SUNSHINE CANYON LANDFILL

SCL - LEA

LOCAL ENFORCEMENT AGENCY

14747 San Fernando Road
Sylmar, California 91324

Date: June 27, 2013

To: Sunshine Canyon Landfill Board of Directors

From: Wayne Tsuda, SCL LEA Program Manager

Subject: Report Transmittal – Interagency Task Force Sunshine Canyon Landfill Odor Mitigation Program Recommendations

The Interagency Task Force has completed its recommendations for odor mitigation and I have attached a copy for your review. The primary agencies involved on the Task Force included:

The South Coast Air Quality Management District (Chair)

The Sunshine Canyon Landfill Local Enforcement Agency

The Los Angeles County Department of Public Works

The Los Angeles County Public Health Department, Environmental Services Solid Waste Program

The Los Angeles County Department of Regional Planning

The Los Angeles City Planning Department

Attendees also included legal counsel for the agencies above and the SCL LEA Environmental Consultant, Eugene Tseng and Associates.

The recommendations are intended to provide agencies with recommendations for odor mitigation that may be used in each agency's respective areas of expertise for seeking compliance and enforcement, if applicable.

Attachment

Wayne Tsuda
SCL – LEA Program Manager
Office: (213) 252-3932 Cell: (213) 359-4568
Email: wayne.tsuda@lacity.org
For reply: 3550 Wilshire Blvd. 18th Floor, Los Angeles, CA 90010

Date: June 24, 2013

To: Sunshine Canyon Landfill Interagency Task Force on Community Odor Mitigation

Mr. Mohsen Nazemi, Deputy Executive Officer
South Coast Air Quality Management District

Ms. Cindy Chen, LEA Program Manager
Chief, Solid Waste Management Program
Los Angeles County Public Health Department, Environmental Services Solid Waste Program

Ms. Ly Lam, Senior Management Analyst,
Mr. Nick Hendricks, City Planner
Los Angeles City Planning Department

Ms. Maria Masis, Supervising Regional Planner
Los Angeles County Department of Regional Planning

Ms. Emiko Thompson, Senior Civil Engineer
Los Angeles County Department of Public Works

From: Wayne Tsuda, Program Manager
Sunshine Canyon Landfill Local Enforcement Agency

Subject: Sunshine Canyon Landfill Odor Mitigation Program Recommendations

The Sunshine Canyon Landfill Interagency Task Force (Task Force) has been researching and evaluating best management practices to mitigate odors at the Landfill. This has resulted in a compilation of additional operational and programmatic recommendations to supplement the ongoing odor reduction efforts currently in place at the Landfill.

The recommended measures would be implemented in phases by the respective agencies within their areas of purview and authority, as they determine appropriate. Upon their implementation, monitoring of the measures would also be the responsibilities of the respective agencies. If odors persist, further mitigation measures are to be implemented until the odor problem is fully mitigated.

These recommendations have been developed collectively by the members of the Interagency Task Force comprised of the following agencies:

- South Coast Air Quality Management District, Task Force Chair
- Sunshine Canyon Landfill Local Enforcement Agency
- Los Angeles County Department of Public Works
- Los Angeles City Planning Department
- Los Angeles County Department of Regional Planning
- Los Angeles County Department of Public Health
- E. Tseng and Associates, Consultant to SCL LEA

Sources and Types of Odors

There are two identifiable types of odors: 1) fresh trash smells, and 2) odors associated with landfill gas generated from older decomposing trash. Landfill gas is the carrier mechanism of the odiferous compounds generated by the decomposition of the solid waste. Odor types can generally be characterized as fresh trash smells, landfill gas odors, and/or a combination of the above. Sources of fresh trash odors and odors associated with landfill gas may be attributable to any one or combination of the following potential sources:

1. Odors from vehicles delivering trash for disposal;

2. Odors associated with any litter and/or liquids that may fall from the vehicles delivering trash for disposal;

3. Odors from vehicles that are waiting in queue to dump;

4. Odors from the trash truck unloading process at the tipping face area;

5. Odors from fresh trash on the working face before it is covered;

6. Odors from the trash/litter carried into the neighborhood by winds;

7. Trash odors carried by landfill gas which pass through the fresh trash that has been disposed and/or placed upon the working face during operational hours;

