

Industrial Scale Composting and Off-Site Odor Mitigation

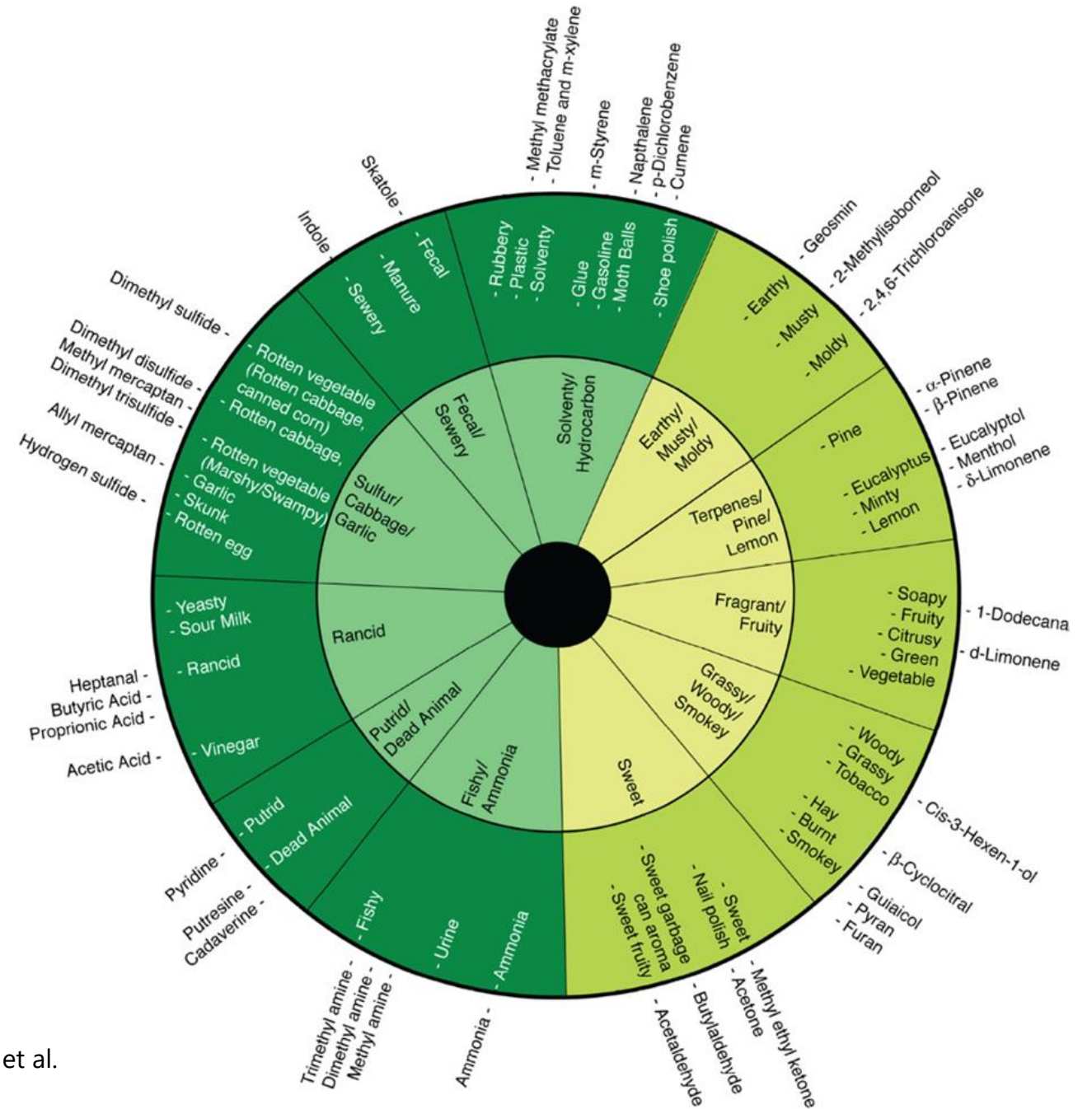
G. Simmons for N. Marina Odor Group

- Food waste composting
- Weather conditions favoring odor problems
- Odor complaints and compost odor wheel
- BMPs, CalRecycle, other states, B.C.
- Composting technology
- Resources

Compost odor wheel

Eleven odor categories:

- (1) fishy/ammonia;
- (2) fragrant/fruity;
- (3) terpene/pine/lemon;
- (4) solventy/hydrocarbon;
- (5) grassy/woody/smoky;
- (6) earthy/musty/moldy;
- (7) rancid;
- (8) putrid/dead animal;
- (9) sweet; (
- (10) sulfur/cabbage/garlic;
- (11) fecal/sewery.



Odor Impact Management Plan and Best Management Practices

(from attached CalRecycle document)

- State Minimum Standards , CalRecycle
- Odor impacts?
 - Complaint investigations
 - Routine inspections
- What happens if chronic odor impacts occur but OIMP is being followed?
 - BMPs recommended, requires feasibility report
- BMPs can include:
 - How to handle high odor causing materials (e.g., manure, food and sludge)
 - Storage, transport, mixing
 - What material to accept in the facility
 - House keeping and maintenance
 - Siting of compost operations
 - Recommended technology mitigations
 - Communication with public and established complaint systems

Food Waste Composting

- Compared to green waste food waste has potential to generate most foul odors
 - *Receiving and storage before incorporation into compost*
 - *During incorporation phase*
 - *During composting pile can become anaerobic quickly*
- Some BMPs for commercial composting ***don't allow open static pile windrow*** methods for food wastes, has to be conducted in enclosed structures (Metro Vancouver B.C., others)
- Recommended technology to mitigate odors includes:
 - *Aerated Static Piles with capped with material to stop off gassing*
 - *Biocaps*
 - *Active Biofiltration of air*
 - *Enclosed Negative pressure buildings*
 - *Misting and deodorant systems*
- Proximity to urban areas, topography, prevalent wind, and volume of food waste processing all have to be taken into account

Composting technology for food wastes



Biofiltration of air to scrub odors



Aerated Static Pile



Green Mountain Technologies. commercial-scale in-vessel composters



240 million lb./yr. facility in Pennsylvania

Environmental meteorology and odor movement

- Factors that can influence odors moving off site or not dispersing into the atmosphere (up and away)
 - Nighttime ground temperature and temperature inversions (hotter air above, common in fall and winter) trap pollution and odors (fog!) at ground level.
 - Topography and cold air drainage
 - Landfill and compost odors are denser than air and follow cold air drainage pathways (odors move downhill: MRWMD ~ 130 ft, N. Marina ~ 20-50 ft.)
 - Site topography affects wind movement, speed, and turbulence
 - Wind speed and direction
 - Relatively high wind speeds needed to disperse odors >13 MPH
 - Nighttime Wind speed and direction can have a big impact, at lower wind speeds other factors beside direction have greater impact.

Some References: Composting Odor Mitigation, BMPs & and Environmental Meteorology

Comprehensive studies on composting Odors and Mitigation Technology:

- Comprehensive Compost Odor Response Project Report CalRecycle Report #442-2007-0001 2007: <https://www2.calrecycle.ca.gov/Publications/Details/1241>
- Odor in Commercial Scale Compost: Literature Review and Critical Analysis, WA. Dept of Ecology & WSU 2013: <https://apps.ecology.wa.gov/publications/documents/1307066.pdf>

Best Management Practices and Odor Wheel:

- CalRecycle: <https://www.calrecycle.ca.gov/SWFacilities/Compostables/BMP/>
- BEST ODOUR MANAGEMENT PRACTICES AT COMPOSTING FACILITIES Metro Vancouver, 2017 http://www.metrovancouver.org/services/solid-waste/SolidWastePublications/Composting_Best_Practices_Study_Final_Report.pdf
- **Odor Wheel:** M. Suffet, I. H., et al. (2009). "Sensory Assessment and Characterization of Odor Nuisance Emissions during the Composting of Wastewater Biosolids." Water Environment Research 81(7): 670-679.
- **Odor Wheel:** <https://www.biocycle.net/the-compost-odor-wheel/>

Weather Conditions Affecting Odor Dispersion:

- METEOROLOGICAL CONDITIONS AFFECTING THE DISPERSION OF LANDFILL ODOR COMPLAINTS 2017. M.S. thesis M. Vidovic. Florida Atlantic University: https://fau.digital.flvc.org/islandora/object/fau%3A38061/datastream/OBJ/view/Meteorological_Conditions_Affecting_the_Dis_persion_of_Landfill_Odor_Complaints.pdf
- Movement of Odors Off-Farm, Oklahoma State University, 2019: <https://extension.okstate.edu/fact-sheets/movement-of-odors-off-farm.html>
- Waste 360 Off-site landfill odors: <https://www.waste360.com/landfill/landfill-odors-why-they-happen-and-chasing-them-down-part-2>

COMPOSTABLE MATERIALS, ODORS, & COMPLIANCE



CalRecycle

Dana Hachigian & Carley Bartlett

Senate Bill 1383

- State wide effort to reduce green house gas emissions
 - *CalRecycle focused on methane*
- With respect to CalRecycle
 - *50% reduction in statewide level disposal of organic waste from 2014 levels by 2020*
 - *75% reduction by 2025*
- 2014 Waste Characterization study
 - *Organic material ~40%*
 - ~25% food waste
- More material >> More infrastructure

Topics

- History of Jurisdiction
- Common Odor Sources
- How do we Regulate?
- Inspections & Complaint Investigation
- Role of Enforcement
- Commonly Observed BMPs



CalRecycle and LEA's Jurisdiction

- California Health and Safety Code Section:
 - *Division 26. AIR RESOURCES PART 4. NONVEHICULAR AIR POLLUTION CONTROL CHAPTER 3. Emission Limitations ARTICLE 1. General Limitations Section 41705*
 - “If a district receives a complaint pertaining to an odor emanating from a compost operation exempt from Section 41700 pursuant to paragraph (2) or (3) or subdivision (a), that is subject to the jurisdiction of an enforcement agency under Division 30 of the Public Resources Code, the district shall, within 24 hours or by the next working day, refer the complaint to the enforcement agency.”
- California Public Resources Code Sections:
 - *43209.1*
 - “(a) Notwithstanding any other provisions of law, if an enforcement agency receives a complaint, pursuant to subdivision (b) of Section 41705 of the Health and Safety Code, from an air pollution control district or an air quality management district pertaining to an odor emanating from a compost facility under its jurisdiction, the enforcement agency shall, in consultation with the district, take appropriate enforcement actions pursuant to this part.”



WHAT ARE COMMON
ON SITE ODOR
SOURCES?



Feedstock



Drainage/Ponding



Anaerobic Conditions



CalRecycle and Local Enforcement Agencies Oversight

- Minimize odors to prevent complaints and nuisance
 - *Permit*
 - *Odor Impact Minimization Plan*
 - *Inspections*
 - Routine - Monthly/Quarterly
 - Focused Inspections – complaint response
 - *Enforcement*
 - Area of Concern
 - Violation

Title 14 CCR 17863.4 – Odor Impact Minimization Plan (OIMP)

ALL compostable material handling operations and facilities shall prepare, implement and maintain a site specific OIMP.	Exempt due to Excluded Activities (Title 14 CCR 17855)
<ul style="list-style-type: none">• Composting Facilities• Green material composting operations and facilities• Vegetative food material composting facilities• Research composting operations• Chipping and grinding operations and facilities• Bio-solids composting operations at POTWs (Publicly Owned Treatment Works)• All in-vessel digestion operations and facilities	<ul style="list-style-type: none">• Agricultural material that doesn't leave the site• Vermicomposting• Mushroom farming• IF total amount of feedstock and compost on-site at any one time does not exceed 100 cubic yards and 750 square feet• Activity is located on facility that has tiered or full permit <p>*See Regulation, Title 14 CCR 17855 for complete list</p>

Title 14 CCR 17863.4 – Odor Impact Minimization Plan

- Provides guidance for on-site operations
 - *Odor monitoring and data collection protocol for on-site odor sources*
 - *Describes the proximity of possible odor receptors and a method for accessing odor impacts*
 - *Meteorological conditions effecting migration*
 - *A complaint response and recordkeeping protocol*
 - *Descriptions of design considerations of optimal operation to minimize odors*
 - *Descriptions of operating procedures for minimizing odor*
- Revised to reflect any changes and shall be provided to the EA within 30 days of those changes
- Reviewed annually by the operator to determine if revisions are necessary

Keys to an OIMP

■ Operational Best Management Practices (BMPs)

- *Time to process feedstock*
- *Type of Feedstock*
- *Amount of Material*
- *Porosity of Material*
- *Maintenance*
 - Water control
 - Proper aeration
- *Turning piles*
 - Avoid windy conditions
 - During cooler times of the day

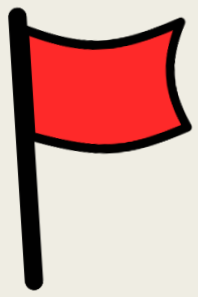
■ Odor Control Measures BMPs

- *Misters/Adding deodorant*
- *Aeration*
- *Biofiltration*
- *Covering*
 - Biocap
 - Blankets/covers
- *Enclosures*
 - Negative pressure buildings
 - Contained bays

Evaluating Sites for Odor Compliance

- Be familiar with the OIMP and BMPs
- Inspections & Complaint Response
 - *Odor Circuit*
- Assess OIMP/State Minimum Standards for Violation





Title 14 CCR 18302(d) Written Complaints of Alleged Violations

- Odor Complaint related to a compostable material handling operation or facility
 - *EA shall investigate as soon as practical within 15 days*
 - *Investigation shall include:*
 - Date and time EA arrived and departed
 - Weather Observations (*wind direction, speed, overall conditions*)
 - Observe for odor at the complainant's location
 - If odor is detected, document:
 - *Location(s) odor is detected*
 - *Odor characteristics (odor wheel)*
 - *Intensity of odor*
 - *Identify activities conducted at the operation*
 - Any known facts relevant to the alleged violation

Benefits of an Odor Circuit

- Familiarize inspectors with odors and operations in surrounding area
- Collection of useful data
 - *Baseline odor profile*
 - *Make correlations to determine cause of odor with possible solutions*
- Help identify potential off site odor sources

Potential Off Site Odor Sources

- Waste water treatment plants
- Publicly Owned Treatment Works (POTWs)
- Dairy farms
- Rendering facilities
- Horse stables
- Animal farms
- Land Application
- Geographic/ Natural features
 - *Low Tide*
 - *Marsh*
 - *Ponds*



Neighborhood



First Street

CalRecycle Way



Composting Facility

Second Street



Waste Water Treatment Plant



What is an Odor Circuit?

- Before the on-site inspection
- Same locations
- Upwind and downwind
- Weather conditions (wind direction? Wind speed? Etc.)
- Odor characteristics and intensity (odor wheel)

Odor Wheel

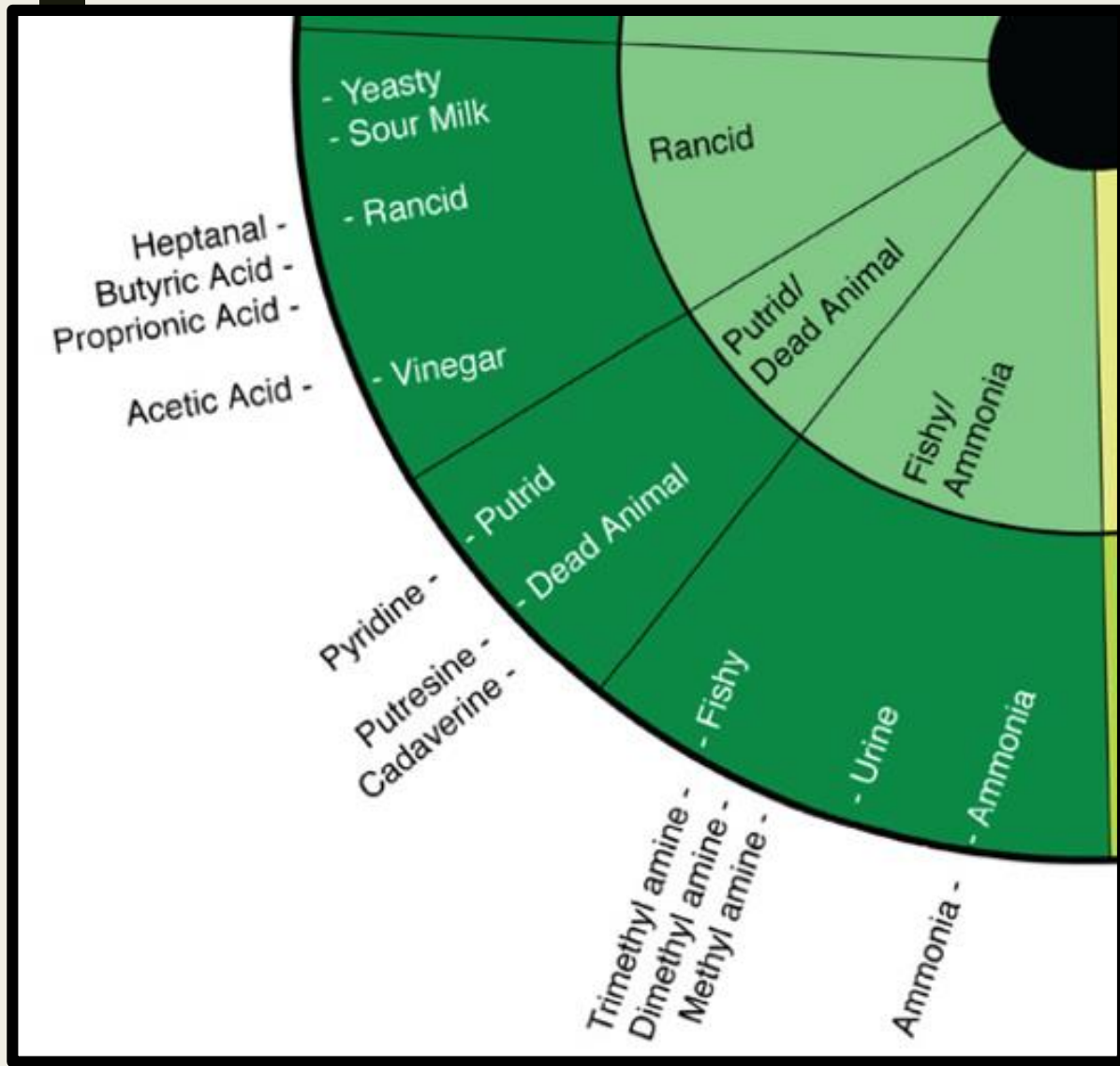


Figure 1. Composting odor wheel

Source: "Sensory Assessment and Characterization of Odor Nuisance Emissions during the Composting of Wastewater Biosolids," *Water Environment Research*, Volume 81, Number 7

Odor Circuit Form

Facility:						
Date:						
Inspector:						
Weather:						
Location (Cross Streets)	Time	Odor Characteristics	Intensity (0-5)	Wind Speed and Direction	Temp.	Notes



Neighborhood



Prevailing Wind

First Street



CalRecycle Way



Composting Facility



Second Street



Waste Water Treatment Plant

Performing an Odor Circuit

Assess OIMP/State Minimum Standards for Violation

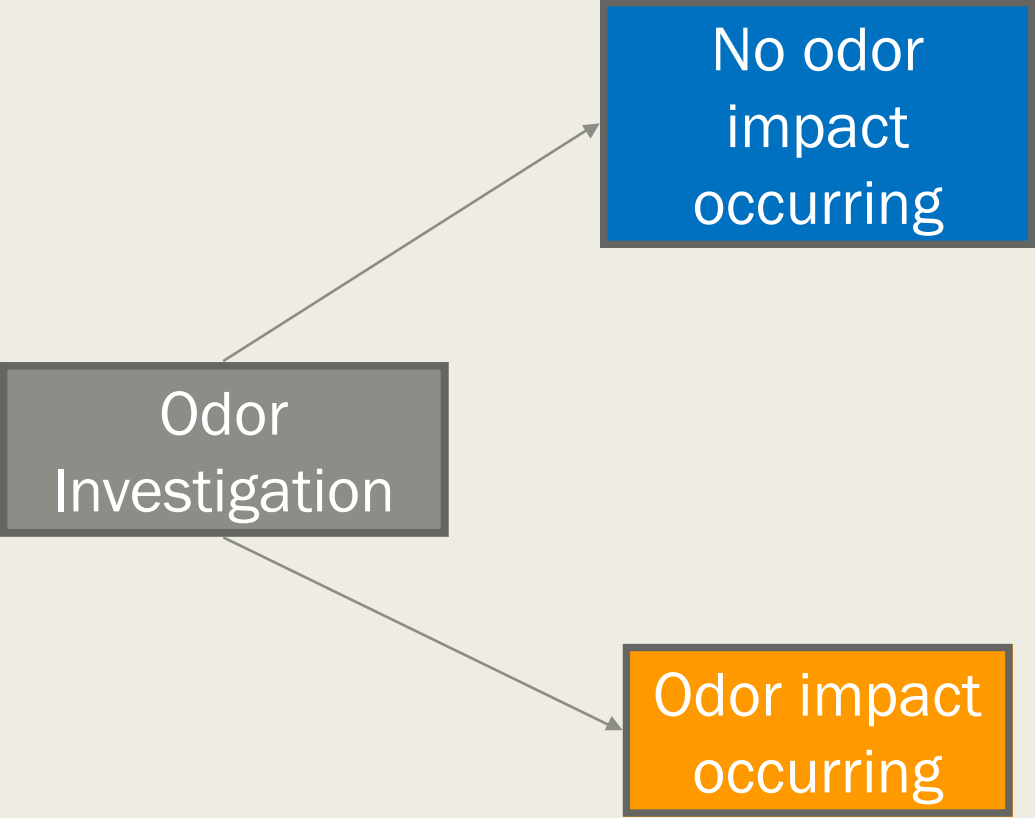
- When is there a violation?

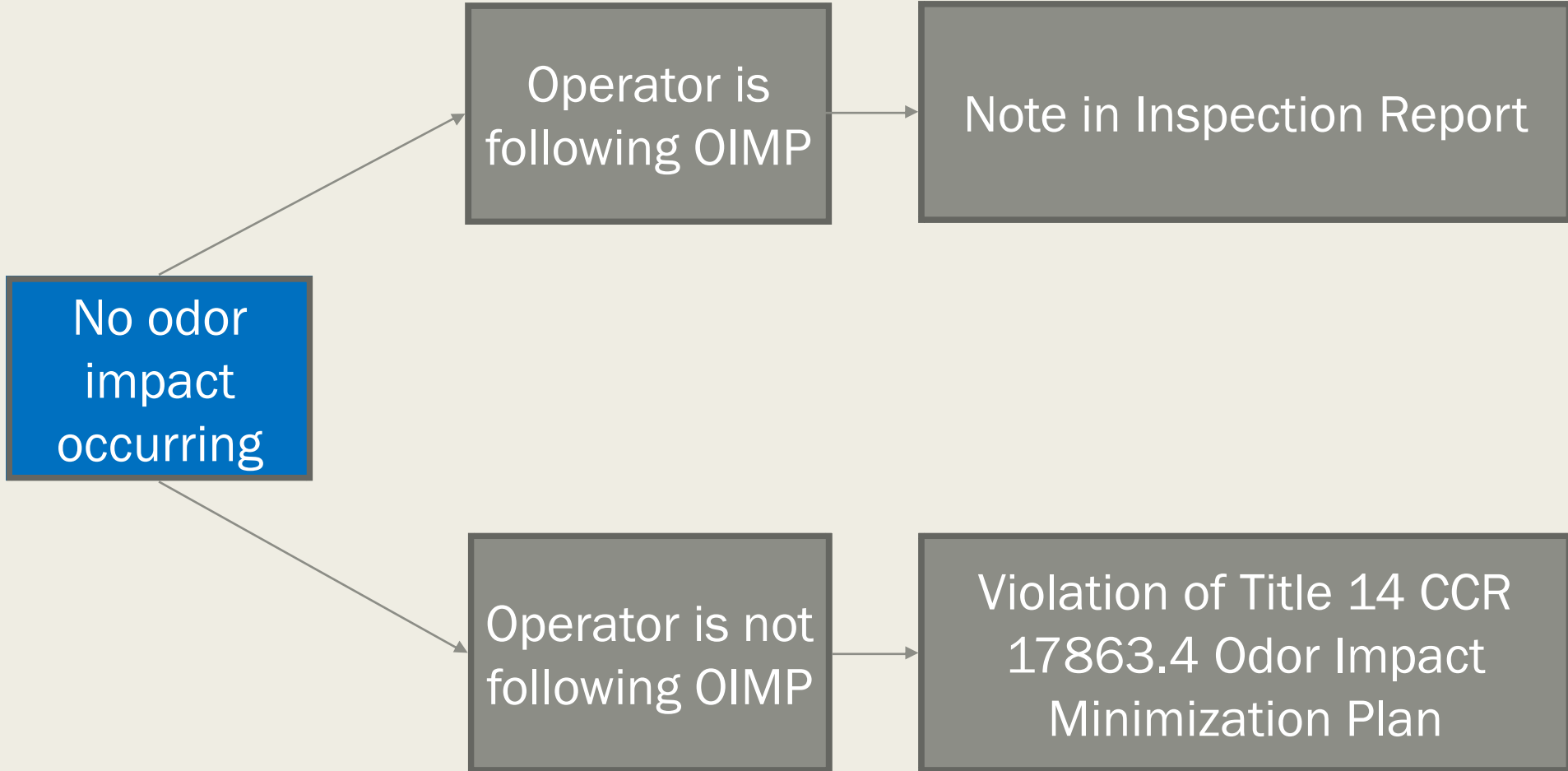
OIMP not being followed

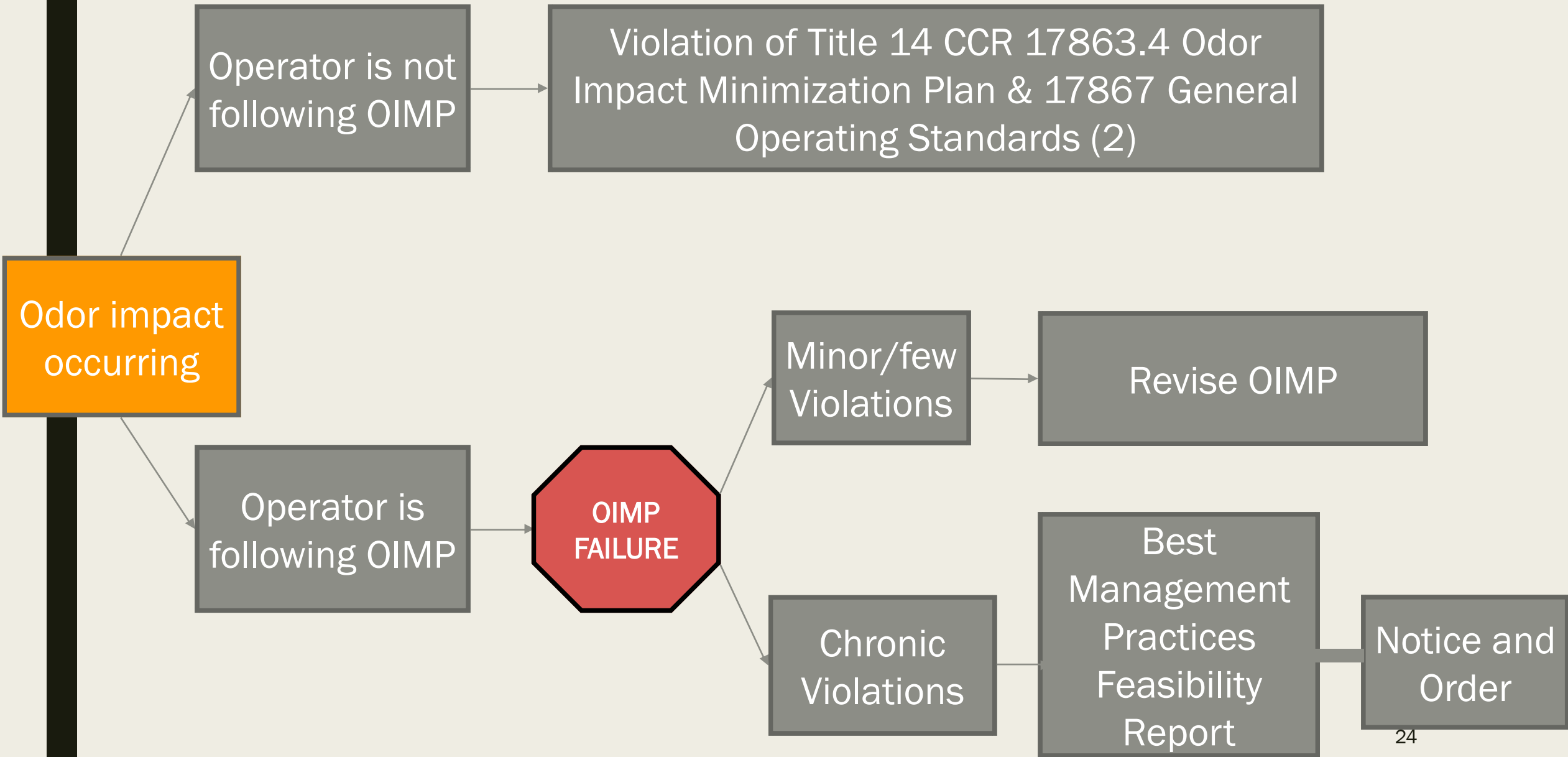
Odor impact occurring

OIMP being followed & odor impact occurring

- What is an odor impact?
 - *Verifying odor off site or impacts to receptors*
 - Complaint investigation
 - Routine/Focused inspections
- What if chronic odor impacts are occurring but OIMP is being followed?
 - *Revise OIMP (if minimal impact)*
 - *Best Management Practices Feasibility Report*







Benefits of Best Management Practices Feasibility Report

- Gives an idea to which BMP's are feasible
- Help to create feasible timeline for Notice & Order
- Shows public that there is a plan

Title 14 Section 17863.4.1 Odor Best Management Practices (BMPs) Feasibility Report

What is it?

- Gathers and presents data on potential on-site odor sources
- Identifies and ranks on-site sources that are and are not contributing to odor impacts
- Lists BMPs that being used to minimize odor
- Analyzes the BMPs for effectiveness, practicality, costs
- Lists all potential BMPs that could be implemented
- Develops a plan and schedule for implementation of recommended BMPs

Title 14 Section 17863.4.1 Odor Best Management Practices (BMPs) Feasibility Report

How to use it?

- Voluntary or Enforcement Agency may require operator to prepare
- Tool to use when chronic odor impacts
- Identifying recommended BMPs that are **feasible**
- Systematic approach to trying each BMP
 - Receiving Area
- Utilize before enforcement actions
 - Schedule >>> milestones in a Notice & Order
- Use documentation and data
 - Good faith effort by the operator

BMPs Feasibility Report Form

State of California
CalRecycle 877 (New 8/17)

Department of Resources Recycling and Recovery
(CalRecycle)

ODOR BEST MANAGEMENT PRACTICE FEASIBILITY REPORT (REPORT)

Facility Name	Facility Address	Facility No.	Report Date (month/day/year)

The use of this template is not a specific requirement of 14, California Code of Regulations (CCR), Section 178634.1. or Section 17896.30 but are provided as one possible method for regulated entities to use to provide what is required to comply with those sections.

A. GATHER/PRESENT | 14 CCR, Section 17863.4.1[b][1] and 17896.30[b][1]

Present representative and correlating odor data for each on-site source. All tools and resources used to gather data should be included as an attachment to the Report.

Date	Representative and Correlating Data Associated with Odor Impact(s)						
	(1) Odor Impact	(2) Time (when data collected)	(3) Weather	(4) Odor Characteristics	(5) Odor Severity	(6) Operations Description	(7) Potential Sources

B. IDENTIFY/RANK | 14 CCR, Section 17863.4.1[b][2] and 17896.30[b][2]

1. Identify which potential on-site sources are contributing to the odor impacts and rank those in order of impact.

Rank	Potential Sources Contributing to Odor Impacts		
	Area of On-site Source	Operations Description	Material Type Handled
1			
2			
3			
4			
5			

BMPs Feasibility Report Form

C. LIST/ANALYZE | 14 CCR, Section 17863.4.1[b][3][A] and 17896.30[b][3][A]

List and analyze all of the existing Best Management Practices (BMPs) that the operator has used to minimize odor. All resources, analysis, calculations and assumptions used to complete the table should be attached to the Report.

BMP No.	Description	Existing BMP(s) Used to Minimize Odors					(6) Overall Recommendation
		(1) Effectiveness in Reducing Odors?*	(2) Potential for More Extensive Use	(3) Operationally Practical?	(4) Approx. Cost to Implement**	(5) New Permit(s) or Permit Changes?	
1							
2							
3							
4							
5							

*Supporting data for all BMPs found to be ineffective should be included as an attachment to the Report.

**All calculations and assumptions used to approximate the costs to implement the BMPs should be included in the Report.

List all existing BMP(s) found to be ineffective.

BMP No.	(7) Existing BMP(s) Found to be Ineffective	Rationale
1		
2		
3		

*Supporting data for all BMPs found to be ineffective should be included as an attachment to the Report.

D. LIST/ANALYZE | 14 CCR, Section 17863.4.1[b][3][B] and 17896.30[b][3][B]

List and analyze all of the potential BMP(s) that the operator has NOT used to minimize odor. All resources, analysis, calculations, and assumptions used to complete the table should be attached to the Report.

BMP No.	Description	Potential BMP(s) Not Used to Minimize Odor				(5) Overall Recommendation and Ranking
		(1) Potential to Reduce Odor Impacts*	(2) Operationally Practical?	(3) Approx. Cost to Implement**	(4) New Permit(s) or Permit Changes?	
1						
2						

BMPs Feasibility Report Form

E. PLAN/IMPLEMENT | 14 CCR, Section 17863.4.1[b][3][C] and 17896.30[b][3][C]

Develop a plan and schedule for implementation of the recommended BMP(s) based on analysis conducted in section C and D above.

Plan and Schedule for Implementing Potential BMPs			
Existing BMP(s) and Potential BMP(s) To Be Implemented	Action	Start Date	End Date

Commonly Cited & Relevant Regulations

- Title 14 CCR 17863.4 Odor Impact Minimization Plan
- Title 14 CCR 17863.4.1 Odor Best Management Feasibility Report
- Title 14 CCR 17866. General Design Requirements
- Title 14 CCR 17867. General Operating Standards
- Title 14 CCR 17867.5 Training
- Title 14 CCR 18227. Report of Compost Site Information (RCSI)
- Title 14 CCR 18302(d) Written Complaints of Alleged Violations



COMMONLY OBSERVED BMPs





Misters with added deodorant to prevent odors



Aerated Static Piles



Biocap placed on active windrows



Biofiltration of the air to scrub odors



Aeration in detention pond

Addition of chemicals to neutralize odors



Covered piles

Conclusion

- Ensure OIMP is strong and is being followed
 - *Revisit annually and update with any changes*
- Odor Circuit – investigative and proactive tool
- BMPs Feasibility Report for chronic odor impacts
 - *Completed before Notice & Orders*
- Reduction of GHGs is a statewide effort



QUESTIONS?

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