SWANA 2013 Landfill Management Excellence Award Nomination

Frank R. Bowerman Landfill
Orange County, California
Executive Summary

OC Waste & Recycling’s mission is to provide waste management services, protect the environment, and promote recycling in order to ensure a safe and healthy community for current and future generations. As a result of a culture that fosters teamwork, accountability, and excellence, Bowerman Landfill maintains regulatory compliance while delivering cost effective waste disposal services to the over 3,000,000 residents of Orange County.

Bowerman Landfill has implemented recommendations contained in a 2011 landfill operations study to further reduce operating costs while increasing efficiency and safety. The landfill is respectful of the growing number of residents in the vicinity of the landfill, taking measures to reduce the impact of a landfill situated in an urban region. Habitat protection and restoration is a priority for the landfill, further reducing its impact in the community.

Bowerman Landfill employees are proud of the job they do operating a modern landfill.

1. General Information

Bowerman Landfill was opened in 1990 to meet the solid waste disposal needs of central Orange County, California. Located in southern California, Orange County is an urban area with over 3,000,000 residents, making it the second largest county in California and the fifth largest county in the nation in terms of population. Bowerman Landfill is the ninth largest landfill in America and the third largest landfill in California.

Situated in a canyon north of the City of Irvine, Bowerman Landfill is approximately 725 acres with 534 acres permitted for waste disposal. Bowerman Landfill is owned by the County of Orange and operated by the County’s OC Waste & Recycling department. The landfill is permitted to accept a
daily maximum of 8,500 tons. Bowerman Landfill accepted over 1,447,000 tons of waste in 2012, a daily average of 4,716 tons.

Operating within urban setting, Bowerman Landfill practices a “good neighbor” policy with its surrounding communities, implementing practices to reduce dust, noise, litter, odor, and traffic on city streets. Bowerman Landfill is a fully-compliant, modern landfill. The landfill has received just one regulatory violation over the past three years and makes every effort to maintain that excellent record. A household hazardous waste collection center is located near the landfill that accepts household hazardous waste free-of-charge to Orange County residents.

The employees of Bowerman Landfill are proud of their enterprise and the hard work they put in to keep their landfill operating safely and at high efficiency.

2. Siting, Design and Construction

The Bowerman Landfill was opened in 1990 to meet the growing solid waste disposal needs of central Orange County, California.

Located in a canyon north of the City of Irvine, Bowerman Landfill is approximately 725 acres with 534 acres permitted for waste disposal. Bowerman Landfill is owned by the County of Orange and operated by the County’s OC Waste & Recycling department.

In 1979 the Bowerman Landfill site was selected among 25 different potential landfill sites in Orange County as a new landfill to replace the Coyote Canyon Landfill. Site selection criteria included:

- Land Use
  - Compatibility with surrounding land use
  - Appraised value of property
  - View from surrounding areas

- Site Engineering
  - Availability and suitability of cover material
  - Hydrology
  - Ease and cost of site preparation
  - Proximity to utilities
• Environmental
  o Water quality protection
  o Wildlife habitat protection
  o Odor
  o Noise
  o Traffic circulation

• Access Road Design
  o Steepness of grade
  o Roadway width

• Location
  o Cost in time and fuel for landfill users
  o Air quality

The Bowerman Landfill site met all the siting criteria.

Sedimentary rocks consisting mostly of sandstone, conglomerate, siltstone, claystone, and shale make up the site geology. The primary surface water drainage system is comprised of drainage ditches and channels, various down-drain structures, and concrete lined desilting basins. Down drains are installed to divert runoff from the deck areas as well as to transport collected runoff from the drainage benches. V-shaped drainage channels are generally maintained along the benches to collect runoff from the slope areas. The final deck area is designed and will be constructed to a minimum slope of three percent to promote proper drainage and to reduce the impacts of future settlement at closure.

A Master Development Plan (MDP) was prepared for Bowerman Landfill in 1991. A large landslide (20 million cubic yards) occurred on Bowerman Landfill property in 2002 that would have decreased available airspace by 40 million cubic yards. In 2004, the 1991 MDP was revised to address landslide remediation and revised designs and operational requirements for the site. Through thoughtful remediation planning, additional airspace will be gained as this landslide is remediated.

Bowerman Landfill utilizes a canyon-fill, cut-and-cover method of solid waste disposal. Disposal areas are lined with compacted low-permeability soil and a 60-mil thick geomembrane liner. Twenty-four inches of a protective soil cover prevents punctures to the geomembrane liner from the first layer of trash buried. A subdrain system transports leachate out of the fill area to above-ground storage tanks for later use as dust control over lined portions of the landfill. A benefit of the Bowerman Landfill site is the absence of usable groundwater beneath the landfill property. Groundwater quality is monitored through 17 groundwater monitoring wells located up- and down-gradient along the perimeter of the landfill property.