8. Fresh trash odors carried by landfill gas through the daily cover; the odor that passes, during closed hours, through the fresh trash that has been disposed and/or placed upon the working face and daily cover;

9. Odors may be carried into the neighborhood via the water spray used to mitigate the odors as odorous compounds attaching themselves to heavier droplets of water as opposed to odorous compounds that otherwise may be dispersed;

10. Odors from “older” decomposing trash that are not captured by the landfill gas collection system;

11. Odors which result from operational activities associated with landfill repair and maintenance such as landfill gas (LFG) collection well installation, trenching, well repair, equipment breakdowns, and shutdowns, etc.;

12. Other odors are occasionally present and may contribute to complaints reported from the community. These include sources such as leachate collection and treatment system, portable toilets, naturally occurring sources associated with the adjacent oil field and from decomposition of plants that are part of the natural habitat areas and/or from plants that have not taken root on the intermediate (and other) cover areas, or odor sources in the community such as manure from horse properties and curbside trash collection.

Source Materials

The primary "source materials" of the odors are from non-hazardous municipal solid waste (MSW), particularly components that are readily decomposable and putrescible materials, such as food waste from homes and restaurants, etc. and from materials that decompose over time to form odiferous compounds within the landfill. Greenwaste (e.g., cut grass) can be odiferous if the grass has been decomposing for a week prior to pickup and disposal at the landfill. Regulated wastes which have been treated (e.g., autoclaved regulated medical waste) are defined as non-hazardous MSW and can be particularly odiferous. The sources of MSW are from residences, businesses, government, schools, industry, and institutions.

Analysis of Odor Complaints and Violations

Since 2008, complaints received by SCAQMD alleging odors from the landfill have substantially increased. These complaints are investigated by SCAQMD field staff and those verified resulted in notices of violation. Other actions taken by the SCAQMD include citations for permit conditions and surface emission exceedances.

The "fresh trash" odor complaints generally occurred during daytime hours (6 AM to 6 PM) and account for approximately a quarter of all verified odor complaints for which the Landfill has been alleged as the source of those odors. Based on SCAQMD's data, potential sources of "fresh trash" odors include:

- transportation of odorous trash through the community;
- the queuing of trucks near or at the landfill and;
- the depositing of odorous trash at the working face during landfill operations. On Mondays or after holidays there may be higher numbers of odor complaints due to the decomposition of trash that has been collected and kept for longer periods prior to disposal.

Calls to SCAQMD during the evening hours (6 PM to 6 PM) were primarily attributable to landfill gas odors which accounted for approximately two-thirds of the verified complaints, based on AQMD's 2012 data. Odors from landfill gas can be caused by the release of gas from the landfill that is not captured by the existing landfill gas collection system. A significant number of complaints attributed to landfill gas releases is suspected to be associated with the following sources:

- a landfill gas collection and flare system that is undersized for the amount of gas being produced and that has experienced frequent shutdowns due to new equipment installation, equipment breakdowns, and equipment maintenance activities;
- landfill gas collection well installation procedures which allow the release of significant amounts of landfill gases;
- soil surfaces that have fissures, crevices or where erosion has occurred creating pathways for landfill gas to escape; and
- local weather patterns affecting wind direction and intensity

Holistic Approach to Odor Mitigation Options

The Task Force has determined that the optimal approach to mitigate odors emanating from Sunshine Canyon Landfill would require the implementation of measures to manage the sources of both fresh trash odors and landfill gas odors through best available technology and best management practices.

The optimal approach requires focusing on the best combination of practical preventative programs, facility design features, operational practices, maintenance protocol, and odor mitigation programs that provide the optimal operating conditions of the landfill gas collection system.

