Hognose Snake is as cryptic and as difficult to detect as the Ornate Box Turtle, so that "visual encounter surveys" are an unreliable technique for assessing the presence or absence of this species, or the size of a population. Nor is the occasional road-kill a good barometer of numbers. As with the Ornate Box Turtle, trained dogs are likely to have a higher detection success rate.

The Plains Hognose Snake has been reported from Section 24 and other areas adjacent to the project footprint in Whiteside County, and populations are known to exist within the project footprint in Lee County. In the Department's opinion, there is a strong possibility this species is also present in remaining fragmented habitats in southeastern Whiteside County.

Recommendation #8: The County should consider a requirement for the developer to obtain an Incidental Take Authorization from the Department for the Plains Hognose Snake.

The following recommendations will be most important if an Incidental Take Authorization is not obtained; any requirements imposed should allow pre-emption by an IDNR permit addressing the issue.

Recommendation #9: The County should consider a requirement that all contractors and employees working on the project should be trained to recognize the Plains Hognose Snake, to understand its significance to the project and the public, and be instructed how to respond to an observation or encounter with this species.

Recommendation #10: The County should consider a requirement for a pre-construction survey for the Plains Hognose Snake in suitable habitat within 0.6 miles of proposed turbine locations, performed using suitably-trained dogs, during May and June. No disturbance related to the project should be allowed in any habitat demonstrated to be occupied by the Plains Hognose Snake unless an Incidental Take Authorization has been obtained from the IDNR.

Recommendation #11: The County should consider a requirement, if Plains Hognose Snakes are found within the project footprint, for the developer to conduct radio-telemetry studies (after securing the required permits from IDNR) of their movements and responses to turbines, collection power lines, and access roads with the goal of determining and reporting the degree of any adverse effects plausibly caused by construction and operation of the wind farm.

Recommendation #12: Where the Plains Hognose Snake is determined to be present, the County should consider a requirement for the developer to establish and fund a predator control program to reduce predation of nests and snakes, a similar program to combat poaching of the Plains Hognose Snake, and an incentives program for private land owners to promote conservation of this species.

Recommendation #13: If the Plains Hognose Snake is determined to be present, the County should consider posting signs along public roads within the project footprint alerting motorists to the risk of killing or injuring this species. If and when this species is documented crossing a public road, a "Snake Crossing" sign should be considered 200 hundred feet on either side of the crossing point.

Recommendation #14: The County should consider a requirement for a periodic assessment of Plains Hognose Snake populations, at least once per decade, with a report to County officials and the IDNR of apparent population trends and possible explanations for the results.

Regal Fritillary Butterfly, *Speyeria idalia*. This grassland butterfly has an unusual life cycle and specific relationships with particular plants. Recent records have been established in several locations in Whiteside County (at Wahl/Garman Prairie in Section 24, and also in Section 26), in Lee County (at both Foley Sand Prairie and Ryan Sand Prairie, within and adjacent to the project footprint there), and in Bureau County (at McCune Sand Prairie, about eight miles southwest of the project footprint).

People tend to think of butterflies in their adult life-stage, when they are most noticeable and recognizable but, where this species reproduces, it is present all year long. However, eggs and

larvae (caterpillars) are considerably harder to spot. The literature on this species often mentions a specific host-relationship with the **Bird's-foot Violet**, *Viola pedata*, but the caterpillars have been documented feeding on at least eight species of Violets, so the presence or absence of Bird's-foot Violet is not a reliable indicator. Moreover, only violets growing in the context of prairie vegetation will support reproduction of this species, even if they are not a preferred variety.

Adult Regals are strong fliers and have been documented more than 20 miles from their reproductive sites. Females are prolific--but indiscriminate--egg-layers, producing up to 10,000 eggs each, one or a few at a time, but with no discrimination on which plants eggs are placed or in what context those plants occur. Eggs hatch in the fall, and the new larvae fall to the ground, where they overwinter in vegetative litter. In the spring, the larvae must quickly find a suitable violet in order to feed, or perish.

The species is dimorphic, with the sexes being distinguishable by wing markings. Males emerge from metamorphosis first, in about mid-June, with females emerging about two weeks later. Only 10-15 days are available for mating, however, before the males die. Females must then survive until mid-September, when egg-laying begins. Adults survive on nectar and must have access to flowering plants to do so. Hence, prairie remnants depauperate in flowering forbs between June and October offer poor habitat and can force adults to wander.

