



# Agenda

## INDUSTRIAL SAFETY ORDINANCE/ COMMUNITY WARNING SYSTEM AD HOC COMMITTEE

January 12, 2023  
1:00 PM

Please click the link below to join the webinar:

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Supervisor John Gioia  
Supervisor Federal Glover

### Agenda Items:

Items may be taken out of order based on the business of the day and preference of the Committee

1. Call to Order and Introductions
2. Public comment on any item under the jurisdiction of the Committee and not on this agenda (speakers may be limited to three minutes).

### DISCUSSION

3. RECEIVE a status report regarding the independent incident investigation into the February 9, 2021 Wharf Oil Spill at the Chevron Richmond Refinery and PROVIDE direction as necessary.
4. DIRECT staff to establish an Oversight Committee and conduct (1) an independent investigation and (2) community exposure/risk assessment of the spent catalyst release that occurred on November 24 and 25, 2022 at the Martinez Refining Company.
5. RECEIVE a presentation from the Bay Area Air Quality Management District regarding implementation of Regulation 6, Rule 5 and wet gas scrubber technology use in the refining industry.
6. DISCUSS future items to be scheduled to present to the ISO/CWS Ad Hoc Committee for next meeting tentatively scheduled for February 21, 2023 at 9:00 AM.

☺ *The ISO/CWS Ad Hoc Committee will provide reasonable accommodations for persons with disabilities planning to attend Committee meetings. Contact the staff person listed below at least 72 hours before the meeting.*

📁 *Any disclosable public records related to an open session item on a regular meeting agenda and distributed by the County to a majority of members of the ISO/CWS Ad Hoc Committee less than 96 hours prior to that meeting are available for public inspection at 651 Pine Street, 10th floor, during normal business hours.*

✉ *Public comment may be submitted via electronic mail on agenda items at least one full work day prior to the published meeting time.*

### For Additional Information Contact:

Matthew Kaufmann, Committee Staff  
Phone (925) 655-3235  
[Matt.Kaufmann@cchealth.org](mailto:Matt.Kaufmann@cchealth.org)

## Glossary of Acronyms, Abbreviations, and other Terms (in alphabetical order):

Contra Costa County has a policy of making limited use of acronyms, abbreviations, and industry-specific language in its Board of Supervisors meetings and written materials. Following is a list of commonly used language that may appear in oral presentations and written materials associated with Board meetings:

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<b>AB</b>	Assembly Bill	HCD	(State Dept of) Housing & Community Development
ABAG	Association of Bay Area Governments	HHS	Department of Health and Human Services
ACA	Assembly Constitutional Amendment	HIPAA	Health Insurance Portability and Accountability Act
ADA	Americans with Disabilities Act of 1990	HIV	Human Immunodeficiency Syndrome
AFSCME	American Federation of State County and Municipal Employees	HOV	High Occupancy Vehicle
AICP	American Institute of Certified Planners	HR	Human Resources
AIDS	Acquired Immunodeficiency Syndrome	HUD	United States Department of Housing and Urban Development
ALUC	Airport Land Use Commission	Inc.	Incorporated
AOD	Alcohol and Other Drugs	IOC	Internal Operations Committee
BAAQMD	Bay Area Air Quality Management District	ISO	Industrial Safety Ordinance
BART	Bay Area Rapid Transit District	JPA	Joint (exercise of) Powers Authority or Agreement
BCDC	Bay Conservation & Development Commission	Lamorinda	Lafayette-Moraga-Orinda Area
BGO	Better Government Ordinance	LAFCo	Local Agency Formation Commission
BOS	Board of Supervisors	LLC	Limited Liability Company
CALTRANS	California Department of Transportation	LLP	Limited Liability Partnership
CalWIN	California Works Information Network	Local 1	Public Employees Union Local 1
CalWORKS	California Work Opportunity and Responsibility to Kids	LVN	Licensed Vocational Nurse
CAER	Community Awareness Emergency Response	MAC	Municipal Advisory Council
CAO	County Administrative Officer or Office	MBE	Minority Business Enterprise
CCHP	Contra Costa Health Plan	M.D.	Medical Doctor
CCTA	Contra Costa Transportation Authority	M.F.T.	Marriage and Family Therapist
CDBG	Community Development Block Grant	MIS	Management Information System
CEQA	California Environmental Quality Act	MOE	Maintenance of Effort
CIO	Chief Information Officer	MOU	Memorandum of Understanding
COLA	Cost of living adjustment	MTC	Metropolitan Transportation Commission
ConFire	Contra Costa Consolidated Fire District	NACo	National Association of Counties
CPA	Certified Public Accountant	OB-GYN	Obstetrics and Gynecology
CPI	Consumer Price Index	O.D.	Doctor of Optometry
CSA	County Service Area	OES-EOC	Office of Emergency Services-Emergency Operations Center
CSAC	California State Association of Counties	OSHA	Occupational Safety and Health Administration
CTC	California Transportation Commission	Psy.D.	Doctor of Psychology
dba	doing business as	RDA	Redevelopment Agency
EBMUD	East Bay Municipal Utility District	RFI	Request For Information
EIR	Environmental Impact Report	RFP	Request For Proposal
EIS	Environmental Impact Statement	RFQ	Request For Qualifications
EMCC	Emergency Medical Care Committee	RN	Registered Nurse
EMS	Emergency Medical Services	SB	Senate Bill
EPSDT	State Early Periodic Screening, Diagnosis and Treatment Program (Mental Health)	SBE	Small Business Enterprise
et al.	et al (and others)	SWAT	Southwest Area Transportation Committee
FAA	Federal Aviation Administration	TRANSPAC	Transportation Partnership & Cooperation (Central)
FEMA	Federal Emergency Management Agency	TRANSPLAN	Transportation Planning Committee (East County)
F&HS	Family and Human Services Committee	TRE or TTE	Trustee
First 5	First Five Children and Families Commission (Proposition 10)	TWIC	Transportation, Water and Infrastructure Committee
FTE	Full Time Equivalent	VA	Department of Veterans Affairs
FY	Fiscal Year	vs.	versus (against)
GHAD	Geologic Hazard Abatement District	WAN	Wide Area Network
GIS	Geographic Information System	WBE	Women Business Enterprise
		WCCTAC	West Contra Costa Transportation Advisory Committee

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**DISCUSSION ITEM # 3 – Status Report Regarding the  
Independent Incident Investigation of the Wharf Oil Spill at  
the Chevron Richmond Refinery**

**Staff Report on the  
Independent Investigation Status for the  
February 9, 2021  
Wharf Oil Spill from the  
Chevron Richmond Refinery**

Site ID: 770837  
CERS ID: 10010575

Contra Costa Health  
Hazardous Materials Programs

For the

Industrial Safety Ordinance/Community Warning System Ad Hoc Committee  
January 12, 2023



## **SUMMARY**

On February 9, 2021, a private citizen notified the Chevron Richmond Refinery of an oil sheen in the water near their long wharf. Chevron laid booms to attempt to contain the leak. The company also isolated and removed the remaining product from the leaking pipeline. The leak was classified as a Community Warning System (CWS) Level 2 incident. Approximately 760 gallons of diesel range hydrocarbons were released.

Contra Costa Health (CCH) was directed by the Industrial Safety Ordinance/Community Warning System Ad Hoc Committee to conduct a third-party independent investigation. This investigation was focused on reviewing Chevron's detailed investigative report for the spill. An Oversight Committee was established to manage this process. A delay occurred in this process associated with Chevron sharing their confidential report with the contractor selected by the Oversight Committee (AcuTech).

The issues surrounding the delay were resolved and the contractor received the detailed investigative report as well as was provided access to Chevron subject matter experts (SMEs) for interviews. This Staff Report summarizes the current status of the third-party investigation and Oversight Committee activities.

## **STAFF RECOMMENDATIONS**

- No recommendations at this time – updating the Ad Hoc Committee on the status of the independent review – provide staff direction as needed

## **BACKGROUND / ANALYSIS**

Chevron estimated that approximately 760 gallons of a low sulfur diesel type material mixed with flush water was released into the Bay. A hole was found on the bottom of a pipeline that measured approximately 0.25 inches in diameter. Multiple agencies responded to the incident and conducted air and environmental monitoring. Air monitoring equipment did not find any chemicals of concern above their detection limit (LEL, H<sub>2</sub>S, CO, SO<sub>2</sub>, NH<sub>3</sub>, Benzene). Environmental impacts were not observed during surveys conducted in the nearby water and marsh lands. The area was monitored until February 23, 2021, when the Unified Command consisting of representatives from the United States Coast Guard (USCG), California Department of Fish and Wildlife – Office of Spill Prevention and Response (CDFW-OSPR), Contra Costa Health Hazardous Materials Programs, and Chevron, determined that clean-up endpoints had been achieved.

Chevron identified in their October 27, 2021 submittal to CCH that they found the hole in the pipeline was the result of localized internal corrosion at a location of fractured cement lining. Radiographs show breaks in the cement lining and localized pitting on the lower sections of horizontal pipe, where failed lining may have allowed deposits to collect. This damage location and morphology is characteristic of under deposit corrosion. Here is a link to this document: <https://cchealth.org/hazmat/pdf/chevron-incident-2021-0209-30day-followup-2021-1027.pdf>

The Richmond Industrial Safety Ordinance (ISO) 42-01 Section 6.43.050(h) identifies, “Major chemical accident or release” (MCAR) means an incident that meets the definition of a level three or level two incident in the community warning system incident level classification system defined in the hazardous materials incident notification policy, as determined by the department.” The department is Contra Costa Health Services. The department classified this incident as a CWS Level 2, which makes the incident a MCAR.

Section 6.43.090(c)(2) of the Richmond ISO identifies, “Contra Costa Health Services may elect to do its own independent root cause analysis or incident investigation for a major chemical accident or release.”

The department has the legal authority to conduct an independent investigation after a stationary source subject to the Richmond ISO has an MCAR. Chevron is subject to the City of Richmond ISO and their wharf oil leak event was classified as a MCAR. The department received approval and direction from the Ad Hoc Committee to proceed with an independent evaluation of Chevron’s root cause analysis (RCA) investigation for this event.

The Oversight Committee was formed and first met in June 2021. The Oversight Committee is comprised of the following members:

- Hazardous Materials Staff – Nicole Heath / Michael Dossey (Chair)
- Local Fire Department representative – City of Richmond Fire Marshal Eric Govan
- Three local community members
  - Hazardous Materials Commission member – Fred Glueck
  - Community member – Nancy Aquirre
  - Community member – Gabe Nelson
- Chevron representative – Laura Leeds
- Chevron employee representative – Open (formerly BK White)

The primary responsibility of the Oversight Committee is to assist the department’s staff in assuring that the Incident investigation is open, transparent, and that the end product will make a difference in the process safety of the stationary source that is being evaluated. Specifically, the Oversight Committee assists the department in developing a scope of work, selecting the contractor or contractors, receive and comment on periodic updates from the contractor, and review and comment on the final draft of the report. The contractor selected to perform an independent review of Chevron’s detailed root cause analysis report was AcuTech.

### **STATUS UPDATE**

The last update to this Ad Hoc Committee was provided on May 16, 2022. Since that time, AcuTech received Chevron’s detailed root cause analysis incident investigation report. AcuTech has completed the review of this report and conducted interviews of Chevron subject matter experts. AcuTech has also received answers to most of their questions from Chevron and is in the process of developing their independent report and anticipate this report should be completed by mid to late January 2023. Preparations are being made for AcuTech to present this report to the Oversight Committee in February 2023. The next Oversight Committee will take place in February 2023 although the exact date has not been set.

**DISCUSSION ITEM # 4 – Independent Incident Investigation  
and Community Exposure/Risk Assessment of MRC Spent  
Catalyst Release**

**Staff Report on the  
November 24-25, 2022  
Spent Catalyst Release from the  
Martinez Refining Company LLC**

ID# 729718  
CERS# 10476676

Contra Costa Health  
Hazardous Materials Programs

For the

Industrial Safety Ordinance/Community Warning System Ad Hoc Committee  
January 12, 2023



## **SUMMARY**

The Martinez Refining Company LLC part of the PBF Energy Group hereinafter referred to as the Martinez Refining Company (MRC) had a particulate matter release from their fluid catalytic cracking unit (FCCU) on November 24-25, 2022. This release was estimated to have emitted 20-24 tons of fine particulate matter, called spent catalyst, into the surrounding community. The spent catalyst was analyzed and found to contain elevated levels of metals including aluminum, barium, chromium, nickel, vanadium, and zinc.

MRC did not use the County's Community Warning System (CWS) or other means to notify any emergency responders or the public of the incident on November 24<sup>th</sup> or on November 25<sup>th</sup>. On November 26, 2022, MRC acknowledged they had a spent catalyst release from their FCCU unit.

Since MRC failed to follow the required incident notification process, this event was not officially classified under the Community Warning System (CWS). Contra Costa Health Hazardous Materials Programs (CCHHMP) contacted MRC on November 26, 2022 and requested that a 72-hour report be submitted for this incident. On December 15, 2022, CCHHMP identified this incident met the criteria for a CWS Level 2 or higher incident and as a result is a Major Chemical Accident or Release (MCAR). The County's Industrial Safety Ordinance (ISO) identifies that CCHHMP may elect to do their own independent root cause analysis or incident investigation associated with a MCAR. CCHHMP is seeking approval from the ISO/CWS Ad Hoc Committee to conduct an independent root cause analysis investigation and community exposure/risk assessment associated with this release.

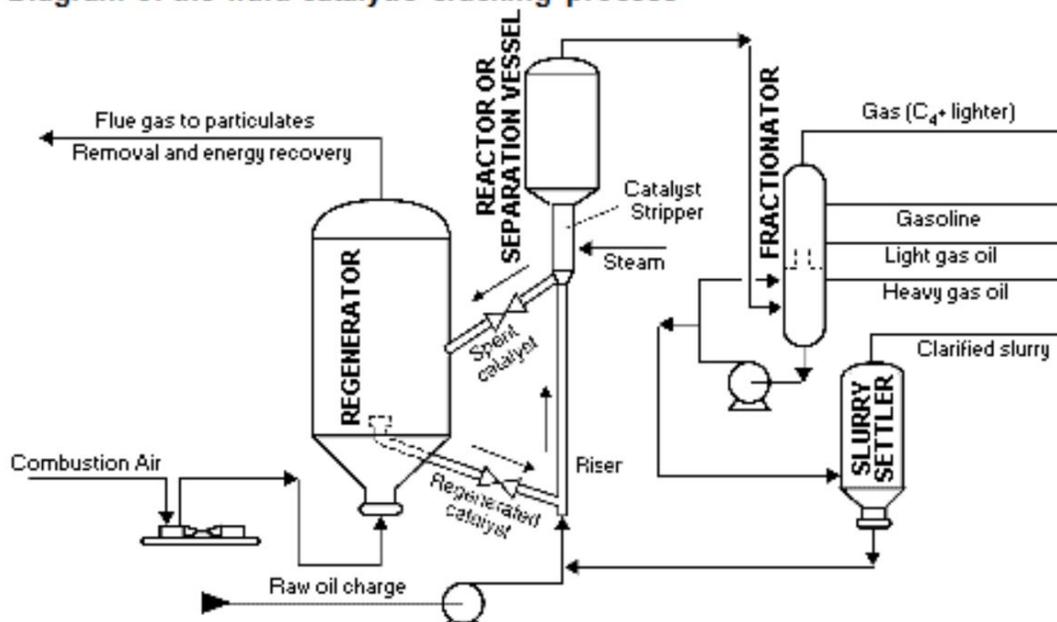
## **STAFF RECOMMENDATIONS:**

- Authorize Contra Costa Health Hazardous Materials Division to proceed with conducting an independent root cause analysis incident investigation and community exposure/risk assessment on MRC's FCCU Spent Catalyst Release MCAR that took place between November 24-25, 2022.
- Establish an Oversight Committee to manage the independent root cause analysis incident investigation and community exposure/risk assessment

## **BACKGROUND/ANALYSIS:**

The function of the Fluid Catalytic Cracking Unit (FCCU) is to break down longer chain hydrocarbon molecules into shorter chain molecules more useful for motor fuels. The unit does this by using a combination of high heat, steam, hydrocarbon feed and a catalyst. The catalyst used in the FCCU is consistent with a fine powder in size and is kept aloft, or is fluidized, within the process. A generic schematic of a FCCU is provided below for illustrative purposes only. The FCCU catalyst reacts with the hydrocarbons typically in the Riser where the heavier hydrocarbon residue adheres to the catalyst. At this point the catalyst is called "spent" because it can no longer react with the longer chain hydrocarbons because it is coated in heavier hydrocarbon residue (also called coke). The spent catalyst and lighter hydrocarbon chains travel to the Reactor where the spent catalyst is separated and sent to the Regenerator. In the Regenerator, the spent catalyst is incinerated to remove the heavier hydrocarbon residue (i.e., coke) to allow the catalyst to be ready for use again. The catalyst is then returned to the Riser where the process repeats.

## Diagram of the fluid catalytic cracking process



Source: U.S. Energy Information Administration

New catalyst has an average particle size of roughly 90 microns and over time each catalyst particle gets smaller and smaller. The catalyst can also pick up small amounts of heavy metals that bind to the particle and further reduce its catalyst effectiveness. These particles are continuously removed from the process and new catalyst is added. When particle sizes get very small (e.g., roughly less than 5 microns in size), they travel out the top of the Regenerator along with the flue gases from the combustion process. At MRC, these flue gases go through an additional combustion process through what are called CO Boilers to complete the conversion carbon monoxide to carbon dioxide before traveling to an electrostatic precipitator (ESP) to collect the very small catalyst particles. After the ESP, the flue gases are released into the atmosphere.

On November 21, 2022, MRC's Fluid Catalytic Cracking Unit (FCCU) was shut down for repairs due to equipment failure associated with an air blower at the unit. After repairs, startup of the FCCU began on November 22, 2022, and continued the startup process over the next several days. It is common for processes such as the FCCU to take multiple days to fully startup after a full/complete shutdown. Also, it should be noted, after the 2015 Torrance Exxon Refinery ESP explosion, it is common practice to not have the ESP in operation during FCCU startup. During FCCU startup there is an opportunity for hydrocarbons to reach the ESP and cause an explosion.

On November 26, 2022, at approximately 7:10 am, the department was made aware of community complaints that a white dust-like material had been deposited in outdoor areas of Martinez, CA. When contacted by the department on the morning of November 26, 2022, MRC personnel indicated they were investigating the incident due to community complaints of the material on vehicles. An MRC Facebook post dated November 25, 2022 indicated they were aware of the white dust and were actively investigating the issue. MRC subsequently confirmed that this material deposited in Martinez was spent catalyst released from their Fluid Catalytic Cracking Unit (FCCU). According to MRC, a release of

approximately 20-24 tons of this spent catalyst occurred intermittently from November 24, 2022 at approximately 9:30 pm to November 25, 2022 at 3:30 am.

On November 26, 2022, MRC was requested to submit a 72-hour incident report in compliance with the Hazardous Materials Incident Notification Policy. Link to 72-hour report:

<https://cchealth.org/hazmat/pdf/MRC-Refinery-incident-2022-1124-72hr-report-edit-113022.pdf>

Hazardous Materials Division personnel took wipe samples from flat surfaces of vehicles and trash cans and sent them to be analyzed for heavy metals. The Bay Area Air Quality Management District (BAAQMD) also took samples. Laboratory analytical results showed that the samples collected from the Martinez community were consistent with a sample of the spent catalyst provided by MRC and they contained elevated levels of metals including aluminum, barium, chromium, nickel, vanadium, and zinc.

MRC provided a Safety Data Sheet (SDS) for the FCC Spent Catalyst as part of the 72-hour report. The hazardous constituents identified in the SDS included aluminum oxide, amorphous silica, and kaolin. Field analysis conducted in the community on November 26, 2022 indicated the material contained silica matching one of the materials listed in the SDS. The laboratory analytical results indicated that samples collected from cars in the Martinez area, had similar chemical composition to a source sample of the spent catalyst, provided by MRC. The dust samples collected in the community contained vanadium and nickel higher than the background sample which are not materials listed on SDS but are characteristic metals associated with the refining process.

CCH issued a Media Release on November 30, 2022, informing citizens that the powdery substance found in the community came from MRC and contained higher-than-normal amounts of heavy metals. The Media Release also informed the community that MRC failed to immediately report the release or suspected release of hazardous materials to emergency response authorities.

MRC failed to notify the department of this incident as required in Article 1 of Chapter 6.95 of the California Health and Safety Code, and as outlined in the County's Hazardous Materials Incident Notification Policy. This notification should have taken place within fifteen (15) minutes from when the spent catalyst was first released or suspected to have been released on November 24, 2022.

On December 15, 2022, CCHMP identified this incident met the criteria for a CWS Level 2 or higher incident and as a result is a Major Chemical Accident or Release (MCAR). It is imperative, and required, that such determination is made early in an actual incident to promote timely notification to emergency response organizations, agencies and the surrounding community.

#### ***INDEPENDENT INCIDENT INVESTIGATION:***

Section 450-8.014(h) of the county's Industrial Safety Ordinance (ISO) identifies, ""Major chemical accident or release" (MCAR) means an incident that meets the definition of a level three or level two incident in the community warning system incident level classification system defined in the hazardous materials incident notification policy, as determined by the department." The department classified this incident as a CWS Level 2, which makes the incident a MCAR.

Section 450-8.016(c)(2) of the county's ISO identifies, "The department may elect to do its own independent root cause analysis or incident investigation for a major chemical accident or release."

The department has the legal authority to conduct an independent investigation after a stationary source subject to the ISO has an MCAR. MRC is subject to the county ISO and their plumbing event has been classified as a MCAR. The department is seeking approval and direction from the Ad Hoc Committee to proceed with an independent root cause analysis (RCA) investigation.

***INDEPENDENT COMMUNITY EXPOSURE/RISK ASSESSMENT:***

Due to the spent catalyst material dispersion over parts of the City of Martinez and the unincorporated parts of Contra Costa County, CCH suggests commissioning an independent community exposure/risk assessment to determine effects of the release on the community. CCH sampling suggests heavy metals associated with the spent catalyst release were above the normal background readings found upwind from the point of release.

A community exposure/risk assessment is a study that outlines the risks associated with exposure to environmental contaminants. The assessment is typically conducted by an individual with education and training typically in environmental assessment, toxicology, biology and/or ecology. A risk assessor organizes and analyzes data collected from environmental samples of water, soil, and air, develops exposure and risk calculations, and provides an analysis of potential health risks associated with the release. Since this was an acute release and most toxicological risks assessments are based on chronic exposures vs acute only a basic risk assessment may be feasible.

The department is seeking approval and direction from the Ad Hoc Committee to proceed with an independent community exposure/risk assessment for the November 24-25, 2022 spent catalyst release.

***OVERSIGHT COMMITTEE:***

CCH recommends that only one Oversight Committee be formed to monitor both the independent incident investigation, as well as the community exposure/risk assessment. Although separate contractors will be hired to conduct these separate analyses, many issues overlap, and the process would benefit from having common oversight. CCH recommends the Oversight Committee is comprised of the following:

- Hazardous Materials Staff (Chair)
- Representative from the City of Martinez
- Five (5) local community members
- MRC representative
- MRC employee representative

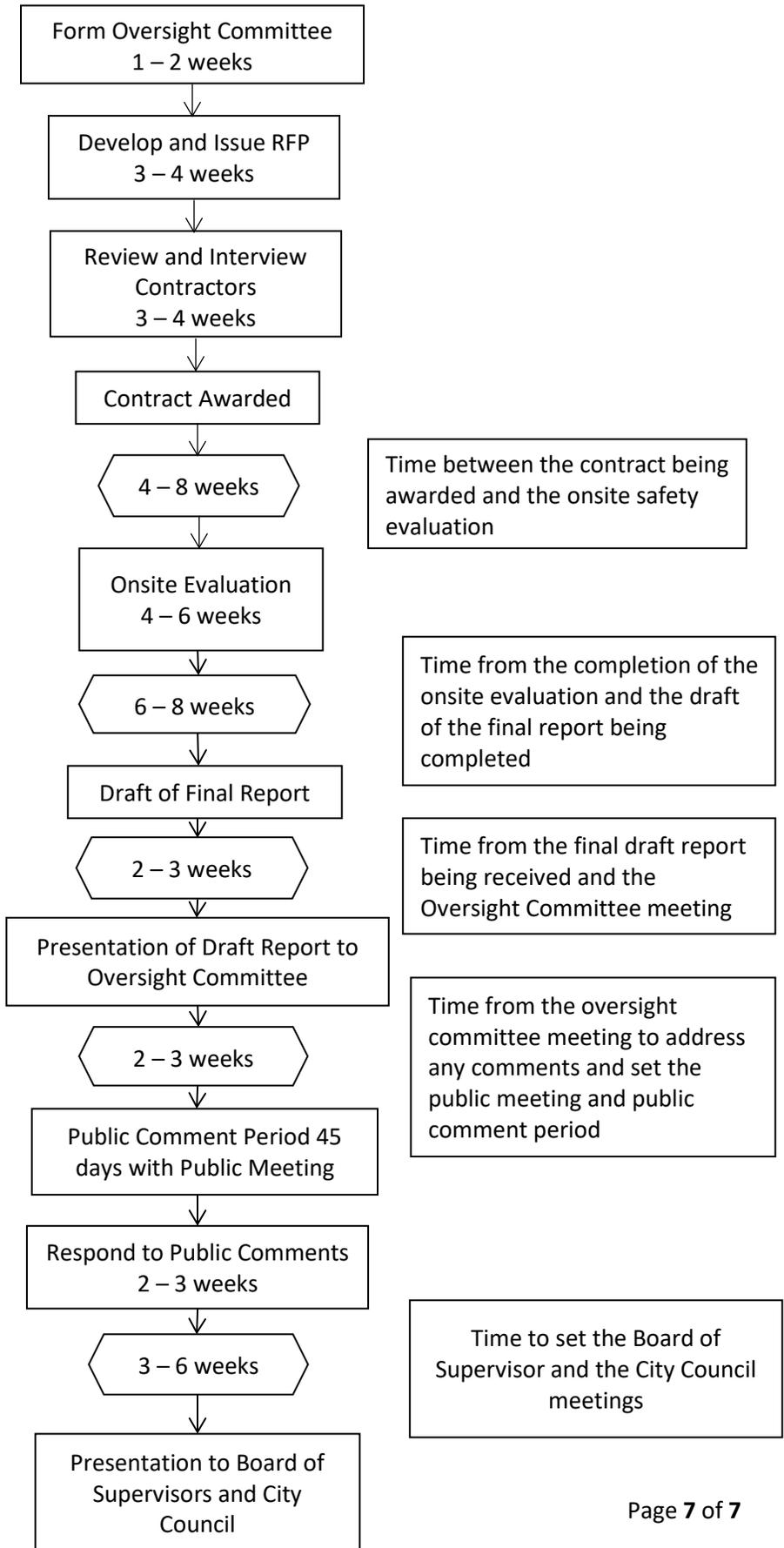
The primary responsibility of the Oversight Committee is to assist staff in assuring that the incident investigations are open and transparent. Specifically, the Oversight Committee will assist the department in developing separate scopes of work, selecting the contractors, receive and comment on periodic updates from the contractors, and review and comment on the final drafts of each report.

The independent investigation to take place will utilize root cause analysis methods and identify root causes of the MCAR. From an investigation standpoint, the two dominant issues to be assessed are: 1) why was spent catalyst released that impacted the community, and 2) lack of proper notification of the

incident. The report of findings will describe the incident, relevant evidence, root cause methodology and the root causes. In addition, the report will identify corrective actions to be taken.

The independent community exposure/risk assessment to take place will utilize a standard approach to a risk assessment that will include four main components which are, hazard identification, dose response, exposure assessment, and risk characterization.

The approximate timeline for the independent incident investigation and the community exposure/risk assessment are expected to each follow this generic schedule:



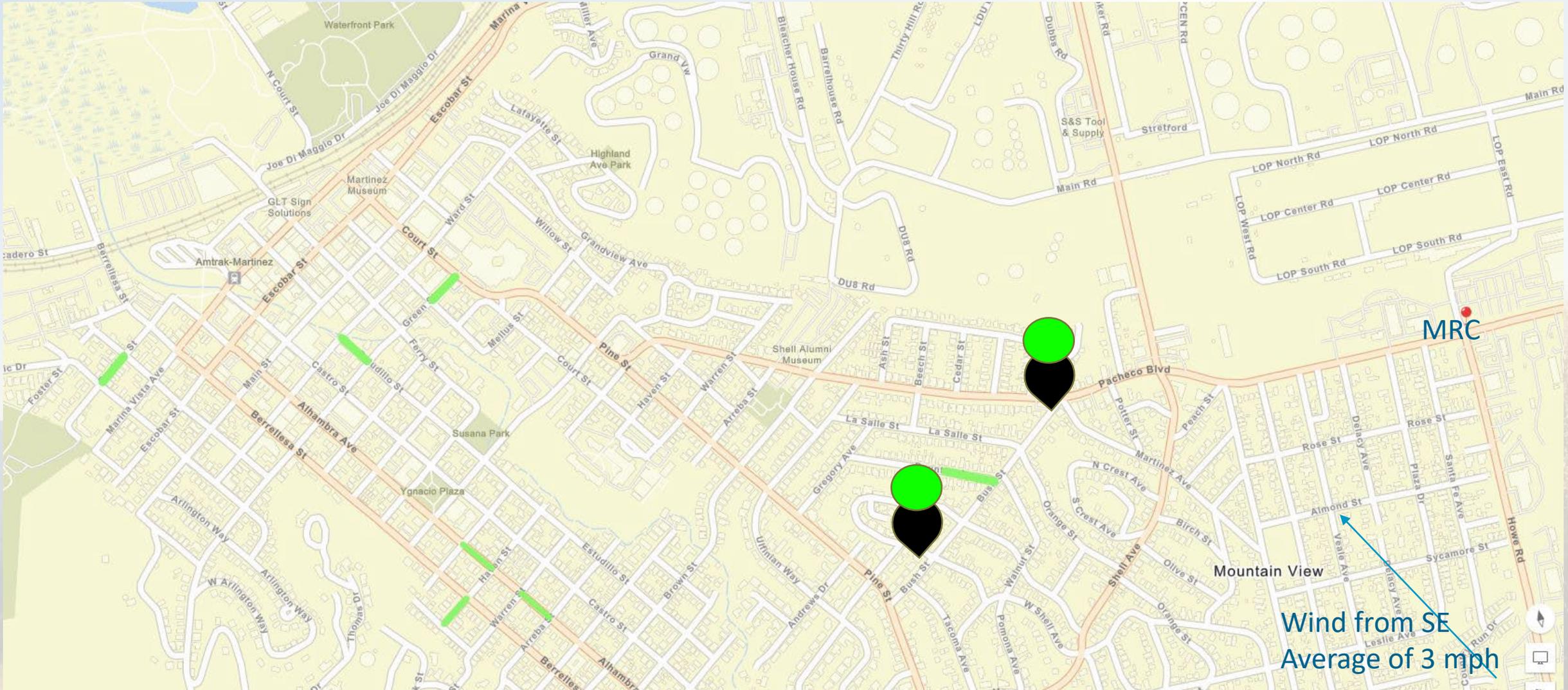
January 12, 2023



# ISO/CWS Ad Hoc Committee Staff Report

**DISCUSSION ITEM # 4 – Independent Investigation and  
Community Exposure/Risk Assessment of Martinez  
Refining Company Spent Catalyst Release**

# Hazardous Material Release from MRC

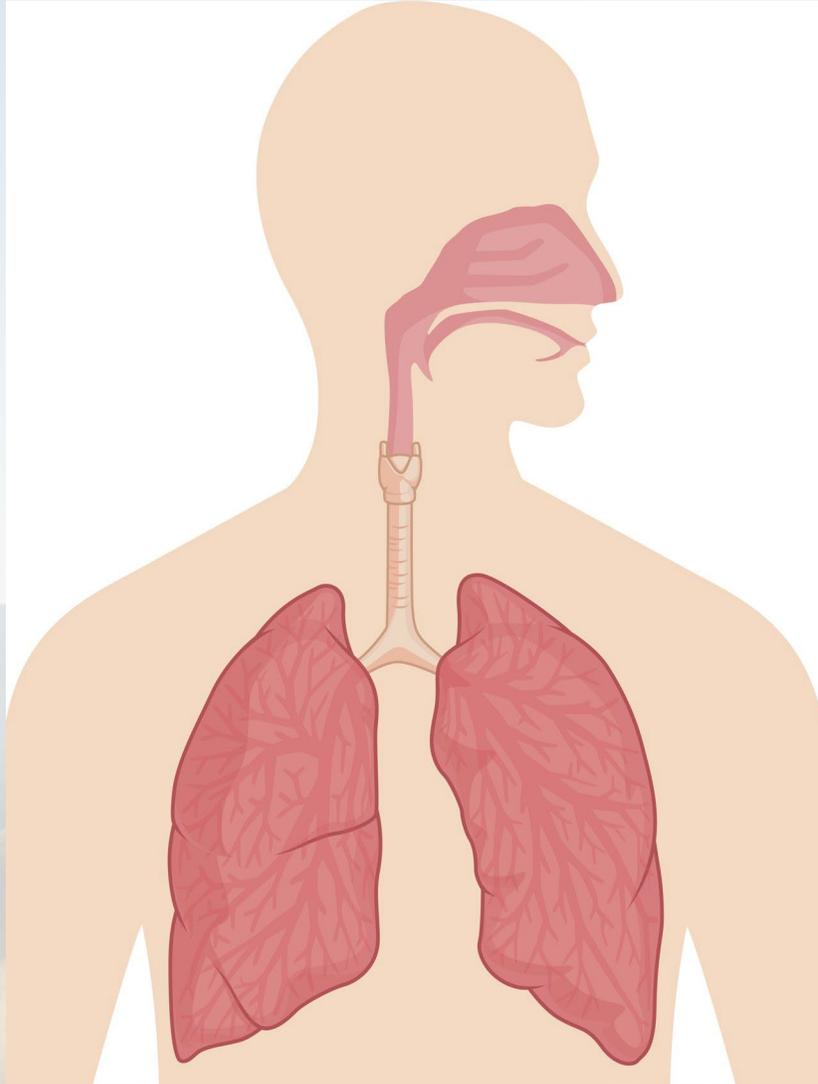


# Fluid Catalytic Cracking Unit Spent Catalyst Release



- The evening of November 24<sup>th</sup> and the morning of November 25<sup>th</sup> spent catalyst was released from the refinery into the surrounding community.

# Health Officer Report

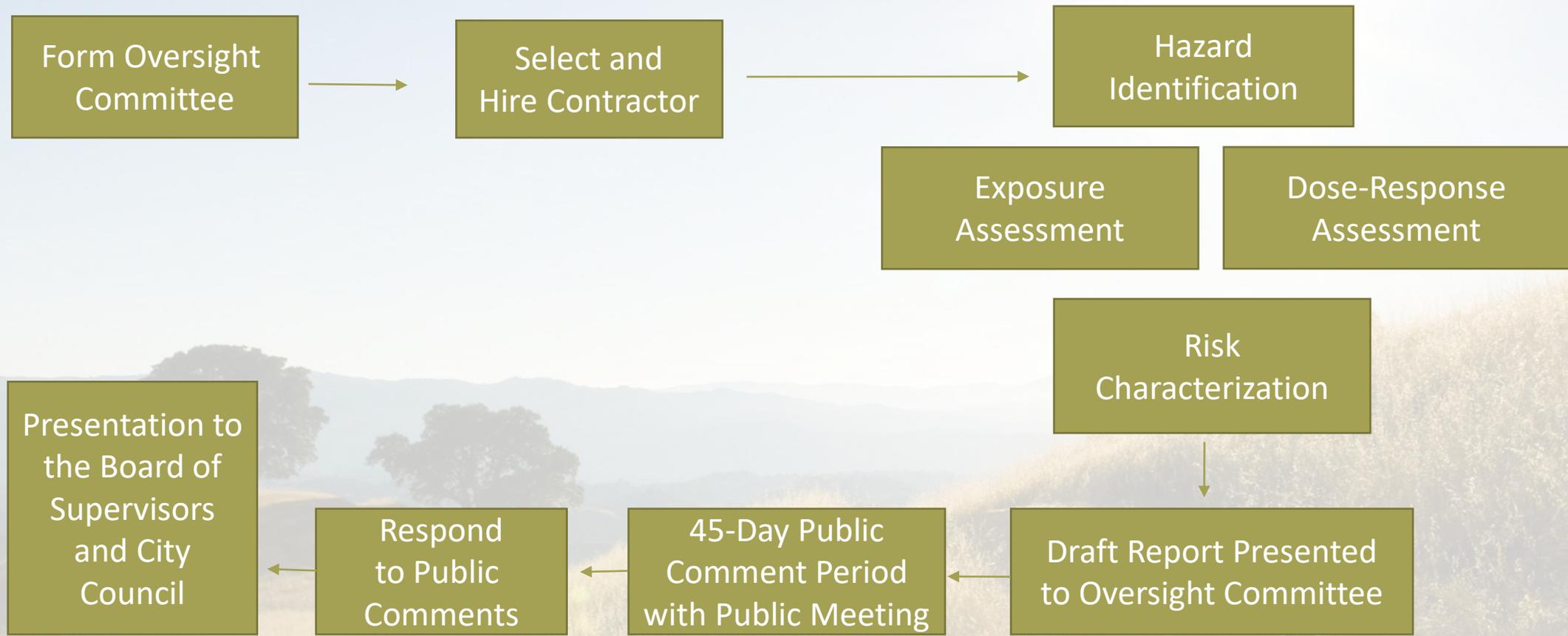


- The primary health concern at time of release was respiratory effects
- The catalyst contained the following which are respiratory hazards:
  - Aluminum Oxide
  - Silica
  - Metals (including Vanadium, Nickel, Chromium, Barium, and Zinc)
- Long term health impacts require further analysis (risk assessment)

# Independent Incident Investigation



# Independent Risk Assessment



# Oversight Committee

- Hazardous Materials Staff (Chair)
- City of Martinez Representative
- Five local community members
- Martinez Refining Company representative
- Martinez Refining Company employee representative

# Next Steps for Contra Costa Health

- CCH is seeking approval to:
  - Establish Oversight Committee to oversee two (2) items:
    1. Independent Incident Investigation
    2. Conduct Community Exposure/Risk Assessment

THANK YOU



CONTRA COSTA  
HEALTH SERVICES



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

**AGENDA: 5**

# **FCCU Air Pollution Control Technologies**

**Industrial Safety Ordinance Ad Hoc Committee  
January 12, 2023**

**David Joe  
Assistant Manager  
[djoe@baaqmd.gov](mailto:djoe@baaqmd.gov)**

# Presentation Outcome



- Provide information on air pollution control technologies used at refinery fluidized catalytic cracking units (FCCU).

# Presentation Outline



- Background on Fluidized Catalytic Cracking Units (FCCU)
- Air Pollution Control Technologies
  - Electrostatic Precipitator (ESP)
  - Wet Gas Scrubber (WGS)
- Air District Rule 6-5 Amendments
- Considerations during upsets and incidents
- Next steps

# Background on FCCUs



- Refinery Fluidized Catalytic Cracking Units (FCCUs) convert heavy components of crude oil into gasoline and high-octane products
- Uses a fine powdered catalyst to promote hydrocarbon cracking process
- Catalyst is aerated and circulated continuously between **reactor** and **regenerator**

# Background on FCCUs (cont.)

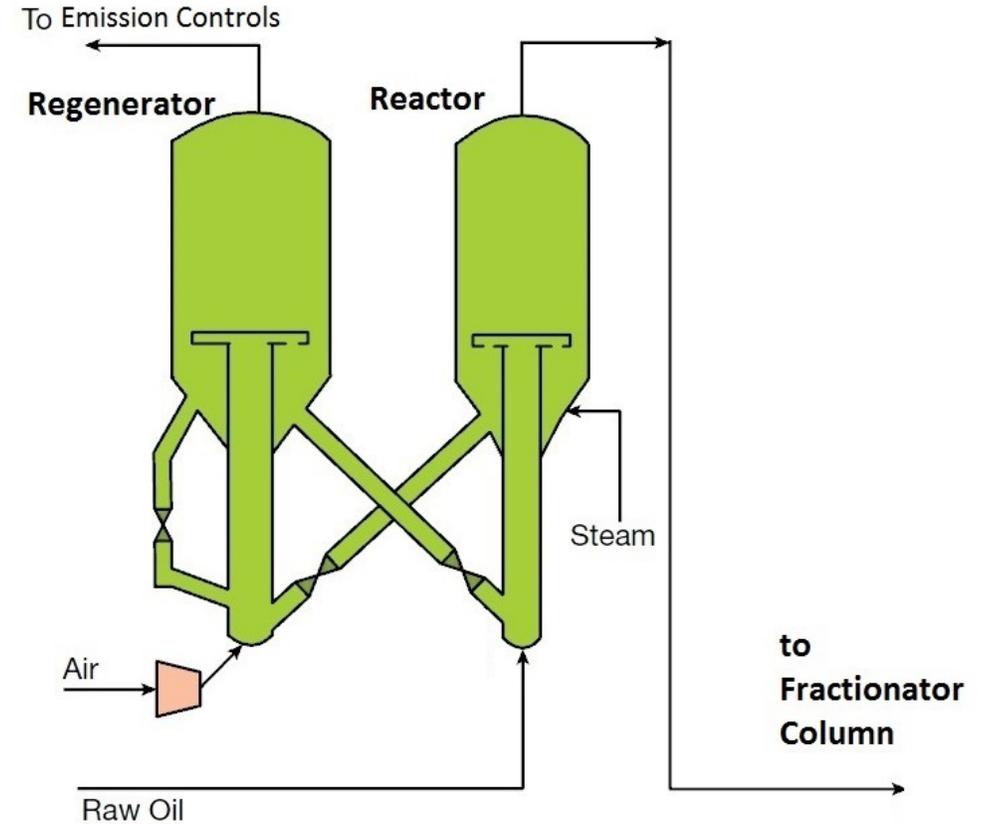


- **Reactor**

- Catalyst mixes with feed to promote cracking reactions
- Cracked hydrocarbons sent for further processing
- Catalyst becomes coated with carbonaceous material (coke)

- **Regenerator**

- Coke deposited on catalyst is burned off to reactivate
- Reactivated catalyst is cycled back to reactor
- Flue gas sent to emissions controls (i.e. ESP)



Modified from American Institute of Chemical Engineers, 2014. *Chemical Engineering Progress (CEP) – An Oil Refinery Walk-Through*. May

# Air Pollution Control Technologies

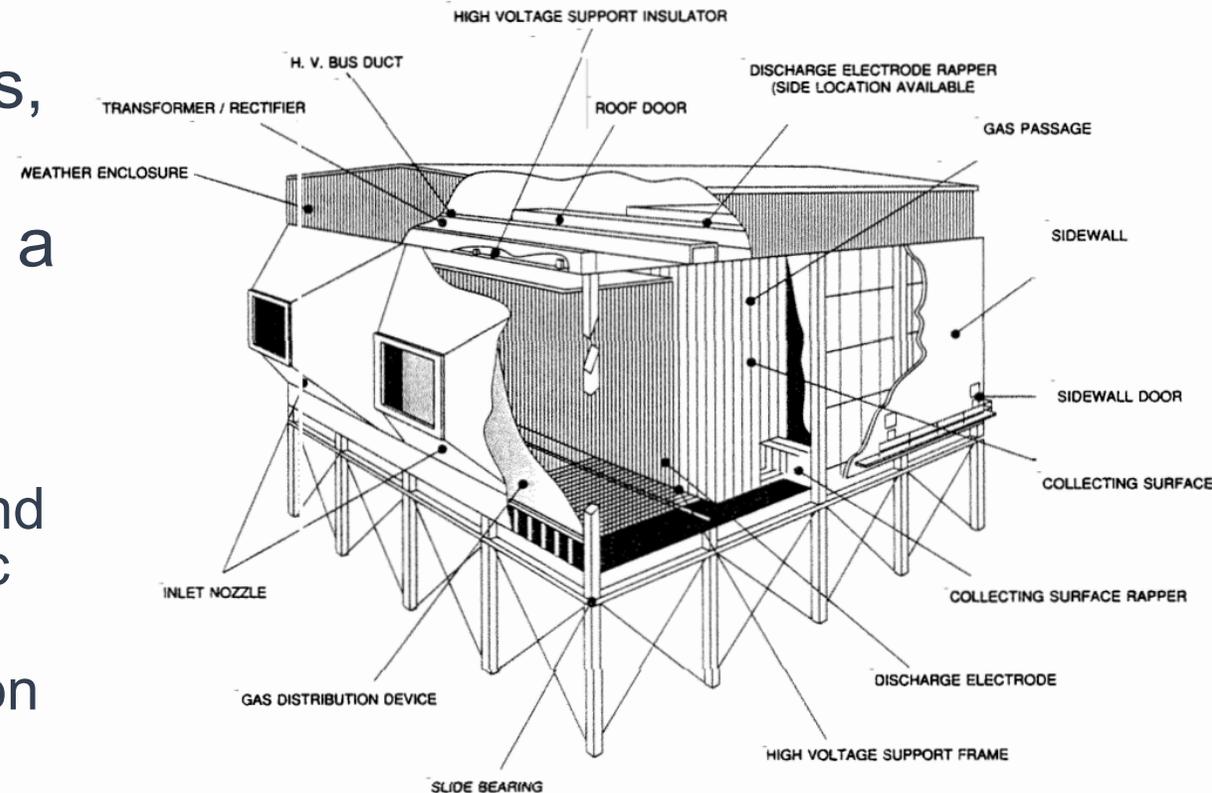


- FCCU regenerator flue gas contains a number of different pollutants
- Includes “catalyst fines” – Catalyst that becomes entrained in the flue gas that exits the regenerator
- Common control technologies
  - Electrostatic precipitator (ESP) – Uses electrical energy to remove particulates
  - Wet gas scrubber (WGS) – Uses liquid spray to remove particulates

# Electrostatic Precipitator



- Discharge electrodes, collection plates, plate cleaning system
- Particulate matter is removed through a series of steps inside the ESP:
  - Discharge electrodes are energized to establish an electric field
  - Particles in the gas stream are ionized and charged as they pass through the electric field
  - Charged particles move towards collection plates, which are oppositely charged
  - Particles collected on the plates are removed for disposal

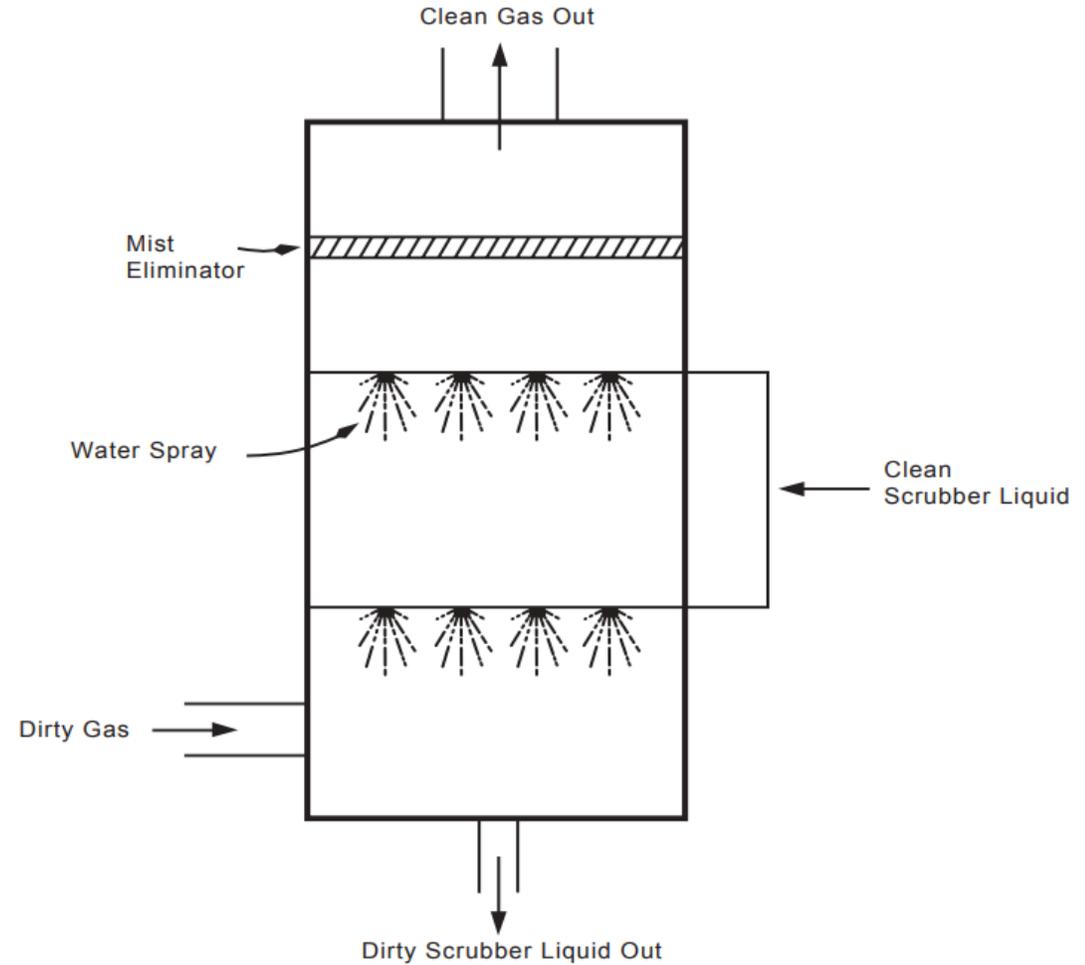


U.S. EPA, 1999. *Air Pollution Control Cost Manual, Section 6, Chapter 3 – Electrostatic Precipitators.* September.

# Wet Gas Scrubber



- Scrubbing liquid is sprayed into the spray tower
- Flue gas flows upwards through the liquid
- Particles are collected as they impact the liquid droplets
- Liquid containing pollutants is collected by mist eliminators or separators for treatment and discharge
- Various types of scrubbers exist with different features (tower design, spray operations, energy usage level, liquid collection, regeneration systems)



U.S. EPA, 2002. *Air Pollution Control Cost Manual*, Section 6, Chapter 2 - Wet Scrubbers. July.

# Air District Rule 6-5 Amendments



- Air District adopted amendments to Regulation 6, Rule 5 (Rule 6-5) in July 2021
- Address total particulate matter emissions from FCCUs
  - Amendments do not require use of specific control technologies, but sets standards comparable to performance typically achieved with wet gas scrubbing controls
  - Facilities must meet standards by 2026
  - Anticipate new/improved control equipment needed at Martinez Refining Company (MRC) and Chevron Richmond
  - MRC and Chevron are challenging the amendments in court, but the amendments remain in effect including the 2026 deadline

# Upset Conditions and Incidents



- Controls designed to abate pollutants for specific range of operating conditions
- Conditions can vary widely for each FCCU incident and upset event
- Control efficacy can be impacted for various reasons and equipment may need to be shutdown or bypassed for safety issues.
  - ESP considerations: Loading capacity, presence of hydrocarbons, catalyst buildup and damage
  - WGS considerations: Gas and liquid flow rate, high dissolved solids content in liquid, plugging of nozzles and pumps, re-entrainment and scaling

# Next Steps



- Major Chemical Accident or Release (MCAR) Report expected by the end of January 2023
- Air District investigation ongoing
  - 20 of Notices of Violation issued to date
    - 1 - Public Nuisance
    - 18 - Opacity Exceedances
    - 1 - Late Reporting of Title V Deviation
  - Additional NOV's may be issued

# Feedback Requested/Prompt



- Questions and comments?