Intermediate slopes are hydroseeded with native grasses to prevent erosion and mitigate visual impacts. Endangered native plant species are relocated to protected areas elsewhere on the landfill property. Additionally, Bowerman Landfill has a Habitat Management Program in place that dictates practices for habitat restoration and maintenance.

Throughout excavation operations, construction management and quality assurance are performed and the daily observations reported to the site’s project managers. Archeological and paleontological monitoring services are performed during excavations to identify and protect any cultural resources that may be unearthed during excavation.
Upon landfill closure both the County of Orange and the City of Irvine designate Bowerman Landfill for open space reserve/preservation. No plans to develop on the landfill property currently exist.

Following its opening in 1990, Bowerman Landfill received the following awards:

- 1990 – National Association of Counties, Achievement Award: Leading Edge of Landfill Technology
- 1991 – American Society of Civil Engineers, Project of the Year
- 1991 – Orange County Engineering Council, Engineering Project of the Year
- 1991 – SWANA, System Excellence Award
- 2007 – SWANA Landfill Management Excellence Award - Gold

### 3. Environmental Controls and Monitoring

The design for Bowerman Landfill includes a number of environmental protection and control elements in compliance with applicable local, state and federal regulations. These elements include compliance with surface and groundwater monitoring and protection requirements, and air and landfill gas monitoring and protection requirements. Bowerman Landfill’s environmental controls include:

#### Groundwater Protection Systems

Landfill regulations impose requirements to minimize the production of leachate by reducing the potential for infiltration. Infiltration reduction is accomplished by prohibiting disposal of liquid wastes in the landfill, effective drainage management which diverts surface water flows away from the landfill, placement of subdrain and leachate collection systems on the slope and bottom of the landfill, and placement of daily, intermediate and final cover.

All fill areas at Bowerman Landfill are lined in accordance with approved liner systems consisting of the following components:

The bottom area liner section consists of (from top to bottom):

- Minimum 24-inch thick protective soil cover layer
- Geotextile
- 12-inch thick drainage gravel layer for leachate collection
- Geotextile
- 60-mil or 80-mil HDPE geomembrane
- 24-inch thick compacted low-permeability \((1 \times 10^{-7} \text{ cm/sec})\) soil liner
- Subdrain system

The slope area liner section consists of (from top to bottom):

- 24-inch thick protective soil cover layer
- Geotextile
- 60-mil or 80-mil HDPE geomembrane
- 24-inch thick compacted low-permeability \((1 \times 10^{-7} \text{ cm/sec})\) soil liner
- Subdrain system
Intermediate cover is applied to areas that are anticipated to be inactive for six months or more. Intermediate cover consists of 12 inches of soil, graded to facilitate runoff drainage. Intermediate slopes are sometimes hydroyosed with native grasses to prevent erosion and for aesthetic appeal.

The leachate collection and removal system consists of a free draining sand or gravel layer and a network of leachate collection piping. The drainage layer consists of either granular coarse sand or pea gravel with permeability greater than $1 \times 10^{-2}$ cm/sec. The leachate piping system is composed of a dendritic system of HDPE, slotted pipes connected to trunk lines, which carry the leachate towards a collection sump at the toe of the landfill, where the leachate is pumped to above-ground storage tanks. In 2012, Bowerman Landfill collected 279,072 gallons of leachate. Collected groundwater and leachate are reused for dust control on the lined areas of the landfill property.

Bowerman Landfill monitors groundwater quality through 17 monitoring wells. Samples are collected quarterly and analyzed by an independent laboratory for metals, VOCs, inorganic compounds, pH levels, and conductivity. Twice a year, landfill staff collects samples of storm water as it leaves the landfill site. An independent laboratory analyzes the storm water for metals, inorganic compounds, pH levels, and conductivity. All monitoring data are reported to Regional Water Quality Control Board.

**Drainage and Erosion Control**

The primary surface water drainage control system for the Bowerman Landfill is designed to accommodate a 100-year, 24-hour storm event. The drainage system is comprised of drainage ditches and channels, various down-drain structures, and concrete lined desilting basins. Down drains consisting of corrugated metal flumes or corrugated steel pipes are installed to divert runoff from the deck areas as well as to transport collected runoff from the drainage benches. V-shaped drainage channels are generally maintained along the benches to collect runoff from the slope areas.

The final deck area is designed and will be constructed to a minimum slope of three percent to promote proper drainage and to reduce the impacts of future settlement at closure. Special attention is paid to all deck area grading and interim and final drainage control features prior to the rainy season. Erosion rills formed during storm events on the refuse deck and slope areas are repaired as soon as equipment can access these areas.

For erosion control, processed green material (PGM) is spread with a bulldozer to achieve a thickness of approximately 12 inches. The PGM is then compacted using heavy equipment to an average of 6 inches.
Other erosion control Best Management Practices include hydro-seeding of excavation slopes with native grasses, placement of fiber mats on soil slope, erosion check devices, and use of silt fences and sand bags.