Based on this approach, the Task Force has determined that the highest priority for reducing complaints related to landfill gas is to:

- optimize the operation of the landfill gas collection system for maximum effectiveness based on accurate information on existing conditions;
- to assure that the landfill gas collection system is properly constructed and operated at the design criteria; and
- the landfill gas collection system be properly maintained and capable of sustaining temporary emergencies, such as power outages or extreme weather conditions.

Recommendations:

The Task Force has reviewed the various listed odor mitigation measures and recommends the following steps be taken immediately:

Operational Changes

- Require odor control operators with portable mobile sprayers containing odor neutralizer to apply the neutralizers on the waste for specific loads at the working face on a specific load-by-load basis. For loads that are identified as odiferous loads such as treated medical waste or putrefied food, the portable/mobile sprayer and operator must be situated at the tipping location so that the odor neutralizer can be used during the truck unloading operation.

- Require treated medical wastes to be prioritized for immediate burial at the working face.

- All areas of intermediate cover (minimum of 12 inches of compacted soil) must be maintained to prevent the emission of landfill gas through the cover surface.

- Require that an additional vegetative layer (with plants and soil with compost mix) be placed on top of intermediate cover areas, which would also act as a biofilter layer for emissions that may be venting through the cover. Surface emissions must be continually monitored, including areas with established vegetative covers to ensure that the underlying intermediate cover does not develop cracks and seeps.

- Intermediate cover areas with surface emissions beyond regulatory limits must be repaired within regulatory time limits or sooner if possible. Should surface emissions of LFG continue to be released in quantities above the allowable SCAQMD thresholds from intermediate cover areas after completing the landfill gas collection system upgrades, the following may be required:
    a. Install new landfill gas collection wells as directed by SCAQMD. Other methodologies may be employed such as, but not limited to:
    b. A thicker intermediate soil cover or the use of a more impermeable material such as clay may be specified;
    c. The use of a synthetic impermeable removable non-porous geosynthetic liner on top of the intermediate soil cover (e.g., Closure Turf or equivalent) that is anchored and connected to the landfill gas collection system
    d. Should intermediate cover methodologies fail or prove to be infeasible, intermediate covers shall be upgraded to meet final closure standards if surface emissions on intermediate cover areas persist.

- Require the Landfill Operator to maintain an ongoing program of identification, monitoring, upgrading/repairing and replacing non-performing wells, and provide monthly reports to the SCAQMD for distribution to the Task Force.

- Consider allowing the peeling back of the daily soil cover that was applied the previous day under prescribed conditions which may include:

a. to be in conjunction with the proper design, construction, and maintenance of the landfill gas collection system
b. to be allowed only Tuesday through Friday;
c. approximately three to six inches of soil cover to remain in place;
d. soil to be removed in stages to match the need for tipping, disposal and compaction; and
e. after ceasing filling operations on Saturday, a full 9-inch cover is to be placed and remain in place on Mondays.

- Landfill Operator shall submit and implement a plan for using a negative air pressure system to prevent landfill gas from escaping into the atmosphere during gas collection well installations and trenching activities, and from the excavated refuse material.

- Require the Landfill Operator to continuously evaluate the effectiveness of current maintenance procedures including the adequacy of gas well tuning and balancing frequencies, and the efficiencies of the flares and gas wells. The Landfill Operator must also routinely fine tune, maintain, and repair gas wells.

- Shutting down flares and taking the gas collection system off-line for maintenance purposes during adverse wind conditions should be prohibited.

- Monitor the progress of the Landfill Operator to expedite the installation of back-up generators to ensure the continuous operation of all flares in the event of a power failure at the site.

- Consider a pilot project for the Landfill Operator to demonstrate the effective use of a biodegradable or thermodegradable plastic approved as Alternative Daily Cover (ADC) or combinations of ADCs which meets the statutory performance standards that apply.

<u>Actions Related to Overall Facility Design</u>

- Require the Landfill Operator to determine the actual in-place waste density and revise the vertical and horizontal landfill gas well spacing to reflect actual conditions at the site, including cover requirements. The Operator must also reevaluate the existing landfill gas collection system design and expedite installation of new and replacement wells to achieve desired “well density” according to the findings. Additional field analysis such as horizontal and vertical gas permeability analysis (and resulting permeability ratio data) should be used to evaluate the actual radius of influence which should be used to determine the overall landfill gas collection efficiency. The Information used in calculating the radius of influence and designing the landfill gas system shall be shared with Task Force members for their review and concurrence.