Although this species has been observed at heights approaching 100 feet, it generally flies much lower, so that wind turbine collision is not a major threat. Fires ("controlled" or otherwise), predation, and vehicle collisions cause much mortality, as do "collectors" unaware of the status of this rare and beautiful insect. Eggs and larvae can also be devoured by mice and voles; they may be crushed by livestock, vehicle tires, and even foot-traffic; and, like any butterfly, they are vulnerable to vehicle collisions along roads, where many nectaring plants are allowed to remain.

The Department is aware of no studies addressing the responses of insects like the Regal Fritillary to shadow-flicker, but this could be a factor with some effect.

Mainstream Power assessed potential habitat for this species in the project area and concluded the species is most likely to be encountered on state-owned properties which receive natural-area management. The Department does not disagree with this assessment, but is aware that some privately-owned parcels with populations exist in Whiteside County. However, it is always possible adults may be encountered far afield from the point of origin, and they are capable of establishing new reproductive sites in favorable habitat. Fairly extensive areas of potentially suitable habitat are present in and adjacent to the project footprint in Whiteside County.

Recommendation #15: The County should consider a requirement for the developer to obtain an Incidental Take Authorization from the Department for the Regal Fritillary Butterfly.

The following recommendations will be most important if an Incidental Take Authorization is not obtained; any requirements imposed should allow pre-emption by an IDNR permit addressing the issue.

Recommendation #16: The County should consider a requirement that all contractors and employees working on the project should be trained to recognize the Regal Fritillary Butterfly, both as a caterpillar and as an adult; to understand its significance to the project and the public; and be instructed how to respond to an observation or encounter with this species.

Recommendation #17: The County should consider a requirement that all sightings of possible or actual Regal Fritillaries be reported to the County and to IDNR.

Recommendation #18: Where the Regal Fritillary is present, during the construction phase project vehicles should reduce speed to minimize the risks of taking butterflies through collision, or find alternate routes posing less risk.

Recommendation #19: The County should consider a requirement to scientifically investigate whether the Regal Fritillary exhibits any response to flicker shadows.

Recommendation #20: The County should consider a requirement to mitigate for any reported losses of this animal or its documented habitat to the wind farm by contributing to the restoration and maintenance of suitable habitat nearby.

Yellow Mud Turtle, *Kinosternon flavescens*. Once known as the Illinois Mud Turtle, this extremely rare reptile is limited to only a few localities in the state, typically sand prairies within reach of temporary or permanent wetlands, ponds, and small lakes. Its habits are unlike those of any other turtle in Illinois.

The Yellow Mud Turtle spends nearly all of its life underground in upland burrows, emerging for only a few weeks in late spring (usually May) to travel to nearby waters, where it feeds, mates, and basks, before returning to its home range in late June. It is subject to observation only during this short period of time. Populations are generally isolated and quite small; the loss of even a few adults, particularly sexually-reproductive females, may be sufficient to doom a population to eventual extirpation. Nest predation, as with other turtles, is a major impediment to population recruitment.

Wind farm construction activities outside the breeding period risk "taking" this animal through crushing and excavation, whether for turbine foundations, road bases, or power line installation. Road kill has been a major source of mortality where a road lies between home ranges and breeding habitat. Similar activities during the breeding season risk altering or destroying the home range habitats of individual turtles and of erecting barriers to its movements between ponds and uplands.

Underground, the species (or its prey) may be sensitive to vibrations, while in the water phase shadow-flicker may interfere with basking (a key reproductive activity) and feeding, reducing both fitness and reproductive success.

A population of this species may still exist at the Sand Prairie State Habitat Area, near the northeast corner of County Line and Hahnaman Road. However, no Yellow Mud Turtles have been observed at this site since 1989. Prior to that date a number of this species were killed

crossing Tampico Road, suggesting home territories south of the road. Our records indicate no sustained efforts to observe this species or other turtles at the site since 2000.

Much suitable upland habitat is present throughout the project footprint in Whiteside County, but much of it may not be close enough (one-quarter mile) to a suitable water body to support reproduction. The northwest corner of Section 24, near the proposed substation, is an exception.