**LFG Collection System**

The LFG recovery and disposal system at Bowerman Landfill consists of a network of horizontal and vertical collection wells, and a series of flares.

Bowerman Landfill has installed 113 horizontal and vertical LFG collection wells and 47 monitoring probes.

The monitoring program includes:

- Integrated surface monitoring performed quarterly
- Instantaneous surface monitoring performed monthly
- Ambient air monitoring performed quarterly
- LFG sampling from the collection system (i.e. raw gas analysis) performed quarterly
- Perimeter gas (vadose zone) monitoring performed monthly
- Gas condensate monitoring performed daily
- Flare monitoring performed daily

Gas condensate is collected in an above-ground storage tank. In 2012, Bowerman Landfill collected 624,845 gallons of condensate.

Currently, LFG is flared in five fully enclosed Perennial Energy flares with a total installed capacity of 11,000 scfm. Bowerman Landfill’s LFG collection system collected 3,296,142,572 standard cubic feet of landfill gas in 2012. Planning is underway to construct a LFG-to-electricity facility at Bowerman Landfill by early 2015. This facility will consume virtually all the LFG generated by the landfill to generate 23 megawatts of electricity, enough to serve 14,500 homes.

**Litter Control**

Bowerman Landfill uses portable litter fences to capture windblown litter before it can leave the working face. Laborer crews police the site and landfill access roads daily for any litter that might leave the site or blow off a waste hauling vehicle.

**Spill Response Plan**

The OC Waste & Recycling has a Policy & Procedure document specific to responding to spills at the landfills. Landfill staff is trained in responding to hazardous and non-hazardous spills to prevent or minimize environmental impacts.
**Vector Control**

Nuisance birds are kept at bay through the use of cracker and whistler shells fired from a shotgun. Following a successful pilot study, Bowerman Landfill is currently seeking bids to provide on-site falconry service to further reduce the landfill gull population. Other animals are deterred from scavenging at night by covering the trash every day with either tarps or six inches of soil.

**Biological Resources Monitor**

Bowerman Landfill employs a full-time on-site Biological Resources Monitor (BRM) to manage the landfill’s Habitat Management Program. The BRM possesses education and training in the areas of California native plant ecology and habitat, invasive plants and techniques to control them, landscape architecture, GIS/GPS utilization, project management, and construction design. The BRM manages installation and maintenance of habitat, monitors habitat projects on-site, reviews construction documents for compliance with best habitat management practices, and prepares reports on habitat project progress and success.

Bowerman Landfill currently maintains over 32 acres of habitat as mitigation for landfill operations. As an indicator of success, 86 acres of habitat created by OC Waste & Recycling and its contractors has been deemed self-sustaining by local resource agencies and no longer require on-going maintenance by the department.

**4. Regulatory Compliance**

Bowerman Landfill is one of three active landfills in Orange County. All three landfills are owned by the County of Orange and operated by OC Waste & Recycling. Bowerman Landfill is a Class III solid waste disposal site permitted to receive non-hazardous municipal solid waste consistent with the State Minimum Standards for Solid Waste Handling and Disposal. OC Waste & Recycling operates four household hazardous waste collection centers throughout the County. These collection centers accept household hazardous waste free-of-charge for County residents.

While all three landfills in Orange County are owned and operated by the County of Orange, trash collection, processing, and hauling are handled by private enterprises. There are numerous privately owned transfer stations, material recovery facilities, greenwaste processors, and recycling centers serving Orange County’s residents. Through collaborative effort, Orange County currently has a 67% landfill diversion rate equivalent.

Bowerman Landfill’s principal regulators include the California Department of Resources Recycling and Recovery (CalRecycle) through its Local Enforcement Agency, the California Regional Water Quality Control Board – Santa Ana Region, and the South Coast Air Quality Management District.

Bowerman Landfill operates under a state issued Solid Waste Facility Permit. Additional permits cover air and water quality, and biological resources. Bowerman Landfill fully complies with all federal, state and local regulations governing the design and operation of a Class III landfill. As of the writing of this nomination document, Bowerman Landfill has received just one violations during the past three years (see table below).
The landfill's operations superintendent and supervisors inspect the entire landfill every day to ensure regulatory compliance. All landfill employees are trained in regulatory compliance. With an eye toward compliance, diligent effort is made to maintain this exemplary record.

**Frank R. Bowerman Landfill**

**Landfill Site Inspection Record**

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5. Planning, Operations and Financial Management

Planning
In 2006, the County of Orange certified an Environmental Impact Report (EIR) analyzing the potential environmental impacts associated with the continued operation of Bowerman Landfill until closure, now estimated to occur in 2053. In 2002, a major landslide occurred on landfill property. By strategically remediating the effects of the landslide, Bowerman Landfill was able to increase its vertical and horizontal landfill capacity, extending the life of the landfill from its permitted closure date of 2022 to 2053. The horizontal expansion will provide for approximately 193 additional acres of waste footprint area over the currently permitted waste footprint of 341 acres, for a total waste footprint of approximately 534 acres.