- Require the Landfill Operator to plant trees for the purpose of creating a vertical physical barrier. A planted wall shall also be used to mount a misting system to control odors in appropriate locations. Strategically placed orchard fans should be incorporated to create as much dispersion of the funneled air flow out of the entrance of the landfill.

- Require the Landfill Operator to review and revise cell design, sequencing, and fill operations and apply the revised design in all new cell construction in order to minimize the slope angle of daily and the steeper intermediate slopes, which will allow for better compaction of the daily and intermediate soil cover. Cell design, sequencing, and fill operations should consider minimizing the surface area of steeper intermediate slopes in future cell development of the landfill.

- Require the Landfill Operator to explore new industry standards, best management practices and emerging technologies to supplement odor reduction efforts at the landfill and cooperate with Task Force member agencies to implement pilot projects where feasible such as electronically reporting the monitoring and corrective actions on a monthly basis.

<u>Verification of the Effectiveness of Various Odor Mitigation Measures</u>

- Require the Landfill Operator to recalculate the LFG collection system efficiency each at the beginning of each calendar year to take into account the additional landfill gas being generated by the increase in the overall in-place disposal tonnage of the preceding calendar year. The data and the methodology utilized in the calculation of the LFG collection system efficiency shall be provided to the SCAQMD for distribution and review by the Task Force members.

- Require the Landfill Operator to measure the in-place density of trash in the areas with the 9 inch daily soil cover with a Gamma Density Logger for the purpose of calculating the radius of influence. Both the density of the refuse at different depths and the density of the daily cover shall be measured. If the radius of influence is determined to be less than ideal, additional landfill gas extraction wells should be required (unless increasing the vacuum can increase the radius of influence without intrusion of atmospheric oxygen).

- As a supplement to the required ongoing surface emissions monitoring, the Landfill Operator may be required to conduct a research project as part of which a large sheet of synthetic, impermeable material is to be installed on selected locations of intermediate cover to determine any landfill gas emissions through intermediate cover.

As these proposed measures, through its collective implementation, are intended to mitigate odors at the Sunshine Canyon Landfill, agencies should monitor the effectiveness of these measures within their respective areas of purview. Based on the

findings of such monitoring the mitigation measures may be modified, added, or discontinued accordingly, until the odors at the landfill are mitigated.

Documents reviewed include studies and other documents prepared by Republic, its consultants, South Coast Air Quality Management District and related correspondence. Technical references and documents that were reviewed are available in electronic format upon request from the SCL LEA. Other documents that were utilized are posted on the SCL LEA web site www.scllea.org in the "Special Projects" page and can be downloaded from the "Attachments" section at the bottom of the Special Projects page.

Attachment

ATTACHMENT 1
Technical Comments

The following notes are provided as background for the recommendations provided. Please note that the Task Force will continue its research into best management practices for odor mitigation at Sunshine Canyon Landfill (Landfill).

Improving LFG Collection Efficiency

The Task Force recognizes that proper design, operation, and maintenance of a LFG collection system is needed in achieving a high collection efficiency of the LFG gas and thus controlling odors associated with landfill gases. Landfill gas collection systems for operating landfills do not operate at 100% collection efficiency for the total amount of landfill gas that is generated. The danger of oxygen intrusion and the potential for subsurface oxidation (underground fires) have to be avoided therefore, the landfill gas collection system design and operations is a constant balance of trying to collect the largest volume of landfill gas generated without creating overdraw in which atmospheric oxygen is drawn through the surface or other potential paths into the collection system.

