METHANE BURNER IMPACTS ON RAPTORS

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1.0 DESCRIPTION OF PROBLEM

Many industries use burners to flare off unwanted gases (Photo 1). For example, solid waste landfills may burn off unwanted methane gas produced by decomposing organic matter. Likewise, oil producers may burn off "stranded" gas that cannot be integrated into gas pipeline networks.

Image: Joey Mason

Photo 1. Methane burner (candle) with an invisible flame.

Methane is typically burned away using either a flare-up (candle) or an enclosed flare. Flares can burn intermittently or continually, depending on the amount of gas produced. Some intermittent flares are automated to turn on when gas reaches a certain level in the system. Others may be ignited by a switch that produces a spark at short intervals as the gas passively seeps out of the structure. Either system produces a nearly invisible flame of up to 1,700 degrees Fahrenheit (Wentley 2005). Visible flares (e.g., those yellow in color or producing smoke) have contaminants such as hydrogen sulfide. In most cases, these contaminants are filtered or “scrubbed” out before the gas reaches the burner, resulting in a nearly invisible flame.

Burners located in favorable habitat can be problematic to birds. Birds perched on, or flying near, a stack can be seriously injured or killed when a flare suddenly

ignites. In some cases, birds may fly over or even through an almost invisible burner flame. If a bird survives such an encounter, its burned feathers may render it unable to fly. In such situations, the bird is likely to die from starvation, infection, exposure, or predation (Moller 2009, Siftar 2008).

Habitat is an important factor in such incidents. For example, landfill burners may be located on expansive, elevated open areas supporting abundant rodents and small birds (a prey base) (Photo 2). During the winter, these areas may be the first to thaw due to latent (underlying) heat produced by the anaerobic bacteria that produces the methane, thus exposing prey and becoming attractive to raptors. Stacks located in such areas can range in height from 15 to 60 feet or more in height, providing a desirable location for raptors seeking elevated structures for perching and hunting (Moller 2009, Ryan and Young 2009). Risk is not restricted to such areas, as elevated perches in forested areas and/or developed locations also can be attractive to foraging raptors.

Image: Joey Mason

Photo 2. Example of landfill burner habitat.

2.0 SCOPE

There are no national statistics on birds injured or killed from methane burners and it is difficult to assess the scope of the problem for the following reasons:

1. Many burners are inaccessible. They occur in fenced-in, remote locations, making detection difficult.
2. Vegetation around burners may make detection of dead birds difficult.
3. Carcasses may be removed by scavenging animals.
4. Birds may be crippled and fly or walk away seeking shelter, thus avoiding detection.
5. Due to a lack of awareness of the problem, some rehabilitators may not recognize the injuries as resulting from methane burners (instead confusing the symptoms with power line injuries).
6. At closed landfills, personnel are on site only occasionally (e.g., to inspect burners monthly), therefore, dead or injured raptors may not be discovered.

Although it is unclear how widespread the problem is, birds have been reported or suspected to have been killed or injured from methane burners in Alberta, Canada and the following states:

- California
- Florida
- Massachusetts
- Oklahoma
- Texas
- Colorado
- Illinois
- Michigan
- Pennsylvania
- Wisconsin
- Delaware
- Iowa
- New York
- Rhode Island

Species known to be injured or killed by methane burners include the Red-tailed Hawk, Great Horned Owl, Red-shouldered Hawk, American Kestrel, Turkey Vulture, Osprey, and crows, as well as numerous songbirds (Moller 2009, Ryan and Young 2009, Siftar 2008, Save our American Raptors, Inc. [SOAR] 2011). At one Wisconsin rehabilitation facility, most birds suspected of sustaining injuries from methane burners were juvenile Red-tailed Hawks and owls (Moller 2009).

Presently there is an effort to gather gaps in these data and Keeping Company with Kestrels Inc. is online at www.keepingcompanywithkestrels.org with a burner survey link. This survey has been sent to rehabilitators, falconers, and raptor banders with the goal of collecting data, documenting numbers affected, and raising awareness.

3.0 CAUSE OF INJURY OR DEATH

Birds often perch on stacks and other manmade objects such as power poles. Birds may die at these locations of a variety of causes. Careful inspection is necessary to identify the cause of death.