Included in the EIR is a Soil Management Plan that preserves adjacent canyons by stockpiling landfill operational dirt on-site. In addition, strategies to establish and protect plant and animal habitat are addressed. The EIR also includes a Mitigation Monitoring and Reporting Program identifying mitigation measures to be implemented by the County of Orange to avoid significant adverse environmental impacts associated with the landfill expansion. Mitigation measures address water quality, hydrology, landfill bound traffic on city streets, air quality, plant and animal habitat protection, as well as preservation of archeological and paleontological resources.

Accompanying the EIR is a Cooperative Agreement between the County of Orange and the City of Irvine (Bowerman Landfill’s host city) that responds to the city’s interests in a mutually acceptable manner, and guides the relationship between the City and the County.

Operations
Bowerman Landfill is owned by the County of Orange and operated by its OC Waste & Recycling department. On-site landfill management includes a site manager, administration, operations, project management and engineering staff. OC Waste & Recycling headquarters staff including strategic planning, environmental services, budget and finance, accounting, legislative and community relations, and a public information officer provides additional support.

The landfill is open Monday through Saturday 7:00 a.m. to 5:00 p.m. It is permitted to accept a daily maximum of 8,500 tons. Bowerman Landfill accepted over 1,447,000 tons of waste in 2012, a daily average of 4,716 tons, and served an average of 379 vehicles per day.

Bowerman Landfill fully complies with all federal, state and local requirements for operation of a Class III sanitary landfill. Site staff conducts daily inspections to ensure that the site is in compliance with all permit conditions imposed by regulatory agencies. These permitted conditions
include specific procedures involving daily cover application and nuisance controls such as fire, leachate, dust, vector, bird, noise and odor control.

Bowerman Landfill staff operates a fleet of heavy equipment to push, spread and cover its waste using a canyon fill methodology. Equipment operators attend manufacturer training to ensure safe and effective equipment operation.

For safety purposes, Bowerman Landfill maintains one working face with two unloading areas: one for commercial waste hauler vehicles and one for smaller self-haul vehicles. Access road signage and landfill staff direct traffic to the two working faces. Waste inspectors monitor waste being unloaded to ensure that prohibited materials are not buried in the landfill. Additionally, radiation monitors are used at the scale house to detect any radioactive waste before entering the landfill. A separate area on the trash landing is set aside for truck drivers to sweep out their vehicles prior to leaving the landfill, thereby minimizing litter on the roads.

At the end of each day, tarps and processed green material (mulch) are used to cover the trash as an alternative daily cover. Processed green material is also used to frame the tarps and anchor them to the ground. Tarps are used in lieu of soil to preserve air space for waste disposal. Soil from landfill excavation is stockpiled on-site for use later as intermediate or final cover. Bowerman Landfill does not import soil, thus reducing the number of vehicle trips on city streets.

Protecting the health and safety of the public and landfill employees is critical to Bowerman Landfill’s operations. Measures taken to ensure health and safety include:

- All landfill operations and engineering employees attend semi-weekly safety meetings.
- Operations employees receive a 40-hour course in hazardous material management and annual 8-hour refreshers.
- Additional training courses include:
  - Site safety practices and back safety
  - Respiratory protection and hearing conservation
  - Medic first aid
  - Confined space operations
  - Load check inspection
  - Blood borne pathogens
- The California Highway Patrol and Irvine Police Department conduct periodic vehicle inspections. Waste truck inspections occur both on landfill property and along landfill access routes.
- Site contractors must submit a health and safety plan prior to commencing work on a project.
- Landfill equipment operators are enrolled in a random drug and alcohol testing program.

**Financial Management**

Bowerman Landfill has two fully-staffed, non-automated scale house lanes and two fully automated lanes utilizing Paradigm hardware and software. During automated transactions, transponders on truck cabs and trailers transmit vehicle tare weight to the system, which then calculates the cargo weight for billing purposes. A receipt prints out for the driver to end the automated transaction. Scale house software is fully integrated with OC Waste & Recycling/Accounting to record financial
activity, tonnage, and geographic origin. Real-time, hourly, daily and monthly tonnage and revenue reports are available to employees on OC Waste & Recycling’s intranet site. Waste haulers are provided read-only access to these reports via a secure internet connection to reconcile landfill scale house tonnages with their dispatch records.

Orange County’s landfills collect an AB 939 surcharge of $19 per ton for loads hauled directly to the landfill for burial instead of hauling to a material recovery facility where recyclables are removed. The AB 939 surcharge was approved by the Orange County Board of Supervisors in 2006. Since its implementation, self-haul tonnage disposed at County landfills has decreased significantly. OC Waste & Recycling believes the surcharge has been an important policy affecting a significant increase in recycling and diversion practices. As of March 31, 2013, the AB 939 surcharge has generated $21,479,900 for waste reduction activities. This has allowed OC Waste & Recycling to develop new diversion programs and provide grant funding opportunities to ensure that regional efforts continue even during the economic downturn.