While LFG control systems do not operate at 100% collection efficiency, the Task Force recommends that the design capacity for the LFG collection system should be sized for 100% collection efficiency for the maximum rate of LFG generation volume that is anticipated to be produced during the life cycle of the landfill, rather than a default 75% average value, or even the upper end, 85% of the range value. The Task Force believes it would be prudent to have a safety factor to accommodate periods in which the rate of landfill gas generation may be increased beyond the “average” rate of generation.

Methodologies for Calculating Landfill Gas Collection Efficiency

There are many methods of computing “collection efficiency” depending upon how the method is utilized for the calculation of the total volume of landfill gas generated. For this report we have reviewed the US EPA’s AP-42 (Federal Emissions Standards) as referenced by the Landfill operator in their evaluation of their landfill gas collection system.

The United States Environmental Protection Agency (US EPA) document, AP- 42, states that a 75% LFG collection efficiency as a “typical value”, but typically reported a range of values from 60% to 85%. Puente Hills, one of the Los Angeles County Sanitation District’s (LACSD) active landfills, is currently achieving 95%+ LFG collection efficiency. The LACSD utilizes a different methodology from the US EPA called the Integrated Surface Methane (ISM) Industrial Source Complex (ISC) air dispersion model to estimate LFG collection efficiencies of their landfills.

In the Integrated Surface Methane/Industrial Source Complex method, LACSD defines collection efficiency as:

Collection Efficiency = Collection / (Collection + Emission)

Whereas, US EPA AP-42, the LandGEM model utilized by both the Landfill operator and SCAQMD, defined collection efficiency as:

Collection Efficiency = Collection / Generation

where generation is simulated using the LandGEM model. In an ideal situation, the collection efficiencies would be the same under both methods.

The Task Force cautions those looking at landfill gas collection efficiency to be aware of the two methodologies and possible differences in stated results.

Current Status of Landfill Gas Collection System Efficiency

Whatever the potential strengths and weaknesses and/or differences in the calculated "collection efficiency", since the initial Task Force meeting of regulatory agencies in the summer of 2011, the Task Force has maintained that most of the reported landfill odors (occurring during closed hours) are resulting from an inadequate landfill gas system (overall capacity and the associated gas collection well / piping system). The Task Force has reviewed documents received from the Landfill operator regarding the evaluation of the landfill gas collection system ("Evaluation of the Existing Landfill Gas Collection and Control System, Sunshine Canyon Landfill", prepared by Bryan A. Stirrat, dated November 29, 2011).

The Task Force notes that as of January 2013, significant improvements have been made by the Landfill operator to the landfill gas collection system as the result of the SCAQMD' Stipulated Orders of Abatement and by the Landfill operator voluntarily, and that the collection capacity is much more capable than it was in 2011 or 2012.

Landfill operations have significantly changed over the years and so has the solid waste composition. With the passage of AB 939 (Sher - Integrated Waste Management Act of 1989), the composition of municipal solid waste has changed significantly. In the past when the in-place landfill trash densities were much lower in value than those achievable in today's operating practices (1,900+ pounds per cubic yard), a six inch daily soil cover, although a discrete layer when applied, would eventually be indistinguishable with the solid waste because the soil would disperse and move into the interstitial volume and just become part of the overall solid waste mass. This can be observed in borings taken from old landfill; no distinct "daily soil cover" layer is observable.