3.1 Precautions

Proper protective gear should be worn before inspecting any carcass. Investigators should be aware that laws protect most birds. The Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA) not only prohibit the killing of these species, but also prohibit any person from taking possession of a dead bird, any bird part, nests, or eggs without the appropriate permit. Before beginning investigations, therefore, it is important to obtain and comply with the proper state and federal permits.

Investigators also must be aware that many diseases that can be transmitted by contact with wildlife; therefore, gloves or an inverted plastic bag should be used to handle wildlife remains.

3.2 Investigation

Both fired vessels and power lines can cause burns. Electrical burns are often internal and external, whereas fired vessel burns are external. When birds are discovered, some may not recognize the injuries as consistent with fired vessel damage and may confuse the symptoms with electric power line shocks or electrocutions.

When a bird either contacts two differentially energized wires, or touches one energized wire and a ground, it may become shocked with resulting burns. When this occurs, there is typically an entrance wound (Photo 3) and an exit wound (Photo 4) following the path of electricity through the body. If the contact results in death, it is termed an electrocution.

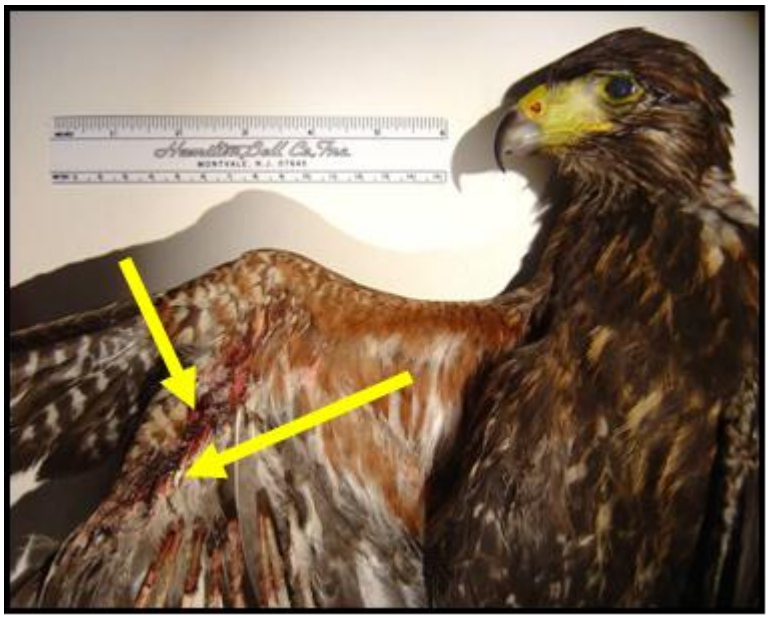

Image: James Dwyer

Photo 3. Raptor burned by a power line (entrance wound).

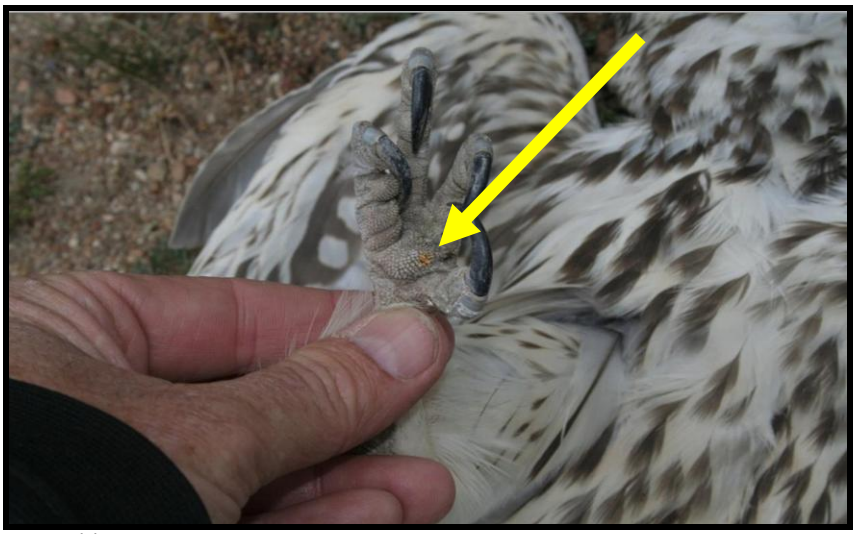

Image: Rick Harness

Photo 4. Raptor burned by a power line (exit wound).