Recommendation #21: The County should consider a requirement to trap water bodies in Section 24 (after securing land owner permission and the appropriate permits from IDNR) in an effort to determine whether the Yellow Mud Turtle is present in these ponds in May/June. If so, the County should consider a requirement for the developer to obtain an Incidental Take Authorization from the Department for the Yellow Mud Turtle.

Recommendation #22: The County should consider a requirement that all contractors and employees working on the project should be trained to recognize the Yellow Mud Turtle, to understand its significance to the project and the public, and be instructed how to respond to an observation or encounter with this species.

Recommendation #23: The County should consider a requirement, if any Yellow Mud Turtles are found, to use radio-telemetry in an effort to locate their home territories.

Recommendation #24: The County should consider a requirement that no turbines or other infrastructure supporting the wind energy project may be located in the home territories of this species, while facilities interposed between home territories and breeding ponds should pose no barriers to movement. Traffic in those areas should be restricted from May 1 until July 15.

Recommendation #25: If Yellow Mud Turtles are present, the County should consider a requirement to establish a vibrational baseline in home territories and perform post-construction monitoring of vibration levels in the home territories to determine any potential response by the Turtles.

Blanding's Turtle, *Emydoidea blandingii*. The life habits of the Blanding's Turtle are nearly the reverse of those of the Yellow Mud Turtle. Classified as semi-aquatic, this species spends most of its time (including brumation) in water bodies and wetlands (including sedge meadows), but often moves from one habitat area to another over significant distances (using streams, ditches, and other waterways to facilitate movement), and lays its eggs a greater distance from water than any other Illinois turtle species. It also demonstrates strong fidelity to nesting sites. Consequently, road-kill is a major source of population losses. The species also commands a premium in the pet trade, so that poaching also contributes to population losses.

In 2000, a population of this species with healthy sex ratios (two female for each male) and a good age distribution was present in ponds of the Sand Prairie State Habitat Area east of County Line Road. Similar habitat, which may not have been surveyed for this species, exists in the northwest quarter of Section 24, Hahnaman Township.

The Blanding's Turtle emerges from brumation in April, when males begin to seek out females. Basking out of the water is a major requirement to ripen eggs before they are laid, but this species is notoriously skittish and difficult to approach without prompting a return to the water. Frequently-interrupted basking can delay the nesting date (normally in June), which in turn can delay hatching (normally in August) until late in the year. Late hatchlings sometimes over-winter in the nest before emerging and seeking the nearest water. Nest predation by mammals is highly successful and is a major barrier to recruitment—fewer than one in a hundred hatchlings reach sexual maturity.

Nesting has occurred on roadside shoulders, soil stockpiles, and in agricultural fields, as well as grasslands.

Construction activities threaten this species with road-kill, excavation or destruction of traditional nesting areas, and the entrapment of turtles in open excavations, as well as the creation of barriers to movement. The species is noted for taking the shortest route to its destination; when encountering an obstacle, a turtle will move to the end of the barrier then resume its line of march. Adults of this species cannot scale an obstacle more than six inches high.

Among operational effects, shadow-flicker and visual motion may have the greater potential for harm to this species. This animal's skittishness may preclude basking at any time the wetland or water body is subject to flicker. The degree to which any site occupied by this turtle will receive flicker will depend on the siting of each individual turbine relative to the turtle habitat; flicker outside the May/June period may be immaterial to reproductive success. At Ryan Sand Prairie INAI Site in Lee County, the Department granted an Incidental Take Authorization for the Blanding's Turtle, but flicker was not considered in that case, and the half-mile setback there proved insufficient in that flicker does affect the primary habitats in the INAI Site. However, the Department has lacked the resources to determine whether flicker is indeed detrimental to this species.

Unlike shadow-flicker, the visible motion of turbine blades is independent of sun angle. The ranges at which rotor movements may disturb this species are unknown.

Turbine noise/vibrations may have some effect in aquatic habitats. A potential impact is interference with brumation, but if such vibrations do not preclude the use of the habitat at other times, it is unlikely to interfere with brumation.

Recommendation #26: The County should consider a requirement to trap water bodies in Section 24 (after securing land owner permission and the appropriate permits from IDNR) in an effort to determine whether the Blanding's Turtle is present in these ponds in May/June. The County should consider a requirement for the developer to obtain an Incidental Take Authorization from the Department for the Blanding's Turtle.

