DOES ANYONE WANT ORANGE COUNTY SANITATION DISTRICT'S 230,000 TONS OF BIOSOLIDS?

PREPARED BY
2003-2004 ORANGE COUNTY GRAND JURY

SUMMARY

Orange County Sanitation District (OCSD) produced more than 230,000 tons of biosolids (treated sewage sludge) in 2003 and beneficially used 100 percent of the material — primarily as a fertilizer and soil amendment on farms in California, Arizona and Nevada. Increasing public opposition to the practice has impacted OCSD's current biosolids management program and prompted OCSD to conduct a comprehensive assessment of alternative, more expensive options. Continuing the current program of applying biosolids on farm land will delay the need to implement more costly methods of disposal but will require proactive measures to broaden public tolerance of the practice. Treating all biosolids to higher quality standards prior to land application would eliminate much of the public's concern regarding potential threats to public health and the environment. Compiling and responding to public health concerns and nuisance issues by soliciting comments from affected parties, regulatory agencies, vendors and local officials would demonstrate a commitment to minimizing impacts. Participating in a national survey to quantify contaminants in biosolids could help eliminate persistent uncertainty regarding potential risks from pharmaceuticals, health-care products and other emerging compounds. Implementing a comprehensive monitoring program at a land-application site could demonstrate that treatment and application methods do, in fact, provide an adequate level of protection for the public.

INTRODUCTION

Biosolids are nutrient-rich materials that are a by-product of the wastewater treatment process. Orange County Sanitation District (OCSD), which collects and treats sewage wastes from about 2.3 million Orange County residents, produced more than 230,000 tons of biosolids in 2003. Owing largely to a 2002 decision by the OCSD Board of Directors to implement full secondary treatment of wastes prior to ocean disposal, total production of biosolids is expected to increase to approximately 325,000 tons per year by the year 2020.

Currently, OCSD beneficially uses 100 percent of the produced biosolids by delivering them to willing farmers who use the material as a fertilizer and soil amendment on crop lands. Utilizing biosolids on agricultural lands is an economical management approach but the practice has generated considerable controversy. OCSD has recognized that more-acceptable alternatives must be developed but also realizes that new methods will have higher costs. While OCSD evaluates other technologies, it hopes to continue to use existing land-application agreements and permits. Even if new methods to beneficially use

biosolids are developed through pilot studies, the cost advantages of land application will continue to make it an attractive option. To keep land application of biosolids a viable option, OCSD will need to implement changes in procedures to minimize public opposition.

PURPOSE OF THE STUDY

The purpose of the study was to review OCSD's existing biosolids management programs and long-range plans in light of recent developments to determine if modifications are warranted. The study also considered opportunities to enhance public acceptance of existing programs, which could extend the timeline for eventual conversion to more-viable options and postpone the inevitable expenditure of funds to develop alternatives for biosolids recycling.

SCOPE OF THE INVESTIGATION

Interviews were conducted with OCSD personnel in the biosolids program to gather information about current operations and long-range plans. An Environmental Protection Agency (EPA) biosolids specialist was contacted to gain insight into changes in public perceptions regarding land application of biosolids. A private vendor with expertise in land application of biosolids provided authoritative information on problems associated with agricultural use of biosolids. A Congressional Fellow with expertise in environmental issues and familiarity with one of OCSD's biosolids sites provided information about local concerns regarding quality-of-life issues and potential environmental problems. A private citizen who lives near an OCSD biosolids land-application site was interviewed to determine which issues are of major concern to affected neighbors.

Numerous reports, compliance documents, and fact sheets prepared by OCSD and their consultants were reviewed to gain information about programs and plans. Numerous Internet Web sites were visited to gain a sense of public perceptions and concerns regarding land application of biosolids. Scientific and technical literature was consulted to obtain factual information about the real and perceived problems and to determine the present state of scientific knowledge.

HISTORY OF OCSD BIOSOLIDS MANAGEMENT PROGRAM

OCSD began recycling biosolids in 1971 when it contracted with a local fertilizer manufacturer to haul and compost material. The contract ended in 1979 when the company lost its land lease and terminated the composting operations.