Sometimes electrical burns are subtle and their internal effects do not show up for several days. Birds with shock injuries often do not survive due to traumatic internal injuries. In other cases, the damage is extensive with limbs blown free of the body. Carcasses are typically located near the base of the utility pole and there may be signs of charring on the bird (Photo 5) and electrical equipment.

Image: Rick Harness

Photo 5. Golden eagle electrocution with significant burns.

Foot Injuries: Foot injuries are common for both types of encounters. Birds perching on stacks may sustain foot injuries (e.g., burned toes) when gas is ignited (Photo 6). Burns to the feet of electrocuted/shocked birds are particularly common, and are due to current passing through birds to or from the object the bird is standing on. Toes frequently show burns or exit wounds (Photos 7 and 8) or may be clenched tightly. A major difference between stack burns and electrical burns is that birds that have contacted power lines typically have both an entrance wound and an exit wound.

Image: Rocky Mountain Raptor Program

Photo 6. Swainson's Hawk burns due to a flared vessel.

Image: James Dwyer

Photo 7. Toe pad with electrical exit wound.

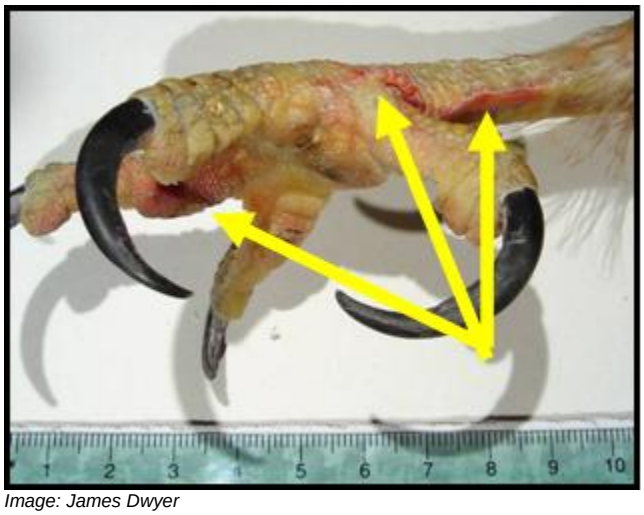

Image: James Dwyer

Photo 8. Multiple burns following electrical path.

Wing Injuries: Birds perching on stacks may have extensive wing burns (Photo 9). Although electrical contacts also can result in extensive burns (Photo 10), dry bird feathers are relatively good insulators and therefore electrical burns often follow a flesh-to-flesh pathway. “Pinhole” burns are common at the wrist of an electrocuted or shocked bird, but can occur anywhere on a bird where contact with energized equipment is made. Pinhole burns may be the only indicator of the cause of death, but are not always present (Photos 11 and 12). Careful examination of all feathers may yield burned feathers near a wound (Photos 11 and 12). Smell can sometimes be used to locate such burns.

Image: Rocky Mountain Raptor Program

Photo 9. Swainson’s Hawk wing burns due to a flared vessel.

Image: Joel Hurmence

Photo 10. Great Horned Owl wing burns due to an electrocution.

Image: James Dwyer

Photo 11. Subtle signs of an electrical entry wound.

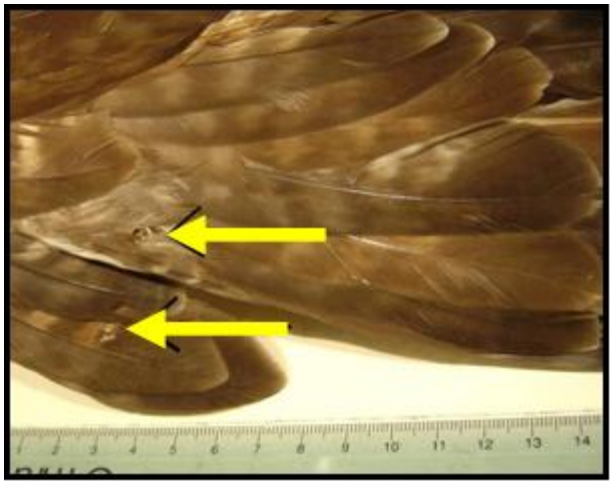

Image: James Dwyer

Photo 12. Subtle signs of an electrical entry wound.