Recommendation #27: The County should consider a requirement that all contractors and employees working on the project should be trained to recognize the Blanding's Turtle, to

understand its significance to the project and the public, and be instructed how to respond to an observation or encounter with this species.

Recommendation #28: The County should consider a requirement, if Blanding's Turtles are found near or within the project footprint, for the developer to conduct radio-telemetry studies (after securing the required permits from IDNR) of their movements and responses to turbines, collection power lines, and access roads with the goal of determining and reporting the degree of any adverse effects plausibly caused by construction and operation of the wind farm.

Recommendation #29: The County should consider a requirement for a shadow-flicker modeling exercise for any turbine in proximity to suitable Blanding's Turtle habitat to determine the dates and times when flicker may affect Turtle behavior during key periods of its life cycle. Under this proposal, only the two northernmost turbines may have this potential.

Recommendation #30: Where the Blanding's Turtle is determined to be present, the County should consider a requirement for the developer to establish and fund a predator control program to reduce predation of nests and turtles, a similar program to combat poaching of the Blanding's Turtle, and an incentives program for private land owners to promote conservation of this species.

Recommendation #31: If the Blanding's Turtle is determined to be present, the County should consider posting signs along public roads within the project footprint alerting motorists to the risk of killing or injuring this species. If and when this species is documented crossing a public road, a "Turtle Crossing" sign should be considered 200 hundred feet on either side of the crossing point.

Recommendation #32: The County should consider a requirement for a periodic assessment of Blanding's Turtle populations, at least once per decade, with a report to County officials and the IDNR of apparent population trends and possible explanations for the results.

Indiana Bat, *Myotis sodalis*, and other Bats. As demonstrated by fatalities of Indiana Bats at an Indiana wind farm in 2009 and 2010, and a Pennsylvania wind farm in 2011, this federally-listed species is vulnerable to collision with utility-scale wind turbines, especially during migration. It appears all species of bats occurring in Illinois are vulnerable to wind turbine collision.

The US Fish & Wildlife Service considers all of Illinois to lie within the historic range of the Indiana Bat. However, not all counties have records of Indiana Bats within the last thirty years. Until 2011, Bureau County had no records for this species. There are currently no records of the Indiana Bat in Whiteside or Lee Counties.

The Blackball Mine, near LaSalle-Peru, provides a winter hibernation site for the Indiana Bat, and it is the only "critical habitat" designated by the Fish & Wildlife Service for this species in Illinois. In April 2011, the Department conducted a telemetry study to follow the migratory flights of gravid female Indiana Bats as they emerged from hibernation in the Blackball Mine. The majority of bats entered the forests along the Illinois River and, after foraging for a few

hours or days, moved downstream along the River in the direction of Peoria. A number of these bats selected maternity roost trees in Bureau County, in close association with the Illinois River and its tributary creeks, streams, and backwaters. However, none were tracked up the Hennepin Canal and all remained in eastern Bureau County, approximately 20 miles southeast of the project area.

Mainstream Power commissioned a thorough study of bats using the project area, employing both acoustic monitoring and mist-netting. No Indiana Bats were captured.

Consequently, it is the opinion of the Department the proposed project is unlikely to adversely affect the essential habitat of the Indiana Bat, and is unlikely to lie on a migration route for this species.

Acoustic monitoring and mist-netting are useful in identifying the entire local bat community which may be affected by a wind farm. Bats still considered common in Illinois have proven highly-susceptible to White-Nose Syndrome, a "new" disease currently devastating bat populations in more eastern states, and confirmed in Missouri this month. The Fish & Wildlife Service is now evaluating petitions to list the **Little Brown Bat** (*Myotis lucifugus*) and the **Northern Long-eared Bat** (*Myotis septentrionalis*). The **Big Brown Bat** (*Eptesicus fuscus*) and the **Tricolor Bat** (*Perimyotis subflavus*) are also susceptible. All four are present within and adjacent to the project footprint. Those planning wind turbines should anticipate that one or more of these additional bat species may become listed in Illinois within the useful lifespan of the wind turbines.

The average mortality of bats at Illinois wind turbines averages about four bats per turbine per year, but some facilities have reported much higher levels of 16 bats per turbine per year, and even 30 bats per turbine per year. Because of the uncertainties facing bat populations in Illinois, it would be prudent to conduct at least one year of post-construction monitoring of bat mortality to be better prepared to address future regulatory actions.

