ATTACHMENT J:

Enhanced Vapor Recovery Report

Clark County Nonattainment Area
Local Control Measure: Enhanced Vapor Recovery

This document describes a potential emissions reduction strategy and includes emissions reductions estimates associated with Stage I (also referred to as Phase I) vapor recovery (EVR) at gasoline dispensing facilities (GDF) in the Clark County nonattainment area (CCNAA). Stage I refers to emissions that occur when gasoline storage tanks (typically underground storage tanks (USTs)) are filled by tanker trucks. The California Air Resources Board has developed the most stringent additional emissions controls (referred to as enhanced vapor recovery; EVR) which require 98.0% control of Stage I emissions. Estimated emissions reductions and costs for this emissions control measure are shown in Table 1.

Table 1. Stage I vapor recovery control measure summary.[a]

2023 Applicable Emissions Estimates	
NOx:	-
VOC:	4.65 tons/day[b]
Control Measure Summary	
NOx Reduction:	-
VOC Reduction:	3.72 tons/day
Cost-effectiveness:	*$2,048 - $10,494/ton VOC*

[a] "-" indicate zero Nitrogen Oxides (NOx) emissions in the inventory and thus no emissions reductions.
[b] Calendar Year 2026 July average weekday inventory. Source: EPA 2016v3 modeling platform. Available at https://www.epa.gov/air-emissions-modeling/2016v3-platform, accessed in April 2024. The NAA is a subarea of Clark County; NAA specific emissions were estimated by allocating 2016v3 county-level emissions with 2016v3 spatial surrogates.

Applicable Source(s) Description

Figure 1 shows a visual depiction of a GDF with Stage I (or Phase I) and Stage II (or Phase II)

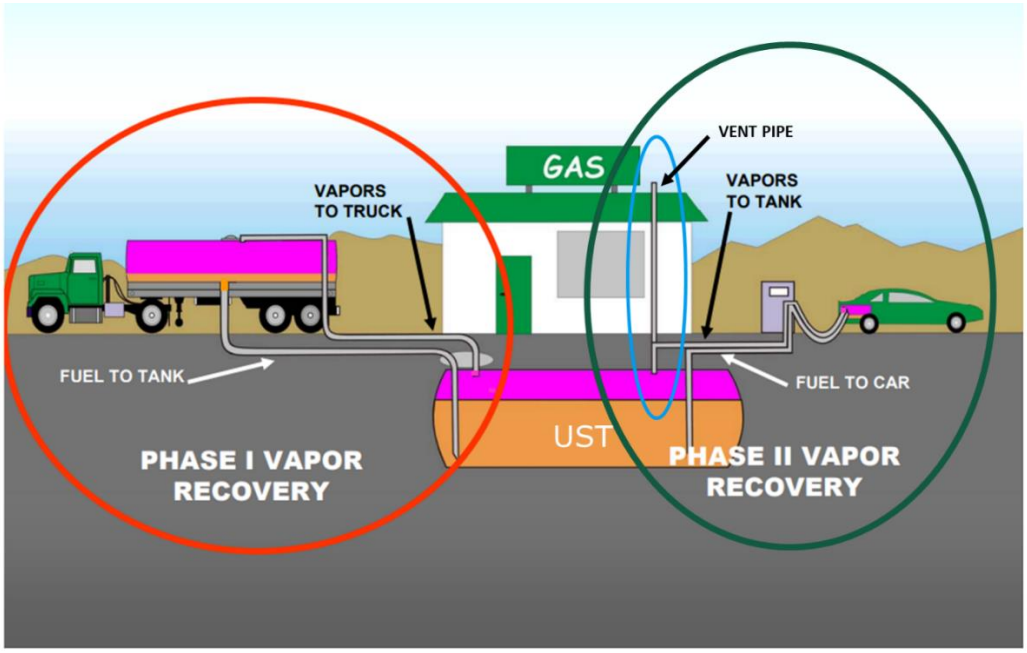

Figure 1. Stage I and Stage II breathing emissions sources at a GDF (adapted from Heiss, 2008).