Tail Injuries: Birds perching on stacks may have extensive tail burns (Photo 13). Electrical contacts also can result in extensive burns. Dry bird feathers are relatively good insulators against electricity and therefore such electrical burns also should have an electrical contact burn point (i.e., either an entry or exit wound).

Image: Rocky Mountain Raptor Program

Photo 13. Swainson's Hawk tail feather burns due to a flared vessel.

Birds that survive flare burns must wait until they molt before they can be released (Photos 14 and 15). During this time, they require rehabilitation to retain their flexibility and muscle strength.

Image: Rocky Mountain Raptor Program

Photo 14. Burned foot.

Image: Rocky Mountain Raptor Program

Photo 15. Burned beak.

4.0 SOLUTIONS

Further research is needed to accurately assess possible solutions to the problem. For example, there are numerous designs for fired vessels (Photo 16 through Photo 21) and it is not known if some burner types are more problematic than others. It also is not known if the problem is greater in certain geographical areas. However, certain measures can be used to reduce the potential hazard to birds from methane burners.

Image: Rick Harness

Photo 16. Large external stack burner.

Image: Rick Harness

Photo 17. Medium intermittent candlestick burner.

Image: Rick Harness

Photo 18. Multiple intermittent burners.

Image: Joey Mason

Photo 19. Enclosed burner.

Image: Joey Mason

Photo 20. Intermittent solar flare.

Image: Joey Mason

Photo 21. Intermittent solar flare.

For example, in one high-risk situation, a capped landfill may produce enough methane to require a large stack burner, but eventually decomposition slows, requiring a smaller burner (Photo 22). When a smaller burner is placed adjacent to a larger out-of-service burner, the larger burner could be either removed, or fitted with anti-perching devices to reduce the risk of birds flying over the active burner to light on the nearby out-of-service structure. To avoid another high-risk scenario, a burner should not be placed between two perching structures such as utility poles (Figure 1).

Image: Joey Mason

Photo 22. Out-of-service enclosed burner (left) replaced by operational candle (right).