Recommendation #33: The County should consider a requirement the developer conduct at least one season of post-construction monitoring to assess or quantify the levels of bat mortality within the project area.

Bald Eagle, *Haliaeetus leucocephalus*, and Golden Eagle, *Aquila chrysaetos*. Though no longer listed as endangered or threatened, eagles are still specifically protected by the federal *Bald and Golden Eagle Protection Act*.

Illinois is experiencing a strongly-resurgent Bald Eagle population. The nearest known nests are on the Hennepin Canal near Tiskilwa and along the Rock River. These locations are well-beyond the expected foraging ranges of this species, although migrating Bald Eagles can be occasionally seen in the area. (A mature adult was observed during the spring bird survey.) But many new nests are observed every year, some in unexpected areas. The Green River may offer habitat in some locations. In any case, the Bald Eagle is not particularly vulnerable to wind turbine collisions; these are extremely rare, even where Bald Eagles are numerous. However, if

Bald Eagles are frequently observed in the vicinity, it would be prudent for the developer to consult the Fish & Wildlife Service.

The Golden Eagle, however, is very vulnerable to wind turbine collisions. While this species is not currently known to breed in Illinois, winter brings northern populations southward. It is not uncommon for this species to be observed along the Rock River, and a famous instance of an observed attempted predation of an adult white-tailed deer occurred at Nachusa Grassland two years ago. This winter, Golden Eagles have been reported along the Mississippi River as far south as St. Louis. Golden Eagle populations are also expanding, which may lead to further enlargement of its winter range. Any observation of a Golden Eagle in the vicinity of the project should be cause for concern, and consultation with the Fish & Wildlife Service is recommended.

Northern Harrier, *Circus cyaneus*. The Northern Harrier (also called the Marsh Hawk) is a migratory grassland bird. Nearly all pre-construction bird surveys for Illinois wind farms have reported this species in spring and fall migrations but, to date, the Harrier is almost universally absent from post-construction surveys.

Evidence continues to accrue that this species, more than others, actively avoids the vicinity of wind turbines. This not only renders otherwise suitable breeding and hunting habitat within a wind farm untenable; it may create a "barrier effect" when wind farms are spaced closely together, so that migratory patterns are disrupted.

In this case, the Green River Wind Farm will fall in the middle of a nearly-unbroken line of existing and proposed wind farms stretching more than 100 miles from DeKalb to Alexis in Mercer County. While the erection of such a barrier is not the sole responsibility of any single developer or county government, all should be aware of their contributions to a regional adverse impact to this endangered species.

Recommendation #34: The County should consider a requirement for post-construction migratory bird surveys, with a special emphasis on the presence or absence of the Northern Harrier.

Loggerhead Shrike, *Lanius ludovicianus*, and Short-Eared Owl, *Asio flammeus*. Both of these listed species have been reported as breeding within the Sand Prairie State Habitat Area, and in the larger project area within the last decade. Similar habitat is present in many areas within the Whiteside County portion of the project footprint. Neither species was observed during Mainstream's breeding bird survey effort.

The Shrike nests in shrubs and small trees in open woodlots near open grasslands. It feeds primarily on large insects, like grass-hoppers and cicadas, and small rodents, such as mice and voles. Sometimes called the Butcher Bird, it often impales its prey on large thorns or twigs for several days, which aids in its dismemberment. Originally listed as "threatened," its continued decline resulted in a new status of "endangered" in 2009. Shifting agricultural practices which have eliminated many fencerows and windbreaks have been detrimental.

The Shrike is not known to be particularly vulnerable to turbine collisions, though some have been reported in western states. There is a greater potential for inadvertent nest destruction if trees are removed to improve transportation access or to reduce wind turbulence. Shadow-flicker could also be a factor of concern. If suitable habitat is present, there is always a chance a breeding pair will take up residence. Habitat need not be in a large block; railroads and roadsides sometimes are sufficient for breeding or wintering success, and nesting attempts at human homesteads have been reported.

The Short-Eared Owl is a prairie ground nester. Though primarily nocturnal, it often becomes active several hours before sunset. Small rodents are its primary prey, although snakes and other animals are sometimes taken. This species has nested successfully at Sand Prairie State Habitat Area in Lee County. This species does migrate, but with an adequate prey base, can over-winter in the same habitat; owls observed in the winter are usually not the same owls as those present in the summer.