After the composting operations ceased, OCSD established and operated an air drying/composting site at the Orange County Coyote Canyon Landfill. Biosolids were dried and composted to 50-percent solids content, blended with municipal solid wastes and deposited in the landfill. Biosolids were also delivered to the BKK Landfill (a private site owned by BKK Corporation) in West Covina. Landfill dumping was the principal method of biosolids disposal from 1979 until 1988.

In 1988, OCSD developed contracts with composting firms and agricultural land appliers to beneficially use as much as 50 percent of produced biosolids. The recycling program grew rapidly and in November 1991, OCSD achieved 100-percent utilization of biosolids (primarily as a fertilizer and soil amend-ment on farm lands, but small amounts were also used as Alternative Daily Cover at landfills) and has continued full recycling since then.

OCSD has used biosolids on farming sites in San Bernardino, San Diego, Riverside, Kern and Kings Counties, California; La Paz, Maricopa, Mohave and Yuma Counties, Arizona; Nye County, Nevada; and Tribal Lands of the Mohave Indian Reservation in California, Nevada and Arizona.

In June 2000, OCSD purchased 1800 acres of farm land in Kings County, California, to provide a reliable, long-term site for treatment and land application of biosolids.

In recent years, OCSD has been frustrated by the passage of local ordinances and rules that have restricted use of sites, required costly treatment before application, or completely banned the use of biosolids. These restrictive local ordinances and mounting public opposition portend an eventual end to direct use of biosolids on farm lands.

In 2003, OCSD commissioned a comprehensive study to assess sustainable options for beneficial use of biosolids. The study concluded that biosolids could be used to produce compost, dry pellets and granules, or organo-mineral fertilizer products for use in horticulture (homes, nurseries and parks) and silviculture (shade-tree programs). The report also identified direct energy production (using biosolids cake and dry pellets as a fuel source) as a viable option. The report acknowledged that it will take time to implement the long-range biosolids management plan and noted that OCSD needed to maintain its current land-application capacity and options during the implementation process. While acknowledging that land application would be an integral part of OCSD's biosolids management program for the near term, the report offered little guidance on ways to prolong the practice.

NATIONAL TRENDS IN BIOSOLIDS UTILIZATION

Recycling of biosolids for beneficial use has been commonplace for centuries in China where "nightsoil" is considered to be a valuable commodity. In the U.S., however, recycling gained acceptance only after disposal of sewage waste became problematic. The city of Boston began using sewage biosolids for fertilizer as early as 1907 but, until the passage of the Clean Water Act in 1972, many communities simply discharged wastes into the nearest waterway. With the passage of the Clean Water Act (and subsequent laws that restricted dumping of municipal wastes into the ocean), communities began to manage biosolids in more environment-friendly ways. The methods most commonly used were disposal in landfills, land application and incineration.

In 1993, EPA promulgated Standards for the Use and Disposal of Sewage Sludge (Code of Federal Regulations Title 40, Part 503), which established rules for land application of biosolids. Only biosolids that meet regulatory requirements for pathogens (disease-causing bacteria and viruses), vector- attraction reduction (to minimize problems associated with flies, mosquitoes, rodents and other pests that can transport pathogens), and metal content can be applied to land.

The pathogen reduction and vector-attraction reduction requirements are presumptive, rather than measured limits. Biosolids are presumed to meet the pathogen and vector requirements if certain specified treatment processes are employed. The metal limits, however, require laboratory testing to determine concentrations in the biosolids.

Part 503 divides biosolids into either Class A or Class B. Class A biosolids must be treated to reduce pathogens to non-detectable levels. Class B biosolids receive sufficient treatment to ensure that pathogens have been reduced to a level protective of public health if used in a prescribed manner. Both Class A and Class B biosolids must meet specified vector-attraction reduction guidelines. Concentrations of certain heavy metals in both Class A and Class B biosolids must meet regulatory limits before they can be approved for land application. There are ceiling limits for the metals and more stringent, high-quality pollutant limits. Biosolids that meet the ceiling limits but not the higher standards can be applied to land only until cumulative limits are reached. High-quality biosolids can be applied without tracking loading limits as long as the application rate does not exceed agronomic rates (application rate matched to the nutrient needs of the crop).

Following passage of Part 503, use of biosolids as a fertilizer and soil amendment on farm lands gained wide acceptance by the agricultural community and the wastewater industry. A nationwide assessment of biosolids management by EPA found that (in 1998) 60 percent of the nation's biosolids were being recycled — 41 percent was applied directly to farms, 12 percent received advanced treatment before land application and another 7 percent was used as landfill cover or mixed with aggregate. The non-recycled remainder (about 40 percent) was either incinerated or deposited in landfills.