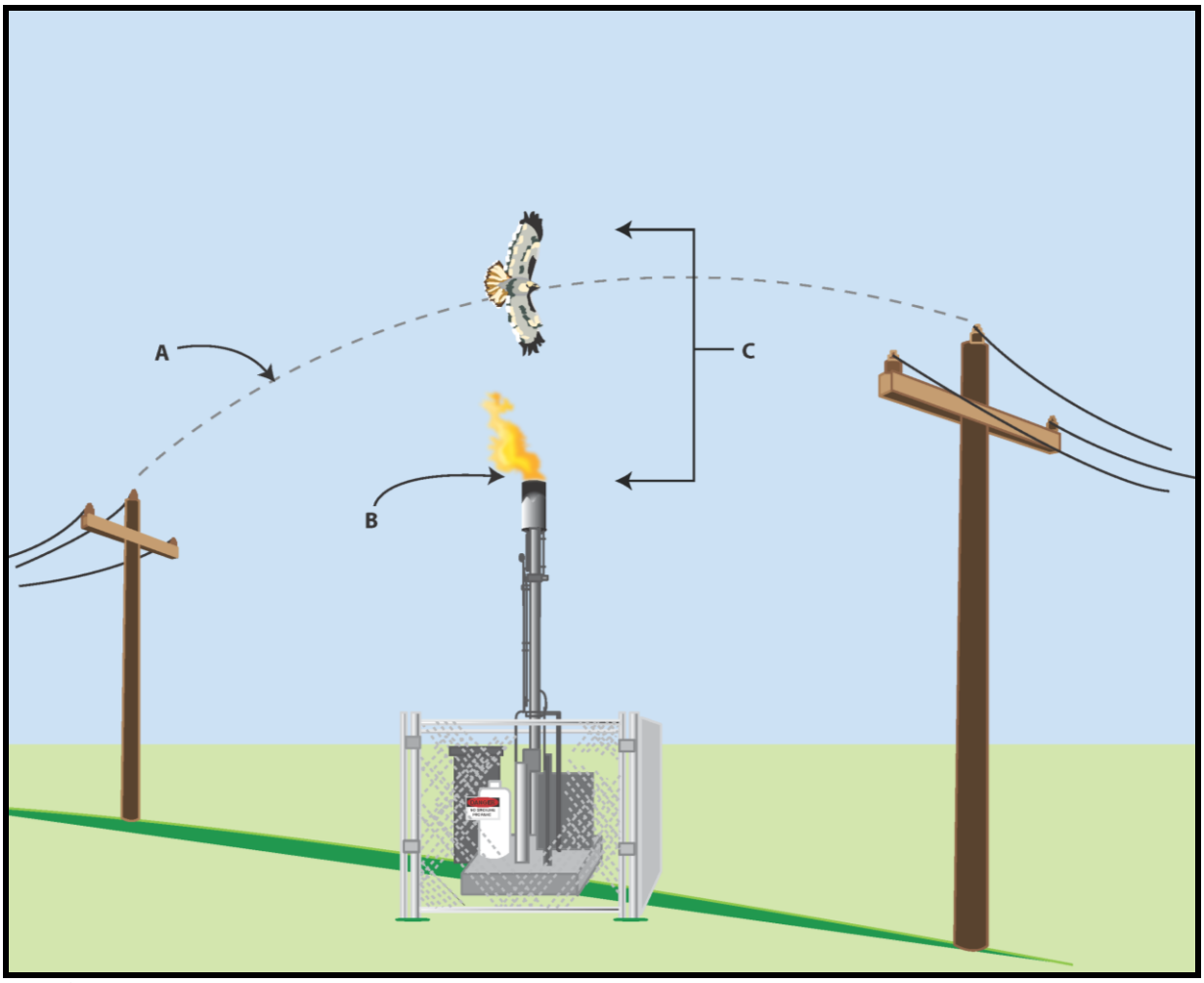

Image: S.E. Bowen

(A) Pole to pole flight path. (B) Flame origin (usually invisible). (C) Area of dangerous intense heat.

Figure 1. Improper placement of a burner relative to perching sites.

5.0 MITIGATION

A collar of spikes can be placed around the top burner rim to prevent raptors from perching on the stack (Photos 23 and 24) (Huntington-Oyster Bay Audubon Society and The Solid Waste Association of North America 2010, Moller 2009, Siftar 2008). Even simple spikes affixed to a burner pipe would make perching more difficult for larger birds. Such spikes require custom fitting and can be ordered from Power Lines Sentry, LLC at: www.powerlinesentry.com.

Image: Daniel Peters

Photo 23. Custom-fitted spike collar.

Image: Daniel Peters

Photo 24. Custom-fitted spike collar.

It is important to recognize that perch discouragers must be designed correctly to deter the correct bird species and withstand high temperatures. Perch discouragers have been used for decades by electric utility companies in an attempt to mitigate bird electrocutions. The utility industry has since shifted efforts towards insulating potential contact points because birds can defeat some designs (Avian Power Line Interaction Committee 2006) (Photo 25). Therefore it is essential the height and spacing of triangular spikes around the top circumference of the burner must not only deter large raptors, but small raptors like American Kestrels as well. The triangular spikes (Photo 23) must be tall enough (18 inches or more) so a raptor can't straddle the triangles to perch and be narrow enough between, so a smaller raptor can't squeeze in between to perch. Placing upright rods around the rim is not recommended since they may resemble reeds and smaller species can perch on or between them. It is not known whether Ospreys may attempt to nest on the crown-shaped discourager.

Image: Rick Harness

Photo 25. Rough-legged Hawk on perch discourager.

While there is cost involved in modifying burners, it is typically minor compared to overall budgets for maintaining (and later recovering) a landfill. It is also likely to be less than fines associated with violating the MBTA, which may be up to $15,000. Fines for eagles are significantly more, up to $200,000 for violating the BGEPA. In addition, the cost of rehabilitating burned raptors can be expensive, as the recovery time is often a year or more (Moller 2009, SOAR 2011). A bird of prey goes through the molting process (replacement of old feathers) only once a year.

Not all methane is disposed of using a flare-type burner system and solutions may include recapturing gases. There are closed-system burners and some larger landfills collect methane, purify it, and redistribute it as an energy source (Ryan and Young). At smaller landfills, however, it is not economically feasible to capture the methane for use as fuel.

5.1 Burner Installation

Methane burners may be installed in a way to minimize the risk to raptors. Some burner manufacturers suggest utility poles near burners should be no closer than four times the height of the burner (e.g., a 25-foot burner must be at least 100 feet from the nearest utility pole) (Shaw LFG Specialties 2008).