While it does have natural enemies, vehicle collision is a major source of mortality, since most flights are seldom higher than ten feet above ground and roadside habitats may provide the best local hunting areas.

The Short-Eared Owl hunts as much by sound as by sight, so that turbine noise may hamper feeding forays, while shadow-flicker may be stressful. These factors may also alter or affect prey abundance. A recent study from New Mexico found that mice were present in higher numbers in noisy areas, but avian predators were absent, apparently due to an inability to locate their prey due to anthropogenic noise. The Department is not aware of any research investigating the response of the Short-Eared Owl to wind turbines.

Recommendation #35: The County should consider a requirement that all contractors and employees working on the project should be trained to recognize the Loggerhead Shrike and Short-Eared Owl, to understand their significance to the project and the public, and be instructed how to respond to an observation or encounter with these species.

Recommendation #36: The County should consider a requirement that all sightings of Shrikes and Short-Eared Owls be reported to the County and to IDNR.

Migratory Birds. A mortality study at a Bureau County wind farm in 2007 tallied about 2 dead migratory birds per turbine per year. A similar study in McLean County found an average of six birds per turbine per year. Other mortality studies completed in Illinois produced results consistent with these numbers. Moreover, losses are spread across a large number of species, so that no one species suffers disproportionately. Waterfowl tend to be struck less often than other types of birds. A few species, such as the Northern Harrier and the American Golden Plover, have demonstrated an aversion to habitat occupied by wind turbines. Most stricken birds are night migrants moving during overcast conditions.

The use of aviation warning lights on tall structures has been long-recognized as a factor in the deaths of birds. Both color and steadiness are factors; the research favors intermittent red lights as producing the fewest bird deaths. This has been punctuated by recent events at wind farms in

Appalachia: in once instance, technicians left on a white light inside the nacelle of a turbine, resulting in the mass collision deaths of more than 50 birds; in another case, outside lights were inadvertently left on at a wind farm substation, resulting in the mass death of several hundred migrants through collision with the power lines.

"No lights" is the preferred condition for wildlife. Recently, the FAA has approved several Audio-Visual Warning Systems (AVWS) for wind farm use. Radar units at the wind farm perimeter track nearby aircraft, and switch on the lights only when an aircraft appears to be on a collision course with the wind turbines, and also broadcast a radio warning to pilots. When the danger has passed, the lights are switched off. Such a system will not only further reduce bird losses to turbine collision, but will also preserve "dark sky" values for nearby natural areas, wildlife areas, and State Parks.

Recommendation #37: The County may wish to consider a requirement to install an Audio-Visual Warning System to reduce the frequency and duration of night-time wind farm lighting.

Foley Sand Prairie Nature Preserve and Illinois Natural Areas Inventory (INAI) Site. This small IDNR-owned dedicated Nature Preserve is located in Lee County, just east of County Line Road, opposite the southeast corner of Section 12, Hahnaman Township. It is documented to support the Yellow Mud Turtle, the Blanding's Turtle, and the Regal Fritillary Butterfly. It likely also supports the Ornate Box Turtle and Plains Hognose Snake.

No Mainstream wind turbines proposed for Whiteside County are in a position to cast flicker-shadows on Foley Nature Preserve. (The Illinois Nature Preserve Commission regards any degree or duration of flicker as an adverse modification of a Preserve, unless it can be shown otherwise.)

While turbines of the Big Sky wind project, 7.5 miles-distant, are likely already visible from Foley Sand Prairie, they likely do not degrade the Preserve's existing value for visualizing pre-settlement conditions. Mainstream turbines proposed for Whiteside County will be far closer, to the south, at about one and a quarter miles, and thus more obtrusive on the consciousness of visitors to the Preserve. Given the heights of modern turbines, little can be done to mitigate visual intrusion which would not also be more ecologically harmful to the Preserve, such as with the planting of a visual vegetative screen which, while blocking the view, would also likely alter the water budget within the Preserve.

Intermittent aviation warning lights on nearby turbines will illuminate the Preserve at night, especially under overcast skies. While this will not affect humans, it may adversely affect nocturnal wildlife within the Preserve.