Although most farmers and those associated with treating, hauling and applying biosolids were comfortable with assurances from EPA that properly treated wastes could be safely applied to suitable farm land, the general public had reservations about the practice. Many expressed concern about potential health risks from unknown contaminants or undefined pathogen pathways, noxious odors and other quality-of-life issues, and threats to natural resources.

The public concerns about the Part 503 rules prompted EPA to request an independent audit of the program by the EPA Office of the Inspector General. In March 2000, the Inspector General concluded that there was a significant lack of oversight and resources committed to the program. The audit noted that EPA had one person in Region 9 assigned to oversee all of the biosolids programs in California, Nevada, Arizona and Hawaii. In 1988, EPA conducted field inspections at only 18 land-application sites in the entire Region and had initiated a total of three enforcement actions. Although EPA can delegate authority for Part 503 to states, only five states (California is not included) have received official delegated authority to enforce the regulations.

In 2000, EPA asked the National Research Council (NRC) of the National Academy of Sciences to conduct an independent evaluation of the technical methods and approaches used to establish the chemical and pathogen standards for biosolids. Eighteen months later, NRC issued a lengthy report that contained about 60 specific recommendations for program improvement. EPA issued a final response to the NRC report in the Federal Register in December 2003. EPA, citing limited resources, announced that it could implement 14 projects in 2004 to, among other things, survey targeted contaminants in sewage sludge, develop methods to identify pharmaceuticals and personal care products in sewage sludge, participate in incident-tracking workshops and conduct field studies at selected land-application sites.

The National Biosolids Partnership (NBP) — a coalition of private water and sewer associations and EPA — developed a model Environmental

Manage-ment System (EMS) to assist operators of sewage treatment works to establish biosolids management programs that exceed the requirements set forth in Part 503. Participants in the program must commit to following NBP's Code of Good Practice, document responsibility for all biosolids management practices and submit to third-party review before certification. In keeping with its outstanding record of leadership in wastewater treatment, OCSD agreed to participate in the program in July 2000. On July 17, 2003, OCSD became the first wastewater treatment facility in the nation to receive formal certification for their EMS.

STATE AND LOCAL REGULATIONS

In California, the Department of Health Services and the State Water Resources Control Board share responsibilities for regulating the beneficial use and disposal of biosolids. Health Services determines whether biosolids are a hazardous or non-hazardous material, and the Water Resources Control Board (through nine regional boards) administers and enforces regulatory requirements. State biosolids regulations incorporate conditions outlined in the EPA Part 503 rule. In addition, state permits require detailed site information and adherence to California Water Environment Association's Manual of Good Practice for Agricultural Land Application of Biosolids.

Other state regulations on biosolids have been issued by the Integrated Waste Management Board, the Department of Food and Agriculture, the Department of Toxic Substances and the Air Resources Board.

A statewide Environmental Impact Report (EIR) on use of biosolids as a soil amendment produced a General Order that added specific requirements related to moisture content of biosolids, wind conditions, depth to ground water, testing of plant tissue for selected metals and annual soil testing for residual nitrogen. The EIR is currently being revised. A draft version of the EIR acknowledges that land application of Class B biosolids is an environmentally superior option compared to use of Class A biosolids when transportation and energy costs are considered.

Several counties have issued ordinances regarding land application of biosolids. Kern, Kings and Riverside Counties, for example, all have issued ordinances that ban land application of Class B biosolids. Many of the local ordinances have been challenged in court, and some cases are still being litigated.

In Arizona, local ordinances have placed strict regulations on, or established permit fees that severely limit, biosolids application on farm land.

PUBLIC OPPOSITION TO LAND APPLICATION OF BIOSOLIDS

Opposition to land application of biosolids usually falls into one or more of three concerns: (1) apprehension about the adequacy of regulations to protect public health, (2) odors and other quality-of-life issues and (3) protection of natural resources.

Public-Health Issues

Those who support the contention that land application poses no risk to the public often quote the opening statement in the "Overarching Findings" section of NRC's review of Part 503:

> *"There is no documented scientific evidence that the Part 503 rule has failed to protect public health."*

Conversely, those who question the adequacy of the rule find substantial support for their views in the sentences that follow the opening statement:

> *"However, additional scientific work is needed to reduce persistent uncertainty about the potential for adverse human health effects from exposure to biosolids. There have been anecdotal allegations of disease, and many scientific advances have occurred since the Part 503 rule was promulgated. To assure the public and to protect human health, there is a critical need to update the scientific basis of the rule to (1) ensure that the chemical and pathogen standards are supported by current scientific data and risk-assessment methods, (2) demonstrate effective enforcement of the Part 503 rule, and (3) validate the effectiveness of biosolids-management practices."*

Much of the current controversy seems to focus on the term "persistent uncertainty." Advocates for land application of biosolids suggest that the "uncertainty" is in the minds of the uninformed public who refuse to accept the contention that there is "no scientific evidence" that public health has been threatened. On the other hand, those with an aversion to exposure to biosolids are quick to argue that the "uncertainty" is in the lack of credible scientific studies to verify that biosolids are truly risk-free. They note the existence of countless pathogens and multitudes

of emerging chemicals (pharmaceuticals, health-care products and industrial compounds, to name a few) known to be present in raw municipal wastes that may pass through the treatment process in concentrations sufficient to constitute measurable risks to the public.

Although there have been lengthy debates in the scientific community regarding potential health risks associated with exposure to biosolids, little has been said about psychosomatic reactions to perceived hazards. Skin rashes, respiratory problems, headaches, gastro-intestinal distress and numerous other maladies can be manifested by real or imagined exposure to toxic substances. It is generally accepted that psychosomatic reactions are exacerbated when affected individuals personally observe evidence that they have been exposed to hazardous substances (e.g., odors, flies, trucks transporting wastes, spreaders broadcasting biosolids).

Odors and Other Quality-of-Life Issues

The single most common complaint about land application of biosolids relates to odors. Part 503 never directly addresses the issue of odor because EPA considered odor to be subjective and not within its authority to regulate. In various publications, EPA has acknowledged that odor may be present but is difficult to characterize because of differences in treatment and other factors. Their descriptions of biosolids odor often include such terms as “musty,” “earthy” and “ammonia.” OCSD’s description of biosolids odor parallels those of EPA but adds “salt water smell” for biosolids that have been treated with organic polymer additives.

The differences between the benign terms used by EPA and OCSD and the terms used by those living near land-application sites are profound. The more folksy terms found in complaints include “noxious,” “horrible,” “putrid,” “nauseating,” “eye-watering” and “sickening.”

An interesting table in the previously mentioned NRC report (Table 5-14) provides a more scholarly basis for assessing biosolids odor. The table contains a list of odorants generated during sewage treatment and characterizes the smell of compounds that have been detected in biosolids. Hydrogen sulfide, as most people know, smells like rotten eggs. Dimethyl sulfide and carbon sulfide have the odor of decayed vegetables. Thiocresol imparts a rancid odor reminiscent of skunk. Methylamine, dimethylamine and trimethylamine have an odor that is described as fishy. The odor of pyridine is characterized simply as disagreeable and irritating. Nitrogenous compounds, indole and scatole (the name provides a clue), have a nauseating fecal smell. In all fairness, acetaldehyde is reported to smell like apples. One can only imagine what

odor might emanate from a concoction of these compounds. "Musty" or "earthy" doesn't come to mind.

Quality-of-life issues are those that aren't necessarily life threatening but nevertheless have a negative impact on nearby residents. Common concerns include increased truck traffic on local roads, blowing dust from agitated farm lands, a perceived increase in the number of flies and mosquitoes, negative impacts on crop values and depressed real estate values.

Natural Resources

Although Part 503 purports to provide adequate protection for ground- and surface-water supplies, monitoring requirements are minimal or non- existent. State regulations are somewhat more restrictive than the federal regulations, but controls are generally programmatic and related to permitting, not periodic monitoring. Land application of biosolids poses the same risks to natural resources (primarily water supplies) as any other farming practice with the added concerns of pathogens and toxic compounds.

Two important pathways for contamination of water resources — runoff from treated lands and deep percolation of excess irrigation water or precipitation — are difficult to control or mitigate. Ground-water supplies can be rendered undrinkable if applied fertilizer (either commercial chemical products or biosolids) is leached from the soil by excess irrigation water or precipitation. Erosion can present problems if sediment washed from farm land contains biosolids. Sediment transported into waterways could pose a threat to stream biota.

A LITANY OF FRUSTRATIONS

OCSD's biosolids management program is faced with an increasing level of public opposition. Despite OCSD's laudable and award-winning efforts in environmental excellence (i.e., source-control programs, participation in the Ground Water Replenishment System, commitment to full secondary treatment of wastes prior to discharge to the ocean, 100-percent beneficial use of biosolids and certification for the nation's first EMS), the public continues to have concerns about human health risks and nuisance issues.

Clear and convincing evidence of the tenuous future of biosolids land application as a means of recycling is provided in a brief review of recent developments that have affected OCSD land-application projects.

In 1999, Kern County adopted an ordinance that bans land application of all except the highest quality biosolids and established extensive monitoring requirements. In an attempt to retain the option of applying Class B biosolids, OCSD and others filed suit to vacate the ordinance. In 2002, the court upheld Kern County's right to control biosolids use. In 2003, the ordinance was expanded to include permitting, reporting, testing and inspection that are to be supported by beneficial-use fees.

In Kings County (where OCSD had purchased farm land for the sole purpose of beneficially using Class B biosolids), lengthy discussions between agricultural interests, land appliers and the public resulted in the adoption of a ban on Class B biosolids beginning in 2003. Use of Class A biosolids is allowed until 2006, but only composted Class A biosolids can be applied after that date. Again, OCSD filed suit to overturn the ordinance but, thus far, has been unsuccessful.

In 2001, Riverside County issued an ordinance that banned the use of Class B biosolids for land application but allowed limited use of Class A biosolids. In 2003, the restrictions were expanded to address nuisance problems related to Class A biosolids.

Although Arizona still allows application of Class B biosolids, OCSD has experienced problems with operations in Mohave County where a newly adopted permit fee makes application uneconomical. In addition, a composting and landfill-cover contract used by an OCSD vendor in La Paz County was suspended because of surety-bond issues.

In Nye County, Nevada (where OCSD's vendor obtained a five-year permit to land-apply Class B biosolids in May 2003), complaints from affected neighbors resulted in cessation of operations in March 2004.

OPTIONS FOR THE FUTURE

In light of the frustrations that OCSD has experienced in preserving its program of land application of biosolids, it is apparent that operational adjustments are in order. If the expectations outlined in OCSD's long-range biosolids management plan (e.g., continued land application during the conversion to higher-cost, more environmentally-acceptable options) are to be realized, OCSD will have to redouble its efforts to overcome public perception problems. Specifically, OCSD must address the issue of "persistent uncer-tainty on the potential for adverse health effects" that NRC described in its review of land application of biosolids.

Actions that could bolster public tolerance of OCSD's biosolids management program include:

- Treating all biosolids to Class A standards by lime addition and/or composting and terminating all existing Class B land-application projects except in remote locations
- Initiating a comprehensive incident-report data system for all land-application projects to expand OCSD's tracking program
- Participating in a nationwide biosolids-characterization project
- Conducting environmental-monitoring programs at selected sites

Terminating Class B Land-Application Projects

Increasingly restrictive local ordinances and growing public resistance has virtually eliminated opportunities to initiate new Class B land-application projects except in remote locations with no nearby residents. Current Class B land-application projects may continue for the foreseeable future but are subject to termination at any time. OCSD would be prudent to abandon hopes of securing future Class B land-application sites and should initiate action to eliminate existing projects. Stablilizing all biosolids with lime and/or composting to Class A standards before land application would demonstrate to the public that OCSD is sensitive to nuisance problems and public-health issues.

Implementing an Incident Reporting System

OCSD has an excellent track record in leading the nation in various biosolids programs (source controls and development of an EMS). Expanding on that leadership role by initiating a pilot comprehensive incident-report data system would demonstrate sincere commitment to addressing the concerns regarding public health and nuisance issues. NRC recommended implemen-tation of a tracking system to document allegations and sentinel events (clusters of health problems or other unusual incidents associated with a land-application site). EPA agreed that an incident-tracking program would be useful in responding to alleged health problems but argued that knowl-edgeable stakeholders should design and manage the system.

To be effective, an incident-report database would need to include more than just complaints submitted to OCSD. To be complete, the database also would have to include complaints addressed to permitting agencies, land-owner/appliers, haulers, health officials and government representatives; reports from regulators and site inspectors; and solicited observations (written questionnaires) from residents living or working in the vicinity of the site. The database should contain responses to all

complainants from OCSD, haulers and regulating agencies (it is presumed that OCSD would provide thoughtful written responses to all complaints, whether addressed to them or not). A comprehensive incident-report data system would be invaluable in assessing allegations of non-compliance and documenting clusters of health complaints that might require special attention.

Biosolids Characterization

NRC's review of the adequacy of Part 503 rules noted a need to better define the occurrence and concentrations of emerging compounds in municipal waste streams. EPA acknowledged a need for more advanced methodologies to identify and quantify newly developed chemicals and recently identified pathogens. Citing limited funds in the current budget, EPA proposed future studies to address the issue. However, EPA did agree to conduct a targeted survey of pollutants deemed to present potential hazards to the public.

OCSD currently performs a wide variety of analytical tests on biosolids and could contribute substantially to a targeted nationwide biosolids-characterization project. Selecting emerging compounds and pathogens of local interest and developing laboratory analytical techniques to investigate the efficacy of waste-treatment processes would help answer concerns raised by NRC's review. Identifying the principal compounds is only part of the task. There is also a need to identify daughter compounds (metabolites) that are produced during the treatment process. Metabolites sometimes pose higher risks to public health than the original compound itself. Documenting and sharing newly developed laboratory and analytical methods with other waste-treatment entities could reduce research-and- development costs for sister agencies. More importantly, sharing the results of pollutant surveys with national audiences would help EPA determine if adjustments are needed in Part 503 rules.

Environmental Monitoring

EPA and state regulations related to land application of biosolids rely heavily on presumptive methods to ensure protection of public health. NRC noted a paucity of field data to verify that accepted practices are indeed protective. In response to NRC's recommendation, EPA announced that they would initiate field investigations at selected sites to determine if pathogen and chemical requirements of Part 503 are being met. They indicated that they would seek participation from state and regional stakeholders to conduct field studies at up to five locations in the coming year. OCSD could exercise leadership by volunteering to participate in the effort and implement a full monitoring program at a biosolids site (including soils, plants, water, air and vectors). The findings would be invaluable in demonstrating that local treatment and

land-application processes do, in fact, serve to protect public health and the environment.

FINDINGS

Under *California Penal Code* §933 and §933.05, responses are required to all findings. The 2003-2004 Orange County Grand Jury has arrived at the following findings:

1. Public opposition to land application of Class B biosolids is increasing, and long-term viability of the practice is tenuous.

2. Continuation of Class A biosolids land-application programs can postpone expenditure of funds to develop other viable alternatives.

3. Developing alternatives to replace Class B biosolids land-application programs will increase the cost of beneficially using biosolids.

4. Public tolerance for Class A biosolids land-application projects can be enhanced by demonstrating commitment to protecting public health and addressing nuisance issues.

5. Participating in EPA programs to develop a national incident-report data system, conducting surveys of emerging compounds and pathogens in waste streams, and implementing monitoring programs at a land-application site would demonstrate Orange County Sanitation District's commitment to protecting public health and addressing nuisance issues.

Responses to all findings are required from the Board of Directors of the Orange County Sanitation District.

RECOMMENDATIONS

In accordance with *California Penal Code* §933 and §933.05, each recommendation requires a response from the government entity to which it is addressed. These responses are to be submitted to the Presiding Judge of the Superior Court. Based upon the findings, the 2003-2004 Orange County Grand Jury recommends that:

1. Orange County Sanitation District phase out Class B biosolids land-application programs except in remote

locations where no nearby residents will be impacted. (Finding 1)

2. Orange County Sanitation District develop plans to stabilize all biosolids through lime application and/or composting to Class A standards. (Findings 1 and 2)

3. Orange County Sanitation District formulate a schedule and costs for implementing a long-range biosolids management plan, and inform the public of anticipated cost increases. (Findings 2 and 3)

4. Orange County Sanitation District explore opportunities to partner with EPA in developing an incident-report data system, conducting a local survey of emerging compounds and pathogens in sewage wastes, and/or implementing a monitoring program at a biosolids land-application site. (Findings 4 and 5)

Responses to all recommendations are required from the Board of Directors of the Orange County Sanitation District.

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