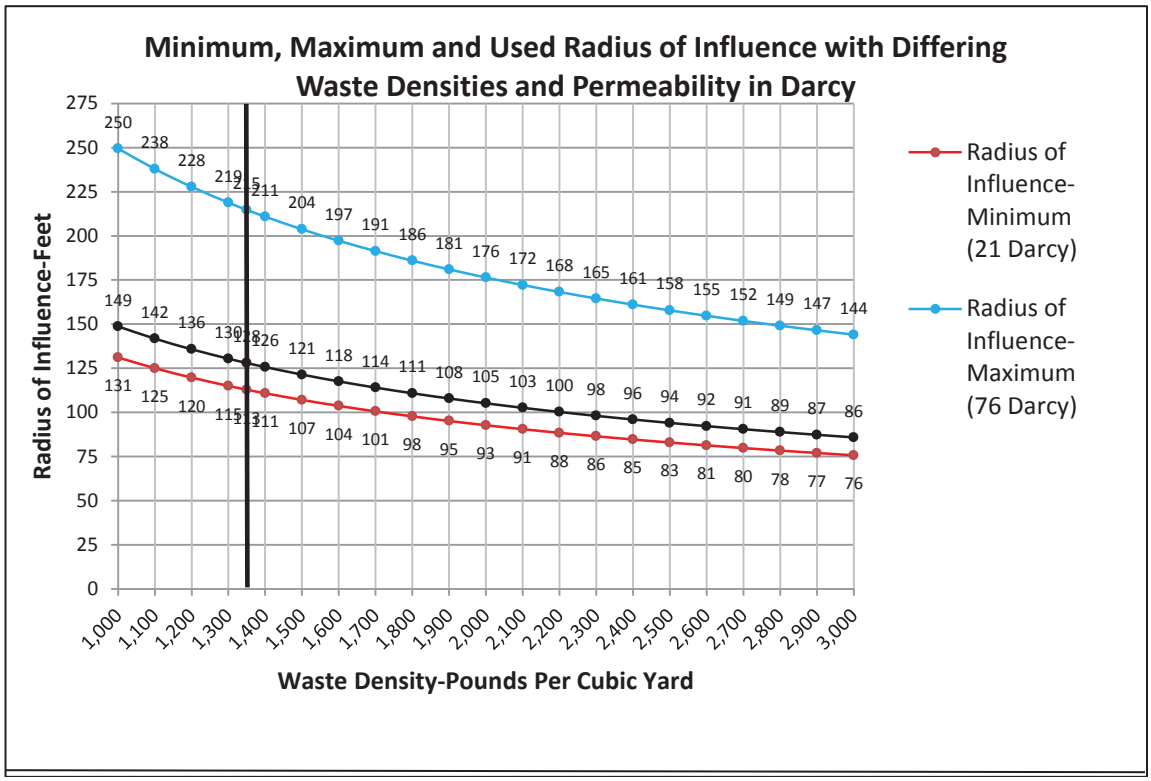
The Task Force believes that using the concept of intrinsic permeability, one can generally correlate flows of water to flows of landfill gas and therefore to the flow of odors (e.g., odorous compounds carried by landfill gases). Intrinsic permeability is a characteristic of any porous medium and entirely independent of the nature of the fluid – whether gas or liquid. Simplifying from Darcy's Law for water and gas flow through a permeable medium and solving for the intrinsic permeability coefficient in common, and thus one can calculate volumetric flow of landfill (higher density, less permeability, more soil, higher density, equals less permeability).