Though doubtless well-within Illinois Pollution Control Board standards for noise pollution, turbines may still be audible to humans within the Preserve at 1.25 miles. [The Department also notes IPCB standards were developed to protect the human environment, not that of wildlife.] While the Preserve is no stranger to road noise, a condition which existed prior to dedication of the Preserve, turbine noise is persistent, rather than intermittent, and of different quality. If

audible, turbine noise will intrude on the consciousness of the human visitor. Whether such noise will be sufficient to alter or affect wildlife within the Preserve is unknown at this time.

The Department notes that, while adverse effects to endangered or threatened species within Foley Nature Preserve may appear to be addressed by seeking an Incidental Take Authorization under the *Illinois Endangered Species Protection Act*, such an Authorization cannot include alteration of habitat within a dedicated Illinois Nature Preserve, wherein all species are equally protected and may be disturbed only for purposes of scientific research or Preserve management having the purpose of protecting natural values.

The Department also notes that turbines may be proposed for Lee County locations which would have far greater potential for adverse modification of the Foley Nature Preserve than those proposed for Whiteside County. The Department will address those issues with Lee County in due course, but the prospect of action by Lee County should not influence decisions by Whiteside County.

Both the Department of Natural Resources and the Illinois Nature Preserves Commission have a duty to prevent, to the extent possible, the adverse modification of environmental conditions within a dedicated Nature Preserve. It is also the mandated policy of all state agencies and units of local government to evaluate the potential for adverse effects and "if the proposed action is found likely to have an adverse impact on a natural area, the agency shall study the proposed action to determine possible methods of eliminating or mitigating the adverse impact. Before implementing any action, the agency shall attempt to mitigate or eliminate any adverse impacts in a manner consistent with the planned action." [525 ILCS 30/17.]

Recommendation #37: The County should consider relocation of the northernmost turbine to reduce the potential for turbine noise to adversely modify environmental conditions within Foley Nature Preserve.

Recommendation #38: The County should consider a requirement to deploy an FAA-approved Audio-Visual Warning System to minimize nocturnal illumination of Foley Nature Preserve.

Sand Prairie State Habitat Area (SHA) and INAI Site. This 315-acre IDNR-owned and –managed property is located in Lee County, across County Line Road from the Southeast Quarter of Section 13 of Hahnaman Township. Some 260 acres of this property is listed on the Illinois Natural Areas Inventory because they provide essential habitat for seven state-listed endangered or threatened species: the Yellow Mud Turtle, the Blanding's Turtle, the Plains Hognose Snake, the Regal Fritillary Butterfly, the Loggerhead Shrike, the Short-Eared Owl, and the Starhead Topminnow. (It is likely the Site also provides essential habitat for the Ornate Box Turtle, though this species has not been documented there.) The vulnerability of each of these species to potential adverse effects from wind turbines has been discussed previously, while the territories of many individual protected animals extend beyond the boundaries of the state property.

As an IDNR property, the Site enjoys some legal protection under the *State Parks Act* but it does not enjoy the level of protection accorded to Foley Nature Preserve. No part of the Sand Prairie

State Habitat Area is currently dedicated as a Nature Preserve or registered as a Land & Water Reserve pursuant to the *Illinois Natural Areas Preservation Act*.

Mainstream Green River proposes two wind turbines in the east half of Section 24 of Hahnaman Township. The nearer location is about 1,400 feet from the SHA, while the farther one is about 3,200 feet.

Both turbines, as well as those beyond them, will be easily visible from within the SHA, although topographical relief within the SHA may provide some locations where turbines will not be visible. At just over one-quarter mile, the nearer turbine will appear to be quite close.

The nearer turbine will be positioned so that shadow flicker may fall on portions of the SHA in late fall and early winter in the evenings; a flicker model would establish the location and duration of shadows from this machine within the SHA. Because the SHA provides important wintering habitat for many species of wildlife which may respond negatively to flicker, this fact is important. Even if the SHA is included in the "action area" of an Incidental Take Authorization for the state-listed species, the Department prefers that flicker on its properties be minimized to the extent feasible. This can be accomplished through alternate siting of a turbine or through shutting down the turbine during periods when shadows would fall on state property.

Standard FAA aviation warning lights will intermittently illuminate portions of the SHA, especially under overcast skies. Nocturnal wildlife will be affected; some receiving benefits, others harm.