Through the leadership of the Orange County Board of Supervisors, as of March 31, 2013, $9,618.54 has been expended on projects partnering with cities, special districts, schools, businesses, nonprofit organizations, sporting organizations and County agencies to divert recyclable materials from Orange County landfills.

Bowerman Landfill’s Fiscal Year 2012-2013 operating budget is $42,090,529 (below). OC Waste & Recycling pre-funds landfill closure costs, per accounting regulations. Also, OC Waste & Recycling is pre-funding post-closure maintenance, special projects, and specific liabilities. To avoid a drain on the Orange County General Fund, it is OC Waste & Recycling’s intention to fully pre-fund these financial obligations prior to landfill closure when tipping fees are no longer coming in.

OC Waste & Recycling is subject to an independent annual financial audit by a certified public accounting and management consultant firm. OC Waste & Recycling Independent Auditor’s Reports and Financial Statements For the Years Ended June 30, 2012 and 2011, found that OC WASTE & RECYCLING financial statements audited presented fairly, in all material respects, the financial position of Orange County Waste & Recycling. A copy of the audit can be reviewed at www.ac.ocgov.com.

“In our opinion, the financial statements … present fairly, in all material respects, the respective financial position of Orange County Waste & Recycling Enterprise Fund.”

Vavrinek, Trine, Day & Co., LLP
Certified Public Accounts
6. Equipment/Systems and Technologies

**Fleet Operations**
Thirty-eight pieces of heavy equipment keep Bowerman Landfill operating. Maintenance and repair of this fleet are performed under a service contract. Under this contract, mechanics perform daily heavy equipment start-up and shut-down, equipment maintenance, repairs, and refueling. Maintenance is based on usage hours and oil samples. Maintenance schedules are tracked using a Microsoft Excel spreadsheet.

Bowerman Landfill’s heavy equipment fleet is comprised of Caterpillar D10 Trash Dozers, 836 Compactors, 657 and 637 Scrapers, 140 Motor Grader, as well as dump trucks, loaders, excavator, and water trucks. As mentioned above, landfill heavy equipment operators attend training from Caterpillar to ensure safe and effective equipment operation.
As Bowerman Landfill is just one of three landfills owned and operated by the County of Orange, OC Waste & Recycling considers all heavy equipment at all three landfills as part of one large fleet. When the need arises, equipment is moved between landfill sites to facilitate effective landfill operations.

In 2011, OC Waste & Recycling contracted for a comprehensive operational review of Orange County’s landfills to increase safety and efficiency, and reducing operating costs. Following recommendations contained in this study, Bowerman Landfill began constructing trash cells in horizontal layers without steep sloping faces, and has modified the compaction patterns to more efficiently use its dozers and compactors. These changes have resulted in increased compaction density, reduced fuel usage, and decreased equipment maintenance costs. Additionally, OC Waste & Recycling has re-evaluated its heavy equipment usage and replacement plan. Over the next several years, the landfills will be strategically reducing the size of their heavy equipment fleet, providing substantial long-term savings in capital expenses and equipment maintenance/repair costs.

**Computer Aided Earthmoving System (CAES)**

Bowerman Landfill utilizes a Computer Aided Earthmoving System (CAES) to plan and monitor excavation and trash disposal operations. Based on a 3-D digital terrain model programmed into the system by Bowerman engineers, heavy equipment operators receive grading instructions on a monitor installed inside their equipment. The CAES machine has an onboard computer, touch screen color monitor display, and GPS that allows the equipment operator to see exactly what they are doing in relation to the grading plan. The color display shows the operator in real time how much the trash or dirt must be cut or filled and the exact location of the machine in relation to the plan without looking at a distant grade marker. It even shows the operator the number of compaction passes he needs to apply on the trash using color coded display on the screen to ensure optimum compaction. The CAES system facilitates increased compaction, adherence to grade plan, a reduction in cover soil usage, and better monitoring of airspace usage. Additionally, CAES usage eliminates the need for costly ground survey crews.

**GPS Technology**

Bowerman Landfill has programmed GPS coordinates into its landfill CAD system to provide not just a 3-D picture of the landfill as it develops, but later to locate the exact location of underground well heads, groundwater monitoring wells, and LFG monitoring probes. Additionally, Bowerman Landfill's Biological Resources Monitor has entered the GPS coordinates of endangered species into a CAD overlay to facilitate their protection from grading operations, and to monitor their growth.
Asphalt Wet Weather Deck
Bowerman Landfill stockpiles broken asphalt for use in creating and maintaining a wet weather deck for waste disposal when muddy conditions exist. This wet weather area allows landfill operations to continue unimpeded during and immediately following rain events. The wet weather deck prevents the hauling trucks from getting stuck in the mud.