When placing burners, it also is important to consider burner alignment relative to other poles. Burners should not be placed between poles (i.e., raptors flying in a straight line from one pole to another should not pass over the flame).

5.2 Perch Management

Since many raptors use perches to hunt from and roost on, it may be preferable to remove selective perches near a burner. Although the proper distance has not been scientifically studied, installation of alternative perching poles near a burner is not recommended. In some areas, perching trees may be plentiful around landfills, so removal of potential perches near the burner might also be prudent. In other areas, there may be few trees or structures for perching. In such areas, installation of alternate perches might reduce the chance of raptors perching on the flare, as long as the perch is placed far enough away from the burner. A biologist with experience with raptors should be consulted before developing a perch management strategy.

A burner typically is surrounded by a fence. Landfills may be surrounded by a ‘paper fence’ to prevent trash from blowing outside the landfill area. This fencing usually consists of netting that may be as tall as a utility pole. Poles suspending this netting serve as perching opportunities and can be fitted with anti-perch devices, if needed. An example of the method one landfill used to discourage perching is shown in Photo 26. The rods at the top of the poles are set at an angle, making them less attractive perches for raptors.

Image: Joey Mason

Photo 26. Example of retrofitting nets to better contain blowing trash and keep large raptors from perching.

6.0 CONCLUSION

There are no national statistics on birds injured or killed from methane burners. However, some raptor rehabilitators routinely report such events and the purpose of this paper is to educate landfill managers, the gas burner industry, and consultants on methods to detect problems and how to deter birds from perching on burners. Solutions include thoughtful set up for new facilities, and implementing effective strategies to mitigate existing problems. Mitigating methane burns will be most successful if collaborate approaches are used utilizing expertise from industry engineers along with wildlife biologists familiar with raptor behavior.

7.0 ACKNOWLEDGEMENTS

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8.0 REFERENCES

AVIAN POWER LINE INTERACTION COMMITTEE. 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington D.C. and Sacramento, CA.

ARMSTRONG, J. 2011. Red-tailed Hawk flies again after recovering from burns. Edmonton Journal, August 10. Available online: http://www.globaltvedmonton.com/red-tailed+hawk+flies+again+after+recovering+from+burns/6442462020/story.html.

HUNTINGTON-OYSTER BAY AUDUBON SOCIETY AND THE SOLID WASTE ASSOCIATION OF NORTH AMERICA. 2010. Methane flare/raptor conflicts - a national problem. Presented at the Federation of New York Solid Waste Association's Spring Conference and Trade Show in Lake George, NY, May. Available online: http://www.nyfederation.org/pdf2010/49_millerSppt.pdf.

MOLLER, D. 2009. Burned while getting dinner - raptors hunting down a meal at landfills risk a hot, painful surprise. Wisconsin Natural Resources Magazine. Available online: http://dnr.wi.gov/wnrmag/2009/02/raptors.htm.

RYAN, S. AND K. YOUNG. 2009. Raptor injuries and deaths attributed to landfill methane burners. Presented at the Michigan Bird Conservation Initiative 3rd Annual Ornithological Congress in Petoskey, MI on April 5, 2009. Available online: http://www.docstoc.com/docs/74108597/INJURIES-AND-DEATHS-ATTRIBUTED-TO-LANDFILL-METHANE-BURNERS.

SIFTAR, G. 2008. Raptor burns from landfill methane burners. Tulsa Audubon Society. Available online: http://www.tulsaaudubon.org/raptor-burns.htm.

SAVE OUR AMERICAN RAPTORS, INC. (SOAR). 2011. SOAR Illinois website, accessed January 12: http://www.soar-inc.org/.

SHAW LFG SPECIALTIES. 2008. Landfill gas utility flare rental unity, 6" utility flare carburator assembly (drawing), April 14.

SOLID WASTE ASSOCIATION OF NORTH AMERICA (SWANA). 2009. Good news from the Solid Waste Association of North America! Available online: http://www.huntingtonaudubon.org/SaveOurRaptors/news_good_news_from_Solid_Waste_Assn.asp.

WENTLEY, S. 2005. Hawk burns wing, earns name after grazing methane gas flame. Sun-Sentinal, June 18. Available online: http://articles.sun-sentinel.com/2005-06-18/news/0506170783_1_methane-gas-hawk-burns-wing-landfill-workers.