Radius of Influence of Gas Collection Wells

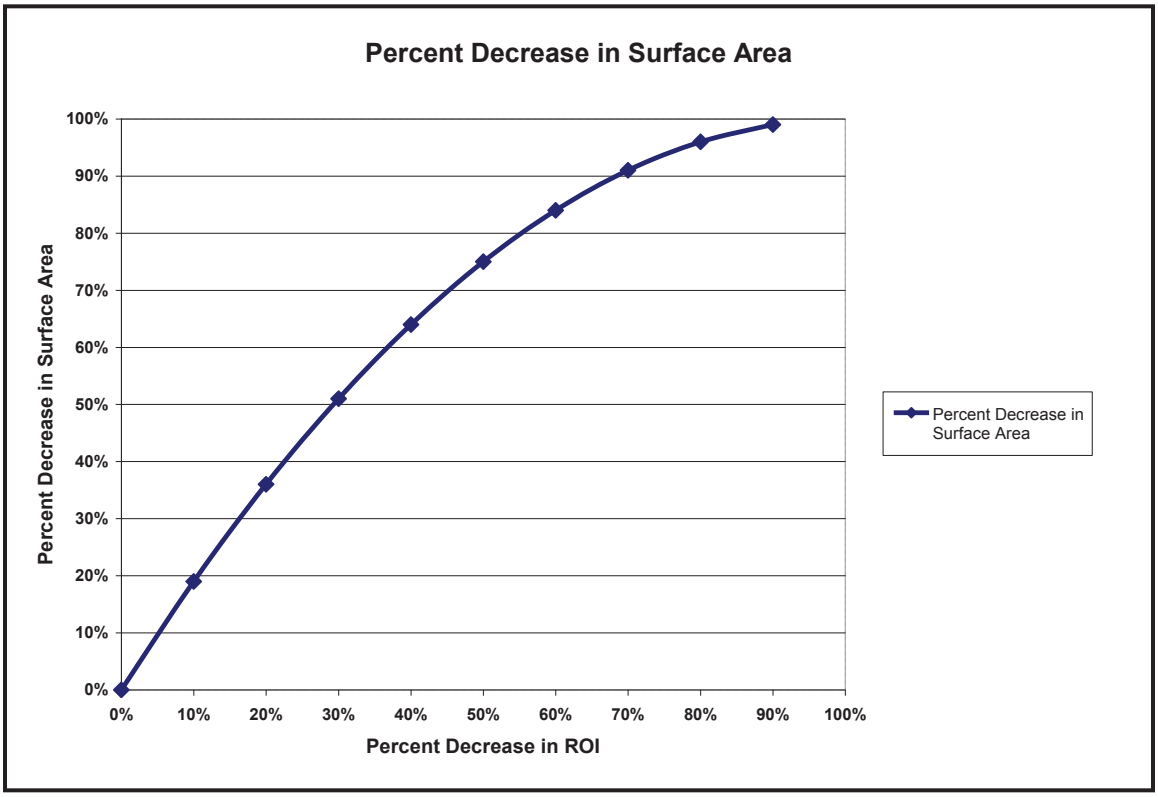
A primary issue discussed between the Task Force members dealt with the radius of influence needed for effective collection of the generated landfill gases and the overall collection efficiency needed for the control of odors. One of the key factors in the design of a landfill gas collection system is the determination of the needed well spacing. One of most important factors is the density of the in-place mass. The initial density used by the Landfill operator's consultant, Bryan A. Stirrat (BAS) for the calculation of the radius of influence was 1,350 pounds per cubic yard (assumption used in calculation). The SCL LEA's opinion is that this value is too low, which would result in a radius of influence that this greater and thus a less dense well location density needed for achieving a specific landfill gas collection efficiency.

The radius of influence is important due to the volume of gas being collected; if using the volume of a cylinder as the theoretical volume of the effective vacuum, the volume is proportional to the square of the radius, so that a 10% decrease in the radius of influence results in an impact of 20% of the volume (or surface area of the circle) from which the landfill gas collection well draws from.

Below are several graphs that illustrate the relationship between density and radius of influence. The SCL LEA's consultant calculated the approximate radius of influence as a function of density, with a range (minimum / maximum) with different permeability values.



Source: E.Tseng and Associates, Feb. 2013



Source: E.Tseng and Associates, Feb. 2013

The estimated in place density of trash (in the areas where the 9 inch daily soil has been a requirement) by doing a rough calculation based on data supplied by the Landfill operator.

Data used in the density calculation:

- Days between flyovers from 2/28/11 and 2/10/12 = 347
- Tonnage of waste received at the gate and buried between flyover dates is 2,301,010 tons
- Total weight of 9" soil cover approximated at 896,000 cubic yards at 105 pounds per cubic foot is 1,270,080 tons
- Volume of consumed airspace between flyover dates = 3,133,472 cubic yards
- Add 1,272,080 tons to 2,301,010 tons for total weight of materials in the 3,133,472 cubic yards volume

The actual density of the materials (combined solid waste and daily/intermediate cover) that should be used as the density factor for the calculation of the radius of influence is approximately 2,269 pounds per cubic yard. The density of the solid waste (by itself) at Sunshine is calculated to be approximately 2,056 pounds per cubic yard. According to the Los Angeles County Sanitation Districts (LACSD), the average density of the in-place trash only (called LF waste density) for PHLF is about 1,960 lbs/yd^3. Puente Hills Landfill uses a 50:50 mix of shredded greenwaste with clean soil as daily cover, and the average density of in-place trash and daily/intermediate covers (airspace utilization density) for Puente Hills Landfill is 1,405 lbs/yd^3.

Also, as previously stated, the waste composition has significantly changed compared to the development of the US EPA AP - 42 standards. Municipal solid waste has more moisture content, is denser, and the initial landfill gas generation will occur quicker and produce greater volumes that municipal waste from the pre-AB 939 implementation. In recognition of this change, the Landfill operator utilized a more recent composition of the municipal waste stream in its calculation of the landfill gas generation. As of December 2012, the Landfill operator's consultant BAS, is now utilizing approximately 1,700 pounds per cubic yard for calculating the radius of influence (ROI) of landfill gas wells. If the estimated density of 2,269 pounds per cubic yard is used for the ROI calculations, the ROI will decrease to less than 100 feet, and when combined with an "overlap" of 30% - 40%, the needed well spacing will be significantly lower than the approximate 200 feet being utilized in the current design.

The general design spacing of the vertical gas collection wells at the Puente Hills Landfill calls for 150 – 200 feet spacing, with 200 feet being typical. Note that at Puente Hills Landfill, the landfill gas well spacing is similar to the design standard of that of Sunshine Canyon Landfill. The big difference is that the density of the mixed greenwaste and soil combination daily cover is much lower than that of the solid waste being disposed, which creates the increased permeability needed for landfill gas movement needed for optimum gas extraction and to promote downward flow of leachate.

BAS has indicated that there are limited well depths to 120 ft. in their designs for cell CC2 and that the density for 0-120 ft. is less than the average for 0-250 ft. depth (the max depth of cell CC2 refuse). BAS notes that the gas of most significance is that within the slotted depth of gas extraction well. However, landfill gas is being generated at all depths including depths beyond the slotted collection pipes. If there is no extraction vacuum, landfill gas pressure will build and eventually migrate to the ground surface and be released, where it is not collected.

Note that even if a daily soil cover of six inches instead of the current nine inches were used, the estimated density would decrease to approximately 2,221 pounds per cubic yard, and the resultant change in the radius of influence is a decrease of approximately two feet. In the literature review, both the SWANA MOLO course materials and also the CalRecycle training materials on landfill gas and/or leachate management recommend using alternative daily covers to promote leachate movement downward and to promote landfill gas collection (in recognition of the soil layer's ability to become an impediment to landfill gas movement and leachate flow.

As previously noted, the landfill gas collection system should be designed for 100% collection efficiency with a safety factor to deal with extraordinary gas generation (e.g., increased generation after wet weather). Even with the implementation of the landfill gas-to-energy project, the collection capacity should still be based on the volume of 100% landfill gas generation.

<u>Considerations with Regard to the Daily Soil Cover Requirement</u>

The Los Angeles County Conditional Use Permit (No. 00-194-(5)) under Item 45(N) can require Republic to implement additional corrective measures, in this case 9 inches of daily soil cover, when such measures are deemed necessary. The Task Force has received information that the use of 9 inches of daily cover soil, while effective at reducing fresh trash odors at the working face of the landfill, may slow down the vertical movement of leachate and gases across the landfill cells. Peeling back a portion of the 9 inch daily soil cover under prescribed conditions is an option being considered in combination with other odor mitigation measures to potentially enhance the efficiency of the gas collection system.

Summary

To summarize the Task Force's analysis, the highest priority and the most significant impact to reducing the odors related to landfill gas is to ensure the continued implementation of a well-designed, operated, and maintained landfill gas collection system. The optimal approach would focus on the best combination of facility design features, operational practices, practical preventative programs, daily and intermediate cover requirements, and odor mitigation programs that provide the optimal operating conditions of the gas collection system, to effectively collect the landfill gas that is generated and minimize unintentional releases of landfill gas.

At the same time, programs should also be implemented to mitigate the offsite migration of fresh trash odors in addition to measuring, verifying and documenting quantifiable environmental metrics utilized to benchmark and measure progress in the mitigation of odors.