Weather Monitoring Station
A weather station located on-site assists Bowerman Landfill’s operations staff by monitoring weather conditions. The weather station records temperature, barometric pressure, wind direction and speed, and precipitation.

Automated Truck Scales
Bowerman Landfill has two fully automated scale house lanes and two non-automated lanes utilizing specialized software. During automated transactions, transponders on truck cabs and trailers transmit vehicle tare weight to the system, which then calculates the cargo weight for billing purposes. A receipt prints out for the driver to end the automated transaction. Scale house software is fully integrated with OC Waste & Recycling/Accounting to record financial activity, tonnage, and geographic origin. Real-time, hourly, daily and monthly tonnage and revenue reports are available to landfill employees on OC Waste & Recycling’s intranet site. Waste haulers are provided read-only access to these reports via a secure internet connection to reconcile landfill scale house tonnages with their dispatch records.

The entire truck scale and fee booth operation is connected to a backup generator to provide emergency power in case of an electrical power failure. If utility grid power is lost, the landfill can continue its operation.

7. Public Acceptance, Appearance and Aesthetics
Orange County, California is an urban area with over 3,000,000 residents. Bowerman Landfill was once in a remote area of the county; it now has new neighborhoods in close proximity. Bowerman Landfill strives to be a good neighbor in its daily operations and interactions with the residents of Orange County. Bowerman Landfill’s “good neighbor” activities include:

Nuisance Control
Nuisance control measures at Bowerman Landfill include water trucks spraying the working face and landfill roads throughout the day to prevent dust from blowing. Wind fences stop windblown litter
from leaving the site. Laborer crews pick up litter along landfill access roads that may blow off of waste trucks approaching or exiting the landfill. Additionally, landfill access is restricted to one street to reduce landfill traffic on city streets.

**Aesthetics**

Because of its location within a nature reserve, Bowerman Landfill is committed to protecting and enhancing the California native plant and animal habitat that surrounds the facility. The landscaping adjacent to the administration building was remodeled in 2003 to reflect a native California landscape that is more consistent with the surrounding canyons, better suited to existing soil, and requires less irrigation to survive. Landfill slopes are hydroseeded with native plants and grasses to beautify and enhance the area, while also providing erosion control.

Several rare plant species are found on Bowerman Landfill property. Prior to landfill excavation projects, these rare plants are relocated to permanent protected sites on the landfill property to ensure their preservation. Besides relocation, plant proliferation efforts include experimental propagation techniques and nursery reproduction to increase rare plant species populations.

To mitigate environmental impacts due to landfill operations, Bowerman Landfill has restored and maintained over 118 acres of habitat. A full-time on-site Biological Resources Monitor oversees protection and restoration of biological resources at the landfill.

**Customer Service and Convenience**

Bowerman Landfill has a separate area on the trash landing set aside for truck drivers to sweep out their vehicles prior to leaving the landfill, thereby minimizing litter on the roads. Catering trucks are stationed near the trash landing to provide truck drivers a convenient location to purchase and eat breakfast or lunch without having to drive through the community. In addition, Bowerman Landfill has a household hazardous waste collection center off-site that accepts household hazardous waste from the community free of charge.

**Industry Support**

Landfill staff is invited speakers at industry conferences and meetings. Following the discovery and mediation of sub-surface heat vents at Bowerman Landfill, landfill staff and consultants made presentations on this rare phenomenon to the American Chemical Society, Orange County American Chemical Society, and the Geological Society of America.
Community Support

Bowerman Landfill lives its commitment to be a good neighbor. Not only is the landfill kept clean and litter free, but Bowerman Landfill staff welcome visitors. Although the area was once isolated, new houses are continually being developed in nearby neighborhoods. The Irvine Company, which is developing nearby communities, sends its sales agents to the landfill to educate them about the workings of their important landfill neighbor. In turn, the sales agents often refer prospective buyers to the site for visits. Bowerman is dedicated to educating neighbors and building a foundation of trust. In addition, OC Waste & Recycling hosts landfill tours at all facilities. These include Boy and Girl Scout Groups, class visits, international delegations and professional organizations. In 2012, the Bowerman Landfill hosted 32 landfill tours.

A favorite annual fundraising event is hosted at the Bowerman Landfill. Entitled Dine at the Dump, the barbeque luncheon benefits the United Way of Orange County. In 2012, the event garnered $7,779 benefitting local United Way projects.

Landfill employees actively support nonprofit community organizations through their participation. Organizations such as Operation Santa Claus, food bank collections, shelter blanket and clothing collections are among the activities that benefit from the efforts of Bowerman Landfill employees. Several landfill employees have received training to staff the County’s Emergency Operations Center in case of a regional emergency. Bowerman Landfill’s equipment and operators are available to assist in any county emergency requiring such equipment.