The nearer turbine will be audible to humans within the SHA, and it is likely the farther turbine will also be audible within the SHA. Machines audible to humans are likely to be audible to sensitive wildlife. In addition, the proposed electrical substation is located near the center of Section 24. This installation may also be responsible for noise audible to wildlife within the SHA, although of a different quality and character.

Nearly all discussions of wind-turbine-related noise focus on human sensitivities, while nearly all studies of turbine effects to wildlife fail to differentiate which characteristics of wind turbines may be responsible for observed behaviors. The Department is aware of no research studies which specifically address turbine noise impacts or substation noise impacts to wildlife although, as mentioned earlier, some recent studies of the effects of anthropogenic noise have been done, with intriguing results. Anthropogenic noise within the SHA may benefit some species of plants and animals yet adversely affect others; it is unlikely to be uniformly beneficial or detrimental, while the degree of effect remains unpredictable. The preferred condition is no additional noise.

The best method to decrease sound impacts is to increase the distance between the source and the recipients. But even turbines as far as a mile away may still register some measureable effect within the SHA.

Recommendation #39: The County should consider denial of turbine locations in Section 24 to protect all wildlife within the State Habitat Area from noise impacts.

Recommendation #40: The County should consider whether it is feasible to locate the substation a greater distance from the SHA.

Recommendation #41: The County should consider a requirement to deploy an FAA-approved Audio-Visual Warning System to minimize nocturnal illumination of Sand Prairie State Habitat Area.

Recommendation #42: If currently-proposed locations for the substation and wind turbines are approved, the County should consider a requirement to measure sound impacts to the SHA using methods which identify A-weighted, B-weighted, and C-weighted decibel levels and the octaves in which the strongest frequencies occur. Such data can then be related to wildlife auditory capabilities and sensitivities.

Recommendation #43: If currently proposed turbine locations are approved, the County should consider a requirement for a flicker model study to determine the dates, times, and durations of flicker impacts to the SHA.

Recommendation 44: If a flicker model study indicates flicker impacts to the SHA, the County should consider a requirement to inactivate and lock the responsible turbines for those periods where flicker would occur within the SHA.

Other Landscape Features. No dedicated Illinois Nature Preserves, registered Land & Water Reserves, designated Illinois Natural Areas Inventory Sites, or IDNR-owned or IDNR-managed properties currently exist within the Whiteside County footprint of this project. However, the Department has for several years been engaged in a statewide update of the Illinois Natural Areas Inventory. Areas in Section 24 and Section 26 of Hahnaman Township have been identified as eligible for listing because they provide essential habitat to State-listed species. However, the update process has not been completed and these areas are not currently listed on the INAI.

Turbines in the Whiteside County footprint will be visible from two other IDNR-owned properties: the **Hennepin Canal** in Whiteside County (4.5 miles), and the **Green River State Fish & Wildlife Area** in Lee County (5.3 miles).

Consultation on the part of the Department is terminated, unless Whiteside County desires additional information or advice related to this proposal. In accordance with 17 Ill. Adm. Code 1075.40(h), the County must notify the Department of its decision regarding these recommendations, whether it will:

- Proceed with the action as originally proposed;
- Require the action to be modified per Department recommendations (please specify which measures if not all will be required); or
- Forgo the action.

This consultation is valid for two years unless new information becomes available which was not previously considered; the proposed action is modified; or additional species, essential habitats,

or Natural Areas are identified in the vicinity. If the project has not been implemented within two years of the date of this letter, or any of the above listed conditions develop, a new consultation is necessary.

The natural resource review reflects the information existing in the Illinois Natural Heritage Database at the time of the project submittal, and should not be regarded as a final statement on the site being considered, nor should it be a substitute for detailed site surveys or field surveys required for environmental assessments. If additional protected resources are encountered during the project's implementation, the applicant must comply with the applicable statutes and regulations. Also, note that termination does not imply IDNR's authorization or endorsement of the proposed action. Please contact me if you have questions regarding this review.

Sincerely,

Keith M. Shank
Impact Assessment Section
Division of Ecosystems and Environment
keith.shank@illinois.gov
(217) 785-5500

cc: Jenny Skufca, Illinois Nature Preserves Commission
John Martin, Mainstream Power USA