Stage I (or Phase I) refers to the emissions source category associated with the transfer of gasoline from tanker trucks to USTs. As the UST is filled with gasoline, gasoline vapors in the UST are displaced to the atmosphere or routed back to the tanker truck.

Clark County permitting requirements for GDFs currently require Stage I vapor recovery for stations with a maximum gasoline throughput of 100,000 gallons per month or more per 40 CFR, Subpart CCCCCC (1.2 million gallons per year). GDFs with a maximum gasoline throughput less than the federal threshold are not required to have Stage I vapor recovery control equipment. Per Clark County GDF permit requirements, all vapor recovery systems are required to have an efficiency rating of at least 90% or 95.0% control efficiency which is certified by an "industry-recognized certification body" such as the CARB. Due to the now-repealed Air Quality Rule (AQR) 52, and its prior State Implementation Plan (SIP)-approved versions, most of the gasoline station tanks in the CCNAA are equipped with Stage I controls.

Stage II (or Phase II) refers to the emissions source category associated with the transfer of gasoline from the UST to a vehicle's gas tank. As the vehicle's gas tank is filled with gasoline, gasoline vapors in the vehicle's tank may be displaced to the atmosphere or controlled. Stage II also includes emissions from spillage from gasoline nozzle drip and overflows from the vehicle's fuel tank fill pipe. Clean Air Act Amendments require the use of on-board refueling vapor recovery (ORVR) canisters to capture vapors from vehicle gasoline tanks to release back into the vehicle's engines for vehicles manufactured after 2006. Clark County Department of Environment and Sustainability, Division of Air Quality (DAQ) is not considering Stage II emissions controls as an emissions control measure for the ROP demonstration.Table 2 lists the source classification codes (SCCs), associated category descriptions, and 2026 Stage I VOC emissions from in the CCNAA (Ramboll, 2024).

Table 2. Applicable SCCs.

Desc. One	Desc. Two	Desc. Three	Desc. Four	SCC	2026 VOC Emissions (tons/day)
Storage and Transportation	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Stage I: Submerged Filling	2501060051	4.47
			Stage I: Splash Filling	2501060052	-
			Stage I: Balanced Submerged Filling	2501060053	0.17
				Total	**4.65**

Control Measure Description

Stage I vapor recovery was established by EPA in 1975 to control emissions at GDFs when gasoline is transferred from tanker trucks to USTs. During tank filling, submerged pipes are used to minimize VOC and hazardous air pollutant (HAP) emissions that result from the displacement of gasoline vapors in the UST by the gasoline being loaded into the UST (Oregon Department of Environmental Quality, 2022). A vapor balancing system was introduced by some states and local agencies to recover the displaced gasoline vapors by routing them back to tanker trucks. CARB adopted Stage I EVR regulations in 2000 (CARB, 2020). Under this measure, GDFs in Clark County would be required to meet CARB Module 1 Phase I Vapor Recovery requirements that mandate Stage I EVR with 98.0% control efficiency.

Emissions Reductions

The 2026 CCNAA emissions inventory is taken from the 2016v3 modeling platform[1]. The 2016v3 modeling platform 2026 Stage I emissions were forecast from 2016 base year emissions assuming no change to underlying emissions factors. 2016v3 base year Stage I emissions were forecast from the 2014 National Emissions Inventory (EPA, 2022)[2], similarly, without change to underlying emissions factors, assuming 90% control of Stage I emissions. Based on compliance with CARB's 98% enhanced vapor recovery requirement, emissions reductions of 80% were estimated. The 80% emissions reduction assumes universal application of CARB Stage I enhanced vapor recovery requirements across the CCNAA after rule adoption. If smaller throughput GDFs are exempt from the Stage I enhanced vapor recovery requirement, emissions reductions would be less.

VOC emissions reductions from Stage I EVR at GDFs are presented in Table 3.