Since 2011, Bowerman Landfill has participated with the Sea & Sage Audubon Society in its annual Christmas Bird Count. The landfill property is home to many species of birds, some of which have been documented by the Audubon representatives. This unique partnership allows the birders to see an important habitat area that was previously not a part of the annual count.

In the spring of 2012 Bowerman Landfill staff was called on to support a criminal investigation. Following a trail of evidence, police investigators brought cadaver dogs to search the landfill. Using GPS technology, landfill staff isolated the trash buried on the days under investigation, and then specially-trained dogs and handlers inspected the trash for evidence over 14 days. Bowerman Landfill was proud to be of assistance in this investigation.
Community Outreach
Bowerman Landfill staff has interacted with thousands of county residents in community outreach events throughout Orange County. Such events include the Orange County Fair, Anaheim Angels baseball and Anaheim Ducks hockey games, Earth Day events, environmental fairs, and the Boy Scout Leader Conference. Additionally, landfill tours are conducted for the general public, civic groups, professional associations, community leaders, students, and visitors from foreign countries.

A new initiative in OC Waste & Recycling has been heartily embraced by the Bowerman Landfill employees. The Ambassador Program provides training to employees so that they can represent OC Waste & Recycling at community events. Six of the Department’s 25 Ambassadors are from Bowerman Landfill.

8. Innovation and Creativity

Habitat Protection
Bowerman Landfill is located in a state Natural Community Conservation Planning (NCCP) region. The NCCP program is a cooperative effort to conserve natural plant and animal communities at the ecosystem scale while accommodating compatible land use. Landfill slopes are hydroseeded with native plants and grasses to eliminate any visual scarring and provide erosion control. Several rare plant species are found on Bowerman Landfill property. Prior to landfill excavation projects, these rare plants are relocated to permanent protected sites on the landfill property to ensure their preservation. Besides relocation, plant proliferation efforts include experimental propagation techniques and nursery reproduction to increase rare plant species populations. To mitigate environmental impacts due to landfill operations, Bowerman Landfill has already restored and maintains over 118 acres of habitat. OC Waste & Recycling has agreed to install and maintain a 2-acre earthen wetland basin that will provide aquatic habitat for sensitive species, and to restore and enhance 132 acres of habitat mitigation in an undeveloped canyon near Bowerman Landfill. A full-time on-site Biological Resources Monitor oversees protection and restoration of biological resources at the landfill. All combined, Bowerman Landfill will spend over $8,000,000 on habitat mitigation, restoration and maintenance.
Green Building
The administration building at Bowerman Landfill is a green building, constructed and maintained to minimize environmental impacts. Features include use of recycled building materials, low flow faucets and toilets, low VOC paints and sealants, high-efficiency lighting with automatic shut off switches, and high-efficiency heat pumps.

Computer Aided Earthmoving System (CAES)
Bowerman Landfill utilizes Caterpillar’s Computer Aided Earthmoving System (CAES) to plan and monitor excavation and trash disposal operations. Based on a digital terrain model programmed into the system by Bowerman engineers, heavy equipment operators receive grading instructions on a monitor installed inside their equipment. Each machine has a touch screen color monitor display and GPS that allows the equipment operator to see exactly what they are doing in relation to the grading plan in real time. The color display shows the operator how much the trash or dirt must be cut or filled and the exact location of the machine in relation to the plan. It even tells the operator the number of compaction passes he needs to apply on the trash using color coded display on the screen to ensure optimum compaction. The CAES system facilitates increased compaction, adherence to grade plan, a reduction in cover soil usage, and better monitoring of airspace usage.

Rubberized Asphalt Road
In 2012 Bowerman Landfill resurfaced its 2.5 mile main access road using rubberized asphalt. This overlay project used rubberized pavement products derived from 100% recycled California-generated waste tires.

Household Hazardous Waste Collection
OC Waste & Recycling operates four Household Hazardous Waste Collection Centers, one near the Bowerman Landfill. These centers provide the public a convenient location to dispose of its household hazardous waste, free-of-charge, in an environmentally responsible manner. Use of these disposal facilities continues to increase each year, reducing illegal and improper hazardous waste disposal.

Soil Stockpile Surcharging
Excavated soil is strategically stockpiled on top of buried trash to further compact the trash. This surcharged compaction provides additional airspace after the soil is removed for use. It is estimated Bowerman Landfill will gain approximately 600,000 cubic yards of airspace as a result of this surcharging.
Solid Waste Facility Permit

1. Name and Street Address of Facility:
   Frank R. Bowerman Landfill
   11002 Bee Canyon Access Road
   Irvine, CA 92618

2. Name and Mailing Address of Operator:
   OC Waste & Recycling
   320 N. Flower Street, Suite 400
   Santa Ana, CA 92703

3. Name and Mailing Address of Land Owner:
   OC Waste & Recycling
   320 N. Flower Street, Suite 400
   Santa Ana, CA 92703

4. Specifications:
   a. Permitted Operations:
      - Solid Waste Disposal Site
      - Transfer/Processing Facility (MRF)
      - Transformation Facility
      - Composting Facility (Green Material)

   b. Permitted Hours of Operation:
      Receipt of Refuse: 7:00 a.m. to 5:00 p.m. Monday through Saturday (1)(2). Commercial haulers and self haulers operating under commercial status only.
      Ancillary Operations (Construction and Maintenance): 24 hours Monday through Sunday.

   c. Permitted Maximum Tonnage:
      11,500 tons/day (3)

   d. Key Design Parameters:
      | Total | Disposal | Transfer/Processing | Composting | Transformation |
      |-------|----------|---------------------|------------|---------------|
      | Permitted Area (in acres) | 725 | 534 (4) | N/A | N/A | N/A |
      | Permitted Capacity (cubic yards) | 266,000,000 (5) | N/A | N/A | N/A |
      | Max. Elevation (Ft. MSL) | 1,350 | | | |
      | Max. Depth (Ft.) | 640 (6) | | | |
      | Estimated Closure Year | 2053 | | | |

5. Approval:
   Richard Sanchez, REHS, MPH
   Director, Environmental Health

6. Enforcement Agency Name and Address:
   County of Orange Health Care Agency
   Environmental Health
   Solid Waste Local Enforcement Agency
   1241 E. Dyer Rd., Suite 120
   Santa Ana, CA 92705

7. Date Received by CIWMB:
   July 9, 2008

8. CIWMB Concurrence Date:
   August 19, 2008

9. Permit Issued Date:
   September 22, 2008

10. Permit Review Due Date:
    September 22, 2013

11. Owner/Operator Transfer Date:
    N/A

Upon a significant change in design or operation from that described herein, this permit is subject to revocation or suspension. The attached permit findings and conditions are integral parts of this permit and supersede the conditions of any previously issued Solid Waste Facility Permit.

(1) The facility accepts waste for disposal 307 days per calendar year
(2) Transfer trucks only between 4:00 p.m. and 5:00 p.m.
(3) A Cooperative Agreement between landfill owner/operator and City of Irvine dated August 15, 2006, sets limits on annual average tonnage. The Local Enforcement Agency does not enforce Cooperative Agreement limits.
(4) 534 acres is the refuse disposal area. Total disturbed area is 655 acres.
(5) 266,000,000 cubic yards is the facility's permitted airspace capacity that includes liner, LCRS, refuse, daily and intermediate covers and excludes final cover. Remaining airspace capacity 205,000,000 cubic yards as of 02/29/2008.
(6) Based on the difference between final fill grade and finished excavation grade.
South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

DATE: 10/16/2012

EQUIPMENT LOCATED AT: 11002 BEE CANYON ACCESS RD
IRVINE, CA 92602

LEGAL OWNER: 69646
OR OPERATOR: OC WASTE & RECYCLING, FRB
300 N FLOWER ST SUITE 400 ST ATTN MOHAMMAD SALAM
SANTA ANA, CA, 92703-0000

PERMIT/APPLICATION RENEWAL

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FIRE AUTHORITY
PERMIT

Business Name: FRANK R BOWERMAN LANDFILL #27
Mailing Address: 300 FLOWER ST Suite 400
SANTA ANA CA 92703
Site Address: 11002 BEE CANYON RD
IRVINE CA 92718

THIS PERMIT IS ISSUED BY THE ORANGE COUNTY FIRE AUTHORITY AND IS ACCEPTED ON CONDITION THAT THE APPLICANT, HIS AGENTS AND EMPLOYEES CARRY OUT THE PROPOSED ACTIVITY IN COMPLIANCE WITH ALL THE APPLICABLE CODES, LAWS, REGULATIONS OR CONDITIONS/LIMITATIONS LISTED ON THE PERMIT APPLICATION. ANY VIOLATION OF THESE PROVISIONS MAY BE GROUNDS FOR REVOCATION OF THIS PERMIT.

PERMIT GRANTED FOR:

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THIS PERMIT SHALL AT ALL TIMES BE POSTED IN THE PREMISES DESCRIBED ABOVE

This permit(s) does not take the place of any license required by law and is not transferrable. Any change in the use or occupancy of the premises shall require a new permit. This supersedes all other permits issued by the Orange County Fire Authority.

Keith Richter
FIRE CHIEF

Jason Sykes
FIRE MARSHAL
2013 LANDFILL MANAGEMENT EXCELLENCE AWARD

RELEASE FORM

Release Statement: I certify that the information provided in this 2013 Excellence Award application is accurate and correct to the best of my knowledge. I understand that nominations become the property of SWANA. SWANA reserves the right to publish any or all of my application. My signature gives SWANA the right to reprint or make available for purchase any portion of this application.

Printed Name of Representative: Dylan Wright, Interim Director

Organization Name: County of Orange / OC Waste & Recycling

Signature: [Signature]

Date: 5/15/13