Table 3. Estimated potential future year VOC emissions reductions from gasoline service stations.

Desc. One	Desc. Two	Desc. Three	Desc. Four	SCC	VOC Emissions reduction (tons/day)	Percent Reduction
Storage and Transportation	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Stage 1: Submerged Filling	2501060051	3.58	80%
			Stage 1: Splash Filling	2501060052	-	-
			Stage 1: Balanced Submerged Filling	2501060053	0.14	80%
					3.72	**80%**

Cost-effectiveness

ERG (2012) estimated cost per ton of VOC reduced by gasoline facility throughput from application of CARB's Stage I EVR systems in Massachusetts (see Table 4). Cost per ton of emission reduction decreases as GDF gasoline throughput increases. The largest facilities, with gasoline throughput greater than 2 million gallons per year, show a financial benefit based on substantial estimated fuel savings from this measure. ERG (2012) notes that the cost per ton can be decreased by allowing GDFs to make Stage I EVR modifications gradually rather than at a fixed time. Cost-effectiveness of application of the CARB compliant Stage I EVR in Clark County will depend upon GDF throughput, whether there is a low gasoline throughput exemption, and the extent to which any existing control equipment is already in compliance.

[1] https://www.epa.gov/air-emissions-modeling/2016v3-platform. Accessed online in April 2024.

[2] EPA, 2022. 2014v2 National Emissions Inventory Supporting Data for Gasoline Distribution. https://gaftp.epa.gov/air/nei/2014/doc/2014v2_supportingdata/nonpoint/Stage%20I%20Gasoline%20Distribution%20for%20NEI%20v2.zip, Accessed online in October 2022.

Table 4. Stage I enhanced vapor recovery system cost effectiveness (source: ERG, 2012)

Gasoline Throughput (gallons/year)	Cost-Effectiveness ($/ton VOC)
<120,000	$55,005
120,000 to 240,000	$17,029
240,001 to 500,000	$7,327
500,001 to 1,000,000	$2,992
1,000,001 to 2,000,000	$885
>2,000,000	-$253
Total	**$2,048**

Geographic Applicability

A control measure for Stage I EVR is assumed to be applied throughout CCNAA area to mitigate VOC emissions.

Responsible Agency

The Clark County Division of Air Quality is responsible for enforcing SIP-approved control measures and other air permitting rules. The current Clark County requirements for GDFs are defined under Clark County's General Permit to Construct and/or Operate Gasoline Dispensing Operations (DAQ, 2020).

Implementation Schedule

A phased approach to implementation will allow continued operation of equipment not compliant with CARB EVR requirements for several years based on gradual replacement of existing equipment with EVR-compliant equipment.

Implementation Feasibility

Clark County general permit requirements stipulate the use of a Stage I vapor recovery system at GDFs; albeit with a lower control efficiency requirement than CARB EVR requirements. CARB's Stage I enhanced vapor recovery requirements have been implemented in several states, including Massachusetts and Connecticut.

Public Acceptance

VOC emissions from refueling can cause or contribute to ozone levels that violate NAAQS for ozone. GDF owners and operators may have a negative perception of these requirements because of the costs required to upgrade Stage I control systems.

References

California Air Resources Board (CARB), 2020. "Evaluation to Identify Potential ISD Report Options for Characterizing UST Ullage Pressure Data." Accessed in October 2022 online at https://ww2.arb.ca.gov/sites/default/files/2020-10/VR-OP-G5%20FINAL.pdf

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Heiss, 2008. "Enhanced Vapor Recovery (EVR) for Gasoline Dispensing Facilities." San Diego County APCD. October. Accessed in September 2022 online at https://www.sandiegocounty.gov/content/dam/sdc/deh/hmd/presentations/hmd_2008_ust_apcd.pdf.

Ramboll 2024. "2017 and 2026 Emission Inventories for the 15% Rate of Progress (ROP) Plan for the Clark County Ozone Nonattainment Area". Prepared for the Clark County Division of Air